AGRARIAN TECHNOLOGY AND ECODEGRADATION OF EETTA FORESTS IN SALKANI VILLAGE IN NORTH KANARA DISTRICT, KARNATAKA

By

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'Peasant isolation.....is the combined result of a self sufficient mode of production involving little social interaction, dispersal throughout the country side, poverty and poor communications'.

DONALD S. ZAGORIA
(Asian Tenancy systems and
Communist Mobilization)

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PREFACE

This project idea materialised after listening to a talk on Indian Forest Policy by Dr. Madhav Gadgil at IIMB on 8.9.1983.

My visit to several villages in Sirsi taluq in January 1984 to study the Appiko movement strengthened my resolve to return for a closer look atthe Forest problem.

Dr.Vinod Vyasulu of IIMB was instrumental in my being invited to the Center for Ecological Sciences, Sirsi, as a Visiting Scientist, from April to June 1984.

In order to keep the investigation within manageable levels, the problem of Betta Forest Resource Management was studied in detail in Salkani village, about 15 km from Sirsi town.

The choice of Salkani forthe study was not accidental. The villagers of Salkani had spearheaded the Appiko agitation, and were responsible forthe first stoppage of Departmental tree felling in the nearby Kelase forest in September 1983. Salkani also has the reputation, among official circles, of having the most degraded betta forests in Sirsi taluq.

The villagers of Salkani have realized the need to conserve forest resources, including the Betta forests under their control. The Yuvak Mandal ofthe village assisted me in this study, and have asked to be made the principal recipients of this report.

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ACKNOWLEDGEMENTS

A study of this type would have been impossible without the active co-operation and interest of district officials and their staff. I would like to express my gratitudeto all these individuals, especially, Mr. Sanjoy Das Gupta, I.A.S., Dy.Commissioner (Special), N.Kanara district; Mr. Subhash C.Khuntia, I.A.S., Asst. Commissioner, Sirsi, for giving me access to village records in Sirsi and Salkani. Mr. B.S.Ramaiah, I.F.S., Dy.Conservator of Forests, Sirsi circle, for his open attitude and sincere co-operation. Mr. Arvind Hegde, Range Forest Officer, Hulekal Range, for sharing his experience, and providing valuable tips in Forest Nursery Management.

I, benefited from discussions with the following professional colleagues : Dr.S.N.Prasad, Scientific Officer, CES, Sirsi for his constant help and advice. Mr. M.Vijayakumar, of the ISI, Calcutta, who has been living among the Havik farmers for the last four years provided valuable insights into Havik social behaviour. Ms Vasavi Gowda permitted me to use material collected by her during a field study in Sirsi taluq in the first week of May 1984 in the field of Social Organisation. Dr. M.S.Hegde of IISc, who is doing pioneering work in rural energy consumption and appropriate technology explained aspects of change of cultural practices.

My gratitude is due to the farmers of Sirsi and Yellapur taluqs, without whose open hospitality, intelligent appreciation of my study objectives and constant guidance, this study could never have proceeded beyond the conceptual stage.

I am grateful to Mr. Shankar Dixit, President of the Yuvak Mandal, Salkani for the official support he extended to my work.

In particular, I am indebted to Mr. and Mrs. Ganapathy Veerappa Hegde of Salkani Hosamane, with whom I stayed for over a month, not only for giving me food and shelter, but also the status of a son, which opened a vast network of contacts all over Sirsi taluq. Their own son, Ramachandra Salkani was my expert guide, and in many ways this study is the result of his initiative and energy. Mr. Narasimha Hegde, a young Pre-University student, handled the bulk of my routine calculations and data compilation out of sheer personal interest, and came to my rescue whenever my Kannada proved inadequate.

My final discussions with Mr. Mahabaleshwar Hegde of Hulgol and Mr. K.M. Hegde of Bhairumbe helped to rationalise much of the data that appeared confusing.

I am grateful to Mr. M.M. Hegde of Bhairumbe for the practical training I received from him in many aspects of cattle economics.

Finally, I would like to record my thanks to Dr. Kulkarni of Rallis Agrochemical Research Station, Bangalore for doing the foliar analysis of the samples I collected from Salkani, free of charge.

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I. Introduction and Objectives

I.1. Historical Perspective

According to their own tradition, the Havik Brahmins were brought to N.Kanara around AD 680-700 by Mayurvarma, the founder of the Kadamba dynasty of Banavasi. It is believed that the Haviks settled the Kanara and Malabar coasts in the 7th or 8th century when Valabhipur, in S.East Kathiawar, their homeland was destroyed by the Arabs.

The Gazetteer for Kanara district for the year 1883 records that "they are most skilful gardeners, growing fine pepper, cardamoms and betel nuts and arranging for the water and shade of their gardens with the most ceaseles care and complete success. They are also very expert in climbing the betel palms to gather the nuts and the pepper which is trained up their stems."

The Havik farmers are extremely industrious and have no ritual sanctions against any form of manual labour. This attitude extends to the cleaning of their homes and toilets, unlike many other parts of India.

The Havik farms are to be found in valleys which are cool and moist. They have traditionally depended on the forests around their farms for green manure, mulch, grass and building materials.

Attempts by the early British administration to stop the "almost unrestricted destruction of forest"/[1] led to agitations among the farmers. This in turn led to the demarcation of betta forests in every village, on the basis of the thumb rule, " All land covered with trees that are pollarded, whether every year or in rotation, is to be regarded as bete and measured accordingly./[2]

The British administration also recognized that the farmers of N.Kanara require timber for their house-construction, cattle sheds, tools and implements, and set apart some areas called Minor Forests for the use of the whole village. This was done on a common access and unlimited entry basis. The records of 1920's still speak of the Minor forests as lands with some useful tree stand; but by the 1960's the comments are that "the trees have been hacked excessively for meeting their priveleges. The inferior species have also been lopped to provide firewood or fodder, while the entire area is over run by herds of cattle and is subject to annual fires."/3

Throughout this study, references are made to Reserved forests, which are state property, and Betta forests which have been assigned to farmers, while Minor forests have been assigned to villages for the exercise of the priveleges of the people. It is necessary to add that the Minor forests have been reduced to thorn scrub, overrun with more cattle than it can carry.

In the 1920's, the Government brought in a regulation permitting 'Strip Cultivation' around farmsteads to provide "elbow-room" and keep out wild animals like pigs which damaged the crops./4

As a further measure to reduce the menace of wild animals, by 1950, one Shikar Officer and 6 Assistant Shikar Officers were appointed in the district. Their duties were to organize gun clubs among farmers. Each gun club received subsidies for it's organization and for the purchase of guns./5

Since the Haviks are strict vegetarians, and not disposed to violence, it is fortunate that shooting of wild animals has not evolved into a privelege and into being part of the culture as in Coorg or Chikmaglur districts.

