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Effect of Protection on Regeneration in JFPM forests in selected villages in Uttara Kannada district, Karnataka.

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ABSTRACT

Effect of protection on regeneration and species similarity was studies in six village forests under Joint Forest Management in Uttara Kannada district, Western Ghats. Difference in species number, stem density, basal area of planted and natural species and shrub density was compared between two observations in all the villages studied

All village forests experienced decrease in number of stems after the protection was withdrawn. The decrease in overall density of natural species was more (19.7%) than that of the exotic species (8.2%). This could be because of the utility of native species than the exotic ones. Basal area increased for stems that were planted, while the basal area generally decreased for stems of natural species. The overall basal area, including native and planted species, has increased during the observation period indicating biomass accumulation. Shrub density increased in all villages except in Kadle, where there was no natural vegetation in the village forest. Greater similarity of species was found for planted species within the same village forests before and after protection. The number of cut stems increased significantly when the protection was removed indicating diversion of pressure. Thus the species that were planted, mostly exotic, were not preferred by the community and on the other hand the native species were used to meet various biomass needs. The study indicates that the programme should develop measures that incorporates various measures to conserve and maintain the village forests.

Key Words: Joint Forest Management, protection, forest regeneration, species similarity, species diversity.

Introduction

Once forests used to be a major resource in the past but with increase in population, pressure on forest has increased to meet the growing needs of industrialization, urbanization (Lal 1990; Dayal and Shah, 1993; Myers, 1993; Sandler, 1993; Southgate *et al*, 1993) it is now not able to meet even the basic needs of the forest dependent communities. Continued deforestation has put increasing pressure on the natural resources and on the livelihood patterns of the forest dependent communities. A study on deforestation has concluded that forest policies have contributed significantly in conserving forests in India (Ravindranath and Hall, 1995; Murali and Hegde 1997, Saxena 1997, Bhat *et al*, 2001). These include the Forest Conservation Act 1980, the Forest Policy 1988 and the Wildlife Act 1972, which triggered several afforestation programmes.

Participatory forestry programme called as Joint Forest Management (JFM) was launched in India during 1990 with a view to enhance regeneration of degraded forests and accord protection through local community. The efforts towards community initiated forest protection has built as a movement in India with over 62,000 village communities protecting over 14.4 million hectares of forests (Saigal, 2001, Murali *et al*., 2002). Though the efforts are largely from the government, the impacts of such efforts on the ecology is not properly understood. The programme now is over a decade old and no attempt has yet been made to understand the impact of protection towards vegetation recovery, regeneration potential and species composition either at the local or regional or at national level (Murali *et al*., 2000, Murali *et al*., 2002).

In Karnataka the programme of participatory forestry is called as Joint Forest Planning and Management (JFPM). In the state of Karnataka, a guideline was issued to undertake participatory community forestry during 1993 through an order based on the guidelines passed from the Government of India. Plantations under JFPM are raised with a view to supply fuelwood, fodder and other non-timber forest products to the local people living in and around the forests. The plantations are also expected to improve tree cover and allow natural regeneration due to the protection provided jointly by local people and the Forest Department. The implicit assumption in the community protection is to improve regeneration in these forests, either pure plantations or assisted natural regeneration plots. For the first three years of JFPM plantations in Karnataka,

protection is offered primarily by the Forest Department through barbed wire fencing, cattle proof trenches and a watchman (Bhat *et al.*, 2000) After completion of three years, the fence and the services of watchman will be withdrawn to enable the community to take over the forest for protection Here we attempt to understand the change in regeneration potential species numbers, stem density in these JFPM plantations

Study Area and Methods

The study was conducted in Uttara Kannada district, Karnataka (latitude 30° 55 'to 15° 31 N and longitude 74° 9' to 75° 10 E) where the first experiment on JFPM was taken by Karnataka Forest Department with support from an England donor agency called Department for International Development. The district has of over 330 VFCs as a part of JFPM programme in the state (Gaonkar and Gowda 2000) The study was conducted in Sirsi block of Uttara Kannada district The district is hilly terrain with varying depth of soil. Soils are lateritic with gneiss and schist type of rocks underneath with a pH around 5 Annual average rainfall in the district is 250 cm June to mid-October is monsoon season, November to January is winter season and February to May is summer season. The study villages were Nidgod, Gornmane, Hallibailu, Illimane, Kadle and Hukli belonging to Sirsi division except Kadle, which belonged to Honnavar Division. In all the VFCs the year of plantation was 1995-96 and observations were made during 1997-98 and 1999-2000.