As early as 1894, the Commisioner (Southern Division) of Kanara was suggesting that the forests of Sirsi and Siddapur do not have valuable timber and that it would be preferable to let the farmers use them for agriculture, which would enable the Government to receive a larger return./6

The cutting of green manure from the betta forests was "regulated strictly by WAHIWAT or custom" and " each garden holder knows exactly what is the part of the land which by custom belongs to him and from which he can obtain betta and he only./7

The Survey Settlement Commission divided the betta forests into survey numbers largely for what appears to be form, as to this date each cultivator cuts betta from lands assigned to him by ancient custom and not government regulation.

The first regulation of betta forests appears in Col.Anderson's letter No.639 of 25th Dec. 1866, in which "8 acres of betta to 1 acre of garden was to be the minimum; that lands in excess of 8 acres should be resumed, applied to the increase of those under 4 acres...."/8

The Mollison report was submitted in 1899. Mr.Mollison, Dy.Director of Agriculture proposed that 9 acres of betta be assigned for each acre of garden.The "Collins Report" which was the final settlement document could not be traced in the District Forest Settlement Office. Betta forests are now administered as per the rules laid down in the Karnataka Forest Manual.

I.2. OBJECTIVES

The aim of this study is to

1. Examine those aspects of agrarian technology that are directly related to betta forest degradation.
2. To develop a scale for measuring the extent of degradation of betta forest plots.
3. From a table of degradation of individual plots in Salkani, to make inferences that would provide insights for management decision making.
4. To estimate a betta forest inventory for Salkani village.
5. To propose a line of action that would reduce resource depletion of betta and reserved forests in Salkani.

I.3. METHODOLOGY

Some two weeks were spent in Salkani, merely gaining the confidence of the villagers, and getting a feel of the problem. It was possible later to actually involve the villagers in this study and convince them that knowledge is a public good.

While a questionnaire was used, observations and measurements had to be set up simultaneously, to assess the reliability and validity of information collected.

The farmers in Salkani do not normally maintain detailed records of labour and material costs involved in crop production. Lack of records introduces an element of confusion when farmers seek to explain

the result of cyclical variations in agricultural production. There is considerable variation in the fertility of individual plots of farm and betta forest land, and these endowment disparities influence factor costs and farmers' attitudes.

As in the case of most village studies, a considerable amount of evaluation and interpretation of farmers' responses was required to avoid the accumulation of worthless data that converge to ridiculous and nonsensical conclusions.

The scale used for measuring betta forest degradation has been explained in detail at the appropriate place. In developing this scale, a compromise had to be made between speed and accuracy. First of all, when a scientist says that one plot is more degraded than another, what does he really mean. Is the perception of a Forester different? How would a farmer or an activist of the Appiko movement perceive the problem? It was expected that perceptions would differ when 2 scientists currently working on the betta problem, 1 Forester, 1 Farmer and 1 Activist were asked to rank attributes considered responsible for degradation, using the paired comparison method. The inclusion of 2 scientists was deliberate. Also, by using thermistors, exposuremeters, soil tensiometers, hygrometers and potometers in the betta plots, a more 'scientific' measurement of degradation could have been undertaken. However, this would have required a far longer period of observation and a team of trained technicians. Ultimately such an approach would have yielded figures which would be useful to the decision maker only in relative terms and not absolute terms. This purpose is served well enough in the rough and ready approach used in this study.

Thus it can be seen that there is an element of bias in the data interpretation, particularly as this is a one man study. However, some such bias is unavoidable, especially in the absence of any such studies being available in the district. The only remarks that can be offered to inspire confidence is that this investigator has had close professional contact with forestry and plantation management problems on the Western Ghats since 1967. Also, frequent discussions were held with experts at the CES and among the farming community.

I.4. SALKANI VILLAGE

Salkani Village is the Head Quarters of the Salkani Panchayat which covers Manadur, Naigar, Tattisar, Kadabal, Maregar, Kudregoda and Nilkani villages. The land use pattern in these villages is as follows:

Table 1.

Village	Areca (acres)	Paddy & fld crops	Betta Forest area	Minor	Reserved
1.Salkani -	43.18-	17.13-	274.35*-	59.08-	nil
2.Manadur -	55.13-	86.25-	329.08 -	760.83-	286.23
3.Naigar -	41.75-	138.00-	311.48 -	894.73-	1308.73
4.Tattisar-	40.55-	30.93-	327.73 -	113.63-	nil
5.Kadabal -	42.98-	113.43-	498.02 -	549.40-	"
6.Maregar -	33.40-	54.35-	276.40 -	459.93-	574.25
7.Kudregoda	1.25-	136.40-	nil -	nil -	5433.58
8.Nilkani -	1.23-	44.45-	7.67 -	" -	583.93
	259.47-	620.94-	2024.73 -	2837.60-	8186.72

* Though the betta forest area as per the Village Officer's records is 274.35 acres, the actual area found by a rough measurement of the plots is 216.13 acres. While the difference is largely due to my error, it is also due to reduction of betta area through encroachment, and other uses including labour housing. For the purpose of this study, the exact area is not important. therefore, the measured area of 216.13 acres is used throughout the study.

The population of Salkani village as per the 1981 census is: male-191, female-152, total-343. The cultivation register shows the names of 33 assessees who own land.

Thirty of these assessees have the caste name Hegde(28), Bhat (1) and Dixit (1), all of them being Haviks. Two assessees have the name Gowda and one has the caste name Naika. However, the neighbouring Naigar village has more Gowdas (13) and Naikas (13) than Haviks (23) and this is reflected in the larger area under paddy and other crops. The Haviks have emerged as specialists in the cultivation of Areca and it's intercrops.

II. Agrarian technology and Forest degradation

II.1. Introduction

In any traditional society, Agrarian Technology is developed over several generations of close observation of and adaptation to the ecological setting of the region. The natural tendency for a newly settled society is to apply its existing technology to agriculture and introduce change only when it is forced upon it. This tendency leads to a steady state where a certain rigidity of field practices sets in, sometimes even hallowed by religious ritual. From this position, the need for change arises mainly when there is a drastic change in existing patterns of demand and supply, or if drastic change takes place in technology.

In this study, we shall consider only 4 aspects of technology which have a direct bearing on betta degradation. These are:

1. Mulch and Green fertiliser application in Areca farms.
2. Fuel consumption
3. Cattle keeping
4. New soil application in gardens.

Areca is the main crop in Salkani, yielding about 1.1 tonnes per acre. (Last season's yield is estimated at 1.169 tonnes per acre. Planting is irregular and annual culling out of unproductive palms is a routine job.

Cardamom used to be an important crop, grown in the shade of Areca, till about 10 years ago when mosaic disease became endemic.

Pepper has been almost wiped out in Salkani due to root-wilt. Farmers report that even Panniyur-1 falls prey.

Banana also used to be an important intercrop until bunchy top virus appeared in Salkani.
Cocoa has been recently introduced in the Areca gardens but the crop is indifferently managed in Salkani, and in its present condition, is probably competing extensively with Areca.

Intensity of cultivation is defined as the ratio of gross cropped area to the net sown area. From estimates of crop acreages in Salkani we have the following configuration:

Gross Cropped area: Areca = 43.13 acres
Cardm = 3.82 " *
Banana= 2.75 " *
Total = 49.75 "

*based on regular stand

Net Sown area = 43.18 "

Intensity of yield = 49.75/43.18 = 1.15, against a theoretical possible cultivation intensity of 4.

As this study deals with betta degradation, Paddy and other field crops including Sugar cane, Urad dhal, and Magey kai, a kind of gourd, all of which are grown for home use only, are not considered.

II.2. BETTA LOPPING

As Areca is a perennial crop, a high plant nutrient requirement problem is compounded by leaching and soil erosion during the monsoon.

Inorganic fertilisers are not used in Areca farms in Salkani and the majority of the farmers whose opinion was sampled believe that inorganic fertiliser is harmful to Areca in the long run.

The farmers rely solely on cattle manure which at present is collected in a large open pit near the cattle shed. During the wet weather, NELGAPPU, the shrubs and regenerating species in the bettas are sickled and strewn as bedding in the cattle sheds and added to the dung pits.

Traditionally, branches of forest trees have been cut and spread in the Areca fields in January. This heavy mulch protected the soils from the outside temperatures, heavy rain, and later crumbled into the soil, improving the humus content.

However now, though branches of betta trees are lopped in January, they are stored in the betta till May, when the dry leaves and twigs are separately collected, the former for organic manure and the latter for fuel. This development has very likely led to branches and twigs rich in potash and calcium being diverted for fuel and stockpiling of fuel and encouraging lavish fuel consumption habits.

It is also to be noted that in a moist deciduous forest as in Salkani, natural shedding of leaves is the mechanism through which, nutrients drawn from various levels is returned to the soil. It is possible that the present practice of lopping trees and removing <u>all</u> the dry leaves is placing the forest under severe nutrient restriction in a stressful situation.

Samples of this dry leaf which is considered by the Haviks to be the most efficacious manure for Areca were analysed and the results are as follows:

Nitrogen %	- 0.613	- 0.589	(Two samples)
Phosphorous	- 0.062	- 0.060	
Potash %	- 0.105	- 0.075	
Calcium %	- 1.312	- 1.562	
Magnesium %	- 0.787	- 1.275	

The present rate of dry leaf application (which is influenced both by availability from rapidly deteriorating betta forests and availability of migrant labour) is in the region of 1400 kgs per acre (600 palms) per year, in addition to cowdung at about 3000 kgs per acre. This works out to:

	N	P	K
Cowdung	50 gm	30 gm	55 gm
dry leaf	14 gm	1.4gm	2 gm
Total	64 gm	31.4gm	57 gm

instead of the recommended N 100 gms, P 40 gms, K 140 gms PLUS compost or cattle manure per bearing plant./9 Extra manure will also be required for Pepper, Cardamom, banana and cocoa, which is at present not being supplied. The deficiency in Potash is particularly serious.

However, the present policy has the advantage to the farmer of being a zero cost resource application. Indeed it is the application cost which is now increasing. Attempts to reduce labour cost is resulting in faulty management of the betta resource and causing degradation leading to the death of trees.

Forty years ago, the Conservator of Forest, Kanara, Southern Circle, writing to the Collector of Kanara comments,

> "One thing appears to be fairly obvious, and that is, that this ancient system of using green leaves for manure and for covering manure and of cutting large branches to obtain them is wasteful in the extreme. The simple method of forming leaf mould from dead leaves appears to be unknown to these people, but would probably be quite as efficacious, while the dampness of the country affords a condition very favourable for its adoption...."/10

TABLE - 2 : ANALYSIS OF MINERALS AND NUTRIENTS IN BETTA FOREST TREES(LEAVES AND TWIGS)

Local Names	KAVAL	IPPI	HONNE	JAMBE	HIRDA	KANAGALU	HONAL	MATTI
Botanic Names	Careya Arborea	Bassia Spp.	Pterocarpus Marsupium (leaves)	Xylia Dolabri Formis (leaves)	Terminalia Chebula (leaves)	Dillenia Pentagyna (leaves)	Terminalia Paniculata	Terminalia Tomentosa
Moisture	80.66	78.95	78.77	73.31	77.77	87.06	75.06	81.86
Dry matter	19.34	21.05	21.23	26.69	22.23	12.94	24.94	18.14
Organic matter	18.00	19.60	25.24	20.90	11.68	23.42	16.74	-
Mineral	1.34	1.45	1.45	1.33	1.26	1.52	1.40	-
Silica	0.08	0.10	0.11	0.04	0.08	0.12	0.07	-
Potash K_2O	0.43	0.43	0.44	0.30	0.41	0.40	0.44	-
P_2O_5	0.086	0.097	0.08	0.078	0.070	0.100	0.080	-
Nitrogen	0.31	0.43	0.62	0.40	0.24	0.42	0.34	-

SOURCE: Report of the Dy.Dir. for Agriculture, Bombay Presidency,May 1899.

The following comment is significant:

> "The leaves and twigs contained from 73% to 87% of water. But even in this succulent condition the percentage of Nitrogen and Potash were equal to about half the quantities usually found in well preserved farmyard manure." /11

Yet another observation is:

> "The system of manuring is expensive even though the materials are got free and the destruction caused to the forest growth is enormous. Under the circumstances, it would, I think, be most advisable to test by experiment whether concentrated manures such as castor cake or safflower cake could take the place of a portion of the manure now used." /12

The most enlightened and educated of Havik farmers in Sirsi taluq have already reduced their dependence on forest tree leaves as the main complement to cowdung. They have started using inorganic fertilisers and are harvesting 1.5 to 2.2 tonnes of Arecanut per acre against a district average of about 1.2 tonnes per acre.

But even this is lower than the district average of 6544 kgs/ha or 2648 kgs/acre (2.648 tonnes/acre). North Kanara district which has the unique 'soppu privelege' is lagging far behind S.Kanara district which has a yield of 8455 kgs/ha or 3422 kgs/acre (3.422 tonnes/acre) (Ref.Appendix II).

II.3 - Fuel Consumption

By studying the problem of Fuel with a 'Balance-Sheet' approach, it was possible to estimate the sources and applications of fuel in Salkani village, as presented below:

Table 3

SOURCE			APPLICATION		
	tonnes			tonnes	
1. Dead trees from betta	- 75	- 27.27%	1. Cooking	- 67	- 24.36%
2. Hale	- 14	- 5.09%	2. Heating	- 86	- 31.27
3. Sippe	- 17	- 6.18%	3. Drying WP's	- 40	- 14.54
4. Dead Areca trees	- 12	- 4.37%	4. Sugarcane	- 24	- 8.73
5. Reserved forest	- 157	- 57.09%	5. Areca processing	-- 58	- 21.10
TOTAL	275	- 100%	TOTAL	275	- 100%

Dead trees from betta account for 27.27% of the total consumption in a year. This gives an indication of the need for replacement of betta trees which die of old age, lightning strike, disease, and excessively severe betta lopping.