Methods

Two time series was taken in all the villages, first before the removal of protection and once after one year of removal protection. In each location, three quadrats of size 40 x 50 m each was measured GBH of all the stems were measured for the planted species and for natural species the stems above 10 cm girth were measured Within each quadrat another plot of 10 x 10 m was laid and all stems measuring >20 cm height counted and the species to each stem belong was recorded. In the subsequent year, i.e., approximately an year later, similar data from the same plot was recorded. Difference in species number, stem density, basal area of planted and natural species and shrub density was compared between two observations in all the villages studied In order to know whether the differences are statistically different, student t-test statistic was

computed as given in Zar (1985) Similarity of species composition at two observations was made using Morishita-Horn index as given by Mcgurran (1988).

Results and Discussion

All VFCs experienced decrease in number of planted stems after protection was withdrawn (Table 1). The highest was in Kadle that experienced 16.61% of their stems extracted within one year and the least was in Hallibailu with only 4% of stem removal Stand density of natural species also experienced similar pattern of removal. The highest removal was in Nidgod with nearly 60% of stems being extracted and the lowest in Hallibailu with 4.25% of stems cut No natural species was found in Kadle, as it was a pure plantation The overall decrease in stem density was highest in Nidgod (18.71%) and the lowest in Hallibailu (4.02%) Thus there was difference among villages in stem density of native and exotic species of village forests. The decrease in overall density of natural species was more (19.7%) than that of the exotic species (8.2%), though the total stem density decreased was more in planted or exotic species This may be primarily because of the utility of from the native species than the exotic ones Exotic species are planted primarily to meet the firewood demand than other utilities of the community

Basal area increased for stems that were planted, while the basal area generally decreased for stems of natural species The increment in basal area was over 100% in all villages for planted species, while enhancement of basal area for stems of natural species was observed in Illimane and Kadle There was decreased basal area of stems of natural species in Nidgod, Goranmane and Hukli, while increased basal area was observed in Hallibailu and Illimane The overall basal area, including native and planted species, has increased between the observation period indicating increased biomass accumulation. Shrub density increased in all villages except in Kadle. Kadle being a village without any natural species, the shrub density was zero. Increase in over 100% shrub density was observed in Goranmane. The planted species probably did not promote growth of shrubs under them and the density of planting in Kadle is relatively higher than other village plantations that were either mixed plantation model or Assisted Natural regeneration models. The number of new recruits was high in Kadle (168), while no new recruits were found in Nidgod (Table 1) and therefore the basal area of new recruits was also high in Kadle.

Species diversity was high in Illimane both before and after removal of protection for planted and natural species, followed by Nidgod. The least species diversity was observed in Hallibailu for planted and natural species as well (Table 2). Greater similarity of stems was found for planted species within the same VFC before and after protection. However, there was greater difference for natural species in their similarity. The least similarity was found in Illimane and cthe maximum was found in Hallibail. Least similarity in shrub species density was found in Illimane and the maximum in Kadle. This indicates that where the more diversity was found, the similarity was less

In view of limitations on the availability of villages that had no physical barriers (such as trenches, barbed wires and watchman), the comparison of regeneration was not possible with "control" villages. There is significant difference in the protected and protection relieved forests was found for cut stems (Table 3). The quantity of cut stems increased significantly when the protection was removed indicating that people have removed the stems for various uses. This indicates that people needed these poles or stems for their usage. However, due to the barriers and the watch kept by the forest department. It is interesting note that the basal area of the planted species significantly indicating that stem removal has not really hampered the biomass growth. It is not clear at this stage, whether the basal area attained would be more, had the stems been allowed to grow without cutting. There are two possibilities, one there would have been an increase in basal area, or it would have remained the same as it is due to crowding (Ref).

Joint Forest Management being a people oriented programme, should have taken the people's confidence into account prior to initiating the village forest committees. However, in view of the target oriented programme the JFM was initiated primarily through enthusiasm of the forest department. The present study indicates that many species that are useful for the community has been cut due to removal of physical protection owing to the fact that these resources were not allowed to be part with the community. The feeling of ownership of the land and the forest is yet not imbibed in the community, had they been given a pride in ownership and the management solely to them. Thus the species that were planted, mostly exotic, were not used by the community and on the other hand the native species were used to meet various biomass needs. The indication is that the programme should develop measures that builds confidence of village

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community before the formation of the forest committee and even after formation, the social fencing attitude should be developed for their own benefit.