Hale, is the name for the spathe covering and leaf sheath of the Areca tree. It is found to be a good cattle feed when moist and chopped into pieces. It has several other uses as a readymade, semi waterproof vegetable fabric. Hence it is not a reliable source.

Sippe or Arecanut husk does not burn well. It smoulders for hours and is suitable for heating water, etc. However, it has tremendous Agro-industrial potential and must be discounted as a permanent and reliable source.

Each year about 6 Areca trees per acre are removed due to disease or non-productivity. This material is also in demand for minor construction, small bridges, etc. Again, this is not a reliable source.

The reserved forest accounts for 57.09% of the total requirement of firewood. The farmers "buy" firewood from migrant labour and subsistence farmers in smaller villages, who hire their services out during lean periods. This leads to a certain amount of "dry wood production". The technique is to ring the bark of forest trees and cause their death.

Drying Wp's or weather protectives refers to Sheeps hair blankets or 'cumblies' used by the farmers and their labour.

Areca processing refers to boiling arecanuts and soaking them in the decoction to get the KEMPU or red grade. This grade is in less demand now.

As discussed earlier, the major source of betta forest 'Dead Trees' is from the branches of loppings. The housewives find it convenient to use these small branches which do not require splitting. As this material does not last very long, and since the same quantity of wood is collected each year, in many homes, firewood is consumed on a lavish scale, particularly to provide running hot water - 31.27% of total consumption.

If farmers and their labour were to use plastic raincoats, the need to dry the more expensive Sheeps hair blankets could be eliminated.(14.54% of total.) However, this is a cultural practice of long standing, and may not be easy to change as long as firewood is easily accessible.

Wherever Gobar Gas plants have been installed, cooking is done completely on these. The cowdung slurry from these plants is richer in Nitrogen than cowdung in it' normal state.

In households that own large areas of Areca and paddy, the quantity of firewood extracted from the bettas is far in excess of family requirements. In such cases, the migrant labour use the firewood, duplicating the lavish consumption patterns of their landlords. Again, it must be emphasized that this happens because the resource is still readily available.

The ASTRA chulha has been heard of by most of the farmers in Salkani, but has been constructed only in a few homes despite the low cost of about Rs 200.00 per efficient chulha.

II.4 New Soil Application

The farmers claim that due to heavy annual rainfall, much of the soil in the garden is washed away and fresh soil has to be brought from the betta areas to replace the lost soil. While on the best managed farms, this work is done once every ten years, mainly to cover the exposed areca roos, in Salkani, farmers interviewed do this work once in two years. They claim that without this work, Areca trees will simply not produce.

Some modern farmers claim that this work is intended to supply micro nutrients to the Areca garden. However, the excavation of earth for the Areca fields from the hillsides near the cultivated valleys is causing landslips and destruction of trees and vegetation. It would appear that this practice originated with the intention of enlarging the valley cultivation by encroaching into the betta hillsides.

On a rough calculation, it would appear that the cost of encroaching 10 guntas (0.25 acres) is Rs 40,000 at current rates. It is not understood why encroaching is preferred at this cost, because the cost of an acre of planted areca garden is about Rs 80,000, at current prices. It is seen that several farmers take loans from the Co-op service banks for New Soil Work, and in Hulgol village, it is reported that repayment is heavily in arrears.

The cost of excavating and headloading tonnes of earth to the Areca fields is high and destructive of the betta forest areas. It would also appear to be inefficient if it has to be done once in two years. If soil erosion is the problem, growing of cover crops, sub-surface drains, even alkathene strip covering can be resorted to, among modern technologies available. Cutting into hillsides and transporting vast quantities of earth to Areca fields is an unsustainable agricultural practice that is causing considerable damage to the betta forest ecosystem. Frequent soil and foliar analysis will indicate the exact quantities of micro nutrients to be supplied to the garden soil.

II.5.1 Cattle Keeping

The Yuvak Mandal's record of Cattle population in Salkani was verified and updated during the period of my stay. With additional data from interviews, it is possible to give the following estimated break-up:

Buffaloes	-	63
Exotic cows	-	23
Ordinary "	-	43
Bulls	-	36
Calves	-	63
Total		228

Many farmers feel that though exotic cows may give more milk, they require more attention. Bulls are kept by those families that need to plough their paddy fields, or pull carts. Generally all calves are kept whether male or female. Male calves are sometimes given (but never sold) to the workmen for working their fields on the coast.

228 cattle represent an average of 7 cattle per family with a range of 2 to 20. From so many cattle, each family was getting 3.51 ± 1.13 litres of milk per day at the time of the survey.

The attitude of the farmers is that cattle are kept to produce cowdung and that milk is a by product. According to the survey, each family gets 30.5 ± 8.09 kgs of cowdung per day (at 50% wet weight.) Cowdung is stored in dung pits, but proper composting methods are still not known to the farmers. During heavy rains, the pit, which is exposed is flooded and considerable leaching of soluble mineral elements takes place. Fermentation in the open pits causes loss of Nitrogen in the form of Ammonia.

While many farmers reported that they stall feed their cattle, investigation shows that in most families only lactating animals are stall fed. The other cattle are driven to the minor forests during summer and the bettas during the monsoons. During my visit, at the height of summer, cattle could be seen in some of the betta plots causing damage not only by browsing regenerating tree growths, but also by daily trampling of the open areas.

II.5.2 Range Management

Grass growth is stimulated by annual firing of the bettas in summer. While it is true that burning of grass-lands produces fresh succulent grass growths after summer rains, (RANGANATHAN 1935 and 1941) it is also well known that "annual burning followed by intensive grazing will lead to a weakening of the grass plants and a progressive reduction in their vigour and competitive power. The palatable species are thus liable to be superceded by less palatable tougher species which do not suffer so much under this treatment."/13

The present system of firing the bettas and opening them to intensive grazing may well increase the plant diversity (SINGH 1968, SINGH & MISRA 1969) but the Appiko activists of Salkani point out that firing causes wanton destruction of tree seeds which are produced in the dry months.

The tough wiry grass that survives this harsh regime in the bettas is called "Karada" by the farmers, though it has been identified by CES scientists as a mix of Themeda, Pennisetum and Dicanthium. A well bulked sample of betta grass was analysed at Rallis, Bangalore, and yields the following result in comparison with other grasses and forage legumes:

Table 4	Crude Protein%	Ash %	Ca %	P_2O_5 %
1. Karada	3.40	4.25	0.68	0.071
2. Themeda triandra	2.52	5.74	0.26	0.086
3. Pseudanthistiria heteroclita...	2.82	6.76	0.29	0.065
4. Ischaemum ciliare	3.75	8.07	0.38	0.152
5. Eragrostis unioloides....	4.74	7.66	0.32	0.065
6. Setaria glauca..	7.94	11.41	0.32	0.166
7. Dactyloctenium aegyptium....	7.44	8.29	0.44	0.035
8. Apludia varia...	3.75	6.42	0.23	0.182

SOURCE: for items 2 to 8 - Ash and Mineral contents of certain grasses (Bharucha & Shankaranarayan 1958 b)

Table 5

SELECTED FODDER GRASSES	% Crude Protein	Ca %	P_2O_5 %
1. Brachiaria mutica	5 - 6	0.76	0.49
2. Panicum maximum	5 - 8	Fairly well balanced	
3. Pennisetum purpureum	5 - 7	- " -	
4. Chloris gayana	5	0.5	0.4
5. Panicum antidotale	7.5	0.9	0.9
6. Cynodon plectostachyon	10	0.8	0.5
7. Pennisetum clandestinum	12	-	-

SOURCE: Grassland and Fodder Resources of India
R.O. Whyte - (ICAR)

Table 6

SELECTED FORAGE LEGUMES	Crude Protein %	Ash %	Ca %	P_2O_5 %
1. Albizzia lebbek	29.2	7.5	1.3	0.2
2. Cajanus cajan (before bloom)	21.4	5.8	0.22	0.06
3. Leucaena leucocephala	18.10 (whole)		-	-
4. Prosopis juliflora	21.40	7.7	1.50	0.23

SOURCE: Tropical Forage Legumes P.J. Skerman
FAO Plant Production Series No.2

From tables 4, 5 and 6, it can be seen that while the Karada grass of Salkeni has the nutritive value of the poorest wild grasses, there is much scope for improvement of forage management, using a mix of grass, legume cover crops and browse trees, thus reducing the firing and overgrazing of the bottas.

III Measurement of Betta forest Degradation

III.1 Development of the Scale

As a first step in quantifying degradation, twelve attributes considered to be indicators of degraded forests were selected. These factors refer to 'Status' of forests at a given time, and not necessarily 'Management' of those forests. The idea was to develop a scale that could be adapted to measure the status of a reserved forest, or a teak, or a Eucalyptus plantation. At present there is no way for the public to know how effectively a forest plantation or a forest is being managed.

The selected factors are:

1. No. of trees per acre - As per the Karnataka Forest Manual, "The betta lands shall be maintained at a forest cover of 100 trees per hectare.(40 trees/acre)"
2. Mean girth of trees at brest height - The KFM has stipulated 30 to 45 cm dia at breast height. Since $\pi d = C$, 3.14 X 30 cms = 94 cm girth. For the purpose of this study, 91 cms overbark (o.b.) circumference or girth at breast height has been taken as standard.
3. Mean height of trees - Assuming that 40 trees per acre is acceptable, we would expect trees at 33 ft^2 planting distance per acre (of 43560 ft^2), to satisfy the proviso that they should be 'evenly spaced in the betta area' as per the KFM. In order to provide even shifting diurnal shade to the forest floor, the trees would require to be a minimum of 33 ft or 10 metres height. Accordingly, 10m is taken as the standard.
4. Extent of Vacant Patches - Vacant patches are significant when we consider an acre plot with 50 trees

crowded into a small corner of the plot (say 25%) while the major portion of the plot (say 75%) is exposed to the elements.

5. Lack of Ground Cover - Rated on a Ten point scale
6. Cattle grazing - Rated on a Ten point scale
7. Top soil erosion - --- " ---
8. Die-back of mainstem/branches - It could be argued that this is an indication of Management efficiency. However, for our purpose, it indicates that a tree with die-back indications is going to die slowly. Faster than it would normally have done.
9. Regular fire occurrence- We must remember that we are talking of Natural Climax vegetation - be it a shola forest or moist deciduous or evergreen, where fire is not an essential biotic feature as in a temperate forest.
10. Main Cart Road near one or more boundaries. It is fairly common knowledge that the more inaccessible a forest plot, the less it would be disturbed by man. Here 2.5/10 points are given for one road, 5/10 for 2 roads and a theoretical maximum of 10/10 for a square plot with cart roads on all four sides.
11. Eupatorium and Lantana present
12. Randia and other thorny species present

It may be noted that items 5 to 12 were scored on a ten point scale at the time of actual field inspection. Error is expected to be consistent in each judgement.

In the case of item 3, TOTAL TREE HEIGHT or the distance along the axis of tree stem between the ground and the tip of the tree is considered. In the absence of Hypsometer, ocular estimates were made, making a few checks at the start of each day's work with an improvised Dendrometer which makes a 45° angle of elevation with the tip of the tree.

Ranking of attributes

The next step was to approach Five experts to rank the attributes to obtain an average weight for each attribute. The 'Paired Comparison' or 'Decision Matrix' method was used to minimise bias.

Table 7

	ATTRIBUTE No.											
	1	2	3	4	5	6	7	8	9	10	11	12
Dr.Madhav Gadgil-	7	7	6	10	9	4	11	6	1	0	3	2
Mr.B.S.Ramaiah -	4	1	3	3	4	8	7	5	11	1	10	9
Mr.K.M.Hegde -	3	0	4	5	10	8	10	6	5	5	9	1
Mr.Keshav Hegde -	7	3	2	10	11	4	9	5	2	0	6	7
Dr.S.N.Prasad -	6	2	5	7	8	9	10	0	8	1	7	3
Simple Average:	5.4	2.6	4	7	8.4	6.6	9.4	4.4	5.4	1.4	7.4	4.4

Note Mr. B.S.Ramiah was DFO, Sirsi circle at the time of the study. He is also a graduate in Agriculture.
Mr.K.M.Hegde of Bhirumbe is one of the leading farmers of Sirsi taluq, who is constantly looking for better ways of managing his farm.
Mr.Keshav Hegde of Sheegehalli is a dedicated Appiko activist, with an immense interest in forests and their preservation. His name was suggested to me by Mr. Pandurang Hegde of Appiko.

In the above scale, maximum points indicate maximum perceived importance and least points indicate comparitively less importance.

The AVERAGE ATTRIBUTE WEIGHTAGE was converted into ATTRIBUTE WEIGHTAGE COEFFICIENT as shown below:

Table 8

Attributes	AAW	AWC
1. Trees per acre -	5.4	- 0.8181
2. Mean Girth of trees -	2.6	- 0.3939
3. Mean Height of trees -	4.0	- 0.6060
4. Extent of Vacant Patches	7.0	- 1.0605
5. Lack of Ground Cover -	8.4	- 1.2726
6. Cattle Grazing intensity	6.6	- 0.9999
7. Top soil erosion -	9.4	- 1.4241
8. Die-back of M.S./b -	4.4	- 0.6666
9. Fire damage -	5.4	- 0.8181
10. Main Cart Road -	1.4	- 0.2121
11. Eupatorium & Lantana -	7.0	- 1.0605
12. Randia & Thorny species-	4.4	- 0.6666

In the next Phase, each of the 31 betta plots in Salkani was visited, and scores were indicated against each sample. This gives the SAMPLE WEIGHTAGE COEFFICIENT.

Trees per Acre - To estimate this, it is necessary to first estimate the Vacant patches in the plot. From the wooded area, a 25 m^2 plot is chosen at random, and the number of trees counted. The no. of trees per acre is calculated, bearing in mind the vacant area.

Mean Girth - The trees in the 25m^2 plot were individually measured. The Mean Height was similarly estimated. All other items were rated on a ten point scale.

The two types of weightage coefficients are combined by multiplying the attribute weightage coefficient (AWC) for each attribute by the sample weightage coefficient for each sample. These are then added up to give the total weightage coefficient for each sample plot in respect of all the factors taken together. For example, in a situation where scores have been given for the 12 attributes as follows:

-5, 7, 8, 2.2, 3, 1, 2, 2, 1, 2.5, 0, 0, .

The total weightage coefficient (TWC) is found as follows:

$$(-5 \times 0.8181) + (7 \times 0.3939) + (8 \times 0.6060) + (2.2 \times 1.0605) + (3 \times 1.2726) + (1 \times 0.9999) + (2 \times 1.4241) + (2 \times 0.6666) + (1 \times 0.8181) + (2.5 \times 0.2121) + (0 \times 1.0605) + (0 \times 0.6666) = 16.19$$

The result indicates the percentage of degradation of the plot as intended in this study - 16.19%

If this scale were to be used for, say, Eucalyptus plantations, we would need to decide what are the acceptable girth and height parameters for 1st year, 2nd year of growth etc. Coppicing would also be considered.

In the case of teak plantations, this scale, which takes into account the number of trees per acre, the mean girth and height will provide information which will help to decide whether optimum use of public forest land is being made.

NOTE: Forest areas were estimated by pacing off the boundaries, using a CASIO Pace Runner electronic device in the Pedometer mode. Triangulation and other simple calculations were used thereafter.

III.2 The Extent of Betta Forest Degradation in Salkani

The degradation of betta forest plots in Salkani was found to follow the distribution given below:

Table 9	No of plots	Area in acres	% of total area
Less than 10%	nil	--	--
10% to 19.9%	2	38.64	17.88
20% to 29.9%	5	15.69	7.26
30% to 39.9%	7	39.88	18.45
40% to 49.9%	9	49.26	22.79
50% to 59.9%	5	59.75	27.65
60% and above	3	12.91	5.97
	31	216.13	100.00

In order to have some degree of comparison, given below are details of degradation of 3 Minor Forest plots and 3 Reserved forest plots. It may be noted that the Reserved forest plots at Ammanavaru Kadu have been slightly disturbed for Matchwood/Plywood contracts recently.

	EXTENT OF DEGRADATION	
Plots	1 2 3	
Minor Forest*	- 69.52-72.86-73.14	%
Reserved Forest	- 5.00-11.54-13.54	%

*Manadur, Tattisar, Salkani.

Against this, the extent of degradation for the whole of Salkani village is calculated to be 29.58%.(Bettas only.)

III.3 Interpretation

Referring to the betta degradation distribution given in III.2, it may be seen that if 50% degradation is taken as the danger level on this scale, 8 plots out of 31, representing 72.66 acres (33.62%) of the total area of 216.13 acres requires immediate management attention.

As one kind of possible management attention is to initiate legal action, the table of degradation of individual betta forest plots in Salkani has deliberately not been appended to this report.

The data was examined to see if there was any correlation between size of betta forest plots and level of degradation. However, the Coefficient of Correlation turned out to be r = -0.067, showing that there is absolutely no correlation between the variables.

There is some truth in the plea of owners of extremely degraded areas that their plots have been poor for generations. Such plots have slopes with gradients of more than 1 in 8 in certain parts. Both rill and gully erosion are seen in these areas. Other endowment disparities including poor soil, rocky areas etc. were also in evidence.

Trees per Acre

There are approximately 14000 trees in the Salkani Betta forest, or 65 trees per acre. This stand is compared to that of a few neighbouring villages in which small samples were collected. Tatteesar=88, Naigar=118, Kadabal=65 and Manadur=74 trees per acre.

Kadabal, Manadur and Tatteesar are very near Salkani, while Naigar is further away and closer to the Reserved Forest. In the Ammanavaru Reserved forest, the stand was found to be 211 trees per acre.

Girth

Assuming Normal distribution, with mean girth=0.853m and s.d.=0.3547, the number of trees under each girth limit is estimated below:

Over 1.22 m	- 0.91-1.21m	- 0.61-0.90	- lessthan 61cm
2121	- 3989	- 4459	- 3431
15.15%	- 28.49%	- 31.85%	- 24.51%

It can be seen that 56.36% of all the trees are below 91 cms girth and the number of trees with girth over 1.22m is only 15.15% of the total.

The girth of trees in Salkani village is compared with the girth of trees in the Ammanavaru Reserved Forest.

	Girth	s.d.	Coefficient of Variation
1. Salkani	- 0.853m	- 0.3547	- 41.58%
2. R.Forest	- 1.21 m	- 0.61	- 50.41%

The main significance of the higher Coefficient of Variation in the girth of Reserved forest trees is that despite some disturbance, it is a dynamic and perpetual system with a range of very small to very large trees. The trees in the betta are subject to sufficient disturbance to make the variation in girths not more than one would expect to find in any tree crop plantation. The only large girth trees that I saw were Ficus religiosa, which are venerated and not cut even for betta. There is also a lack of extremely small girth trees, as these are frequently removed for poles and posts. The consequence is that the betta forests are extremely vulnerable when it comes to replacement of old trees.

Height

The mean height of the betta forest trees in Salkani is 8.97m with s.d.=2.7115m. The mean height of trees in the Reserved forest plots is 14.41m with s.d.=4.90m. Under conditions ofless disturbance, with heavy stand per acre, trees in such forests tend to compete with each other for available sunlight. This competition results in tall forest stands.

It is to be expected that workmen would prefer to keep the trees as short as possible in the bettas to reduce the labour and the danger to themselves.

The 1961 Working Plan for Sirsi and Siddapur comments that "Bettas have been practically reduced to tall stumps without any foliage or side branches, on account of heavy lopping for leaf manure and drastic opening made in the canopy coupled with frequent fire and heavy grazing."

Vacant Patches

By estimating the vacant patches in individual plots, we have an aggregate estimate of 107.16 acres of vacant patches for the whole of Salkani village. This represents 49.58% of the entire betta area of 216.13 acres.

If the sole purpose of vacant patches in betta areas is to provide poor quality Karada grass, there is a very good case for planting up the entire vacant patch area of 107.16 acres with trees and good forage material can be introduced in the Minor forest area of 59.08 acres which is at present on its way to a form of desertification.

If the vacant patches have developed not out of design, but sheer neglect and ignorance , there is all the more reason to start up a planting programme before the situation gets any worse.

Ground Cover

The main ground cover seen in betta plots, apart from Karada grass, is Kumsulu (Calycopteris floribunda). At the time of the survey, there were several young tree growths to be seen in every betta plot. With the onset of the rains, these were being sickled down for use as cattle bedding. The dry material soaks up the cattle urine and is dumped into the dung pit where a degree of composting may take place. Thorny shrubs of Randia and Zizyphus species were seen only in some plots. Eupatorium and Lantana were not seen in any of the plots.

Top Soil

Top soil erosion has taken place seriously(70% and over) in 11 plots out of the 33, covering an area of 78.88 acres, which is 36.50% of the total betta area. The principal reason is that steep areas, devoid of cover are exposed to cattle trampling.

Betta area

There is a complicated system of betta exploitation, which is not explained in any record maintained in the village office. Some plots are individually owned, while others are jointly managed. It appears that there is never any dispute about ownership or exploitation rights. Occasional petty thefts are heard of. The betta size distribution as identifiable plots is:

Over 20 acres	:	1 plot
15 - 19.9	:	2
10 - 14.9		5
5 - 9.9		15
		31 plots

IV. SALKANI BETTA FOREST: SUPPLY, DEMAND AND THE LABOUR FACTOR

IV.1. The Salkani Betta Forest Inventory

Based on the survey of tree species and their dimensions in a fairly large sample (n = 291), the estimate given below will give an indication of the trees one can expect to find in the Salkani betta forest.

It would have been possible to estimate the total inventory of hardwood timber softwood timber (in Cubic metres) and firewood (in tonnes) from the data. However, as it has never been the intention to fell betta forests, I have not gone into this exercise.

TABLE-10 : ESTIMATED NUMBER OF TREES

Species Local Name	Species Botanical Name	1.22m and above	0.91m to 1.21m	0.61m to 0.90m	Below 0.61m	Total
1. MATHI	Terminalia Tomentosa	96	537	1474	1636	3743
2. HONALU	Terminalia Paniculata	289	681	905	673	2548
3. NERULU	Eugenia Jambulana	673	875	538	48	2134
4. COWLU	Careya Arborea	-	440	472	543	1455
5. ANALE	Terminalia Chebula	-	260	155	144	559
6. HONNE	Pterocarpus Marsupium	144	60	103	48	355
7. JAMBA	Xylia Dolabriformis	48	308	144	49	549
8. BANATE	Lophopetalum Wightianum	192	30	48	49	319
9. SALLE	Aporosa Lindleyana	-	-	240	49	289
10. NURU-KKULU	Buchanania Spp.	-	48	48	144	240
11. MANGO	Mangifera Spp.	48	30	96	-	174
12. KARAI	-	96	48	-	-	144
13. KURU-KKULU	-	-	48	-	48	96
14. KANGULU	Dillenia Pentagyna	-	48	48	-	96
15. MASHAY	Alseodaphne Semicarpifolia	-	48	49	-	97
16. BANAGI	-	48	-	49	-	97
17. Others[+]		487	528	90	-	1105
	TOTAL	2121	3989	4459	3431	14000

[+] Others includes Ficus religiosa, Terminalia belliria, Vateria indica, Cassia fistula, Artocarpus lakucha and Strychnos Nux Vomica.

IV.2. The Economic Botany of Some Betta Trees

The Deputy Director of Agriculture, Bombay Presidency, writing to the Survey Commissioner and Director of land records and Agriculture, on 1st May 1899 made the following notes :

1. Kaval (Careya arborea)-Good for leaf mould
2. Honne (Pterocarpus marsupium)-Good fodder
3. Jambe (Xylia dolabriformis)-Hard heartwood Good for carts etc.
4. Anala (Terminalia Chebula)-Best leaves for green leaf mold.
5. Kanagal (Dillenia pentagyna)-leaf mold.
6. Honal (Terminalia paniculata) - nearly as good as Matti for leaf mold.
7. Matti (Terminalia tomentosa) excellent for leaf mold.
8. Nerlu (Eugenia jambulena) - leaf mould branch wood.

In addition, several farmers at Salkani reported that Dillenia leaves were much liked by cattle.

Strychnos Nux Vomica leaves, when buried into the soil at the base of coconut trees was reported to have pesticidal properties.

Artocarpus lakucha (Vatte) fruits were reported to be very acidic and useful for cooking.

Garcinia gamboga and Garcinia indica are much prized for the fruits. The seeds from G.gamboge are used for extracting a kind of vegetable fat much resembling ghee.

IV.3. The Problem of Betta Degradation

Under the Kanara Privileges Rules, it is possible to collect timber, soil for bricks etc., from betta forests for the personal use of the farmers. It is not always easy to obtain sanction from the Department for these items.

The following uses of betta forests do not require sanction from any authority. Properly exploited, they can be considered as "flow resources" which can be used again and again without fear of depletion.

1. To provide "hot weather loppings" - mainly as mulch materials for Areca gardens in Dec/January.
2. To provide "green loppings" during the rains- principally for mixing with cattle manure/ covering it.
3. To provide material to break the force of monsoon rain and prevent soil erosion from the areca gardens.

FAMILY LABOUR

In the past, the Havik farmers exploited the bettas mainly using family labour. This has become a scarce input since the Haviks have been introduced to higher education and the external job market.

According to a census survey taken during the study, we have the following figures:

(PTO)

Children in 33 families in Salkani		Married		Educated in College		Men employed outside		Women married outside	
Males	Females	Males	Fem.						
67	48	19	27	23		11		27	

It is seen that of 67 male children, 23 have received College education - 11 men (16% of all male children and and 48 % of all educated male children.) have secured employment outside the village. The qualifications of the 11 graduates, 2 Post graduates and 10 undergraduates due to pass out shortly indicate job preferences in banks, colleges and schools.

Of the 48 female children, none has completed college, and 27 (56%) are married outside the village.

While it is customary for girls to marry outside, 11 men being employed outside and 12 potential outside employees have reduced the family labour force from 67 to 44. It was also noticed that the boys who had been educated prefer sophisticated jobs in the farm, like marketing of Areca, negotiating with banks, and visiting Government Offices, though there are exceptions. Thus, educated men can be generally considered lost to agricultural employment in the farms.

Migrant Labour

According to the 1883 Gazetteer,

> "The brisk demand for field labour in the upland parts of the district is chiefly supplied in Yallapur from Goa, Karwar, Ankola and Kumta, and in Sirsi and Siddapur from Honaver, and Baindur, Kundapur and Udupi in S.Kanara."

These labour, most of whom have their own fields in the low country have evolved a system of work on their land punctuated by hiring themselves out to the same up country landlords year after year. They are fiercely loyal to their landlords, who treat them exceptionally well.

Now, with less family labour, the situation is one of less migrant labour too. The district authorities are helping subsistende farmers through schemes like the DRDS, by supplying them with buffaloes etc.

In short the Havik farmer has to manage his farm with fewer total labour inputs. Yet his farm technology has gerally remained unchanged over the past few centuries.

Since betta lopping is done by migrant labour on a contract basis now, it no longer receives the sme care it used to receive at the hands of the Havik farmer.

To minimise his work of tree climbing, the migrant labourer collects more loppings from less trees, thus contributing to die-back of main stem and branches. The betta tree lopping is no longer supervised by the farmer as in the past, as it has become a low priority job.

V The Appiko Movement

Influenced by the Chipko movement of the Himachal area and inspired by its leader, Sunderlal Bahuguna, who visited Sirsi taluq in August 1983, The Appiko agitation was formally launched on 8th September 1983.

The movement's first action was led by Yuvak Mandal members of Salkani village at Kelase forest. Trees were hugged by volunteers, and axemen were deterred from carrying out their task of tree felling.

The Appiko movement has attracted nationwide publicity because of its ideals of stopping the destruction of forests and "greening the ghats" or replanting the bare areas of the Sahyadri hills with original species. Appiko activists argue that forests of teak and Eucalyptus benefit only the already rich industrialists. The Appiko co-ordinator, Pandurang Hegde (28) simply sums up the movement's objectives in three Kannada words: ULISU (Conserve), BELESU (Grow) and (Mithavagi) BALASU (Use sparingly.)

My own observation is that while the Forest Department has followed a felling policy that is called scientific, the forest contractors and labour at the field level are rapacious and destructive. The replanting of teak and Eucalyptus in Sirsi taluq, which I have inspected with a careful professional eye, are extremely poor in terms of stand per acre, girth, and Eupatorium infestation.

Destruction of Forests by Departmental policies and inefficiencies is only one side of the coin. The break-up of forest lands in Sirsi Division is as follows:

Reserved Forest	:	839.16 Sq.km
Minor Forest	:	454.228 "
Betta Forests	:	403.40 "
TOTAL		1696.788 "

It is seen that 857.628 Sq. km (50.54 %) of the total forest area is under the control of Areca farmers. We would expect that members of the Appiko movement, most of whom are Areca farmers, have taken great care to protect the betta forests in their control before cbiticising the management of Reserved forests by the Department.

With the data collected on degradation of betta forest plots in Salkani village, a Rank sum correlation test was run to see whether the plots belongin to Appiko activists (AA) are less degraded than the plots belonging to Non Appiko Activists (NAA). One sample of plots belonging to AA and one belonging to NAA were randomly selected from the population. The hypothesis was that the two populations are the same - i.e., after ranking the plots for degradation, (least degraded first) that the rankings are more or less evenly scattered.

$n_1=5$ AA		Rank
1.	- 16.20% -	1
2.	- 36.05% -	6
3.	- 51.49% -	8
4.	- 34.81% -	4
5.	- 64.69% -	10

$T_1 = 29$

$n_2=5$ NAA		Rank
1.	- 36.00% -	5
2.	- 40.08% -	7
3.	- 32.07% -	3
4.	- 52.38% -	9
5.	- 19.79% -	2

$T_2 = 26$

H

		5	
		0.05	0.01
5	l	17	15
	u	38	40

The critical values from the table are 17 and 38 for the 0.05 level of significance for the test. Since the calculated value of T_1=29 falls within these limits, we cannot reject the hypothesis that the populations are the same. In other words, the betta plots belonging to the Appiko activists is not different in terms of extent of degradation from those of Non Appiko activists.

I would conclude from this evidence that the Appiko activists have been motivated to stop indiscriminate forest felling due to reasons other than their own high standards of betta forest maintenance.

It can be accepted that the younger generation of farmers, represented by Yuvak Mandals in each village have just become aware of degradation and destruction of forests, as the traditional lavish use of forest resources is no longer possible due to increasing scarcity. They have also realized that the beneficiaries of felling programmes are rich urban industrialists and the people in their pay. It is reasonable to infer that the Appiko movement has gradually built up with this realization and not due to any abstract ideals.

During my stay in Salkani, I persuaded the Yuvak Mandal members to start a forest seedling nursery, and actually found a site and got the beds dug up. However, it was noticed that the work was stopped when I had to leave for Bangalore during the third week of May. This demonstrates two important points. Any major forestry work (nursery to planting) in the villages would coincide with the peak period in Areca and paddy field operations. It is not reasonable to expect poor farmers who are suffering from an acute labour shortage to donate several hours to community forestry work each day. Secondly, though the Yuvak Mandal members are idealistic and enthusiastic, they require a degree of outside participation, for catalytic effect.

Finally, it would seem that any attempt at conservation of forests by Appiko activists involves strict self discipline and upholding of rules and regulations. This is the only way to discourage mavericks among the farmers from cutting trees from the forests for their own use or the market through illegal means.

A farmer of Tatteesar village (near Salkani) cut 26 trees from his betta forest without departmental permission in May 1984. The RFO, Hulekal, was informed of the incident by another farmer of Tatteesar village. The RFO, an energetic young man who enjoys a good reputation in the area, and who belongs to the Havik community, arrived in the village to arrest the accused. The villagers resisted the arrest in a concerted action, and the RFO had to return with only the felled trees. When I questioned Appiko leaders on this action, they expressed regret and said it happened before anything could be done. Since such behaviour does not inspire confidence, illegal fellings must be strictly prevented in future. According to the RFO's record, two such cases have been registered in the Hulekal Range during 1984.

As a concluding remark, I would like to say that the family is the single most important institution in the Havik villages. Each family remains fiercely independent, but has a network of contacts in other villages through kinship and marriage. In Asia, the decay of traditional institutions like family, the clan, the tribe or village community has led to replacement by Communist movements. In Salkani village and others like it in Sirsi taluq, there appears to be no likelihood of radical or revolutionary direction to any grassroots conservation movement. Any plan for an afforestation programme will have to appeal to the family as a unit, and offer suitable economic benefits now, rather than in the distant future.

VI. DISCUSSION AND CONCLUSIONS

The Havik farmers are extremely industrious and have evolved a system of farming that interacts closely with the forest environment. In the past, they have agitated against attempts to regulate their ancient rights to use forest resources free of cost. As a result, they have been able to win unique priveleges which have the sanction of the law.

Though Areca is the main crop, the other intercrops of cardamom, pepper and banana are also important, if they could be saved from the diseases which have almost wiped them out. Cocoa has been recently introduced, but is indifferently managed and may actually be competing with Areca at the present time. As a result of poor management of intercrops (intensity of cultivation=1.15) considerable income is lost to the farmer.

The farmer needs all the income he can get, as he has come fully face to face with the market system and monetisation. And yet, there is considerable inertia to move into production modes that are more efficient and cost effective. Even if some poor farmers are prepared for change, they would not be able to afford the "breakaway" into the new system.

The betta forest is a resource, which, if properly managed, can be considered as an infinitely renewable resource. Unfortunately, the management of bettas has become extremely poor in recent years, due to scarcity of both family labour and migrant labour.

The time has come to consider whether alternative technologies are available to overcome the present resource scarcity. It would appear that some farmers in Hulgol and Bhairumbe have already initiated technological change.

Technological changes

The introduction of Cocoa trees as an intercrop has at once proved to be a device to break the force of rainfall and to shed a heavy mulch of dead leaves. Cocoa prunings provide a source of organic material to improve soil condition. It is well known that Cocoa root activity is beneficial for the main crop, provided separate manuring is done for the Cocoa. In Salkani, due to improper pruning and fertiliser policies, Cocoa gives little or no crop and is featuring as a competitor to the Areca