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Table 1: Species richness and vegetation parameters in villages of JFPM plantations

	Planted Species		Natural Species		Total	
	Before	**After**	**Before**	**After**	**Before**	**After**
Stem Density						
Nidgod	633	568 (-10.27)	131	53 (-59.54)	764	621 (-18.71)
Goranmane	843	788 (-6.52)	353	313 (-11.33)	1196	1101 (-7.84)
Hallibailu	873	838 (-4.00)	47	45 (-4.25)	920	883 (-4.02)
Illimane	1009	967 (-4.16)	75	73 (-5.66)	1084	1040 (-4.06)
Kadle	1180	984 (-16.61)	0	0	1180	984 (-16.61)
Hukli	956	897 (-6.17)	166	136 (-18.07)	1122	1033 (-7.93)
Average	915.67	840.33 (-8.22)	128.67	103.33 (-19.7)	1044.33	973.67 (-9.64)
Basal Area (m^2/ha)						
Nidgod	0.803	2.981 (+271)	5.619	5.194 (-7.15)	6.422	8.175 (27.3)
Goranmane	0.776	4.16 (+316)	6.953	6.700 (-3.6)	7.729	10.86 (40.5)
Hallibailu	0.315	2.378 (+655)	0.492	0.538 (+9.3)	0.807	2.916 (261.46)
Illimane	1.380	4.738 (+188)	3.578	3.716 (+3.8)	4.958	8.454 (70.49)
Kadle	2.120	4.950 (+133)			2.120	4.950 (+133)
Hukli	0.810	2.541 (+213)	1.927	1.850 (-3.99)	2.737	4.931 (60.43)
Average	1.034	3.62 (250.6)	3.094	2.99 (-3.67)	4.128	6.71 (62.62)
Shrub Density						
	Before	**After**				
Nidgod	3216	3600 (11.94)				
Goranmane	3933	8250 (109.7)				
Hallibailu	1750	2700 (54.28)				
Illimane	3350	4350 (29.85)				
Kadle	37525	32225 (-14.12)				
Hukli	11383	11867 (4.25)				
Average	10192.33	10498.67 (-3.0)				
New recruits						
	Number	**Basal area**				
Nidgod	0	0				
Goranmane	22	0.0022				
Hallibailu	28	0.0306				
Illimane	53	0.0650				
Kadle	168	0.5060				
Hukli	22	0.0223				
Average	48.33	0.14				

Table 2. Details of Shannon-Weiner Diversity Index and Morishita Horn Index among the villages studied

	Diversity Index						Morishita-Horn Similarity index			Diversity Index of New recruits	Similarity Index
	Planted species		Natural Species		Shrub Species						Shrub Density
	Before	After	Before	After	Before	After	Plantation	Natural	Total		
Nidgod	0.911	0.872	2.649	2.297	2.614	2.841	0.999	0.952	0.991	1.6819	0.718
Goranmane	0.720	0.704	2.225	2.212	2.743	2.978	0.999	0.999	0.999	1.4100	0.726
Hallibailu	0.062	0.030	1.883	1.930	2.452	2.800	0.999	0.998	0.999	1.4470	0.891
Illimane	1.018	1.006	2.958	2.845	2.838	2.914	0.9997	0.978	0.997	Nil	0.445
Kadle	0.971	0.955	Nil	Nil	0.187	0.216	0.999	Nil	0.999	Nil	0.999
Hukli	0.3490	0.292	2.814	2.640	2.729	2.952	0.999	0.988	0.999	1.9250	0.920

Table 3: Comparison between the vegetation parameters before and after protection across all the villages.

	Before removal of protection Mean ± SD	After Removal of protection Mean ± SD	t-statistics
Stem density	915.67 ± 182.87	840.5 ± 152.84	0.567
Basal area (planted species)	0.607 ± 0.27	2.21 ± 0.67	5.4
Basal area (natural species)	2.48 ± 2.72	1.58 ± 1.48	0.71
Cut Stems	6.83 ± 4.71	81.33 ± 57.3	3.17
Dead	32.33 ± 29.97	10 ± 5.93	1.7
Density of Natural species	128.67 ± 124.76	72.33 ± 111.86	1.03
Species Number (natural)	19.83 ± 12.12	16.33 ± 10.56	0.533
Density of Shrub	517 ± 519.34	501.83 ± 448.83	0.05
Shrub species	26.5 ± 11.8	25.67 ± 10.55	0.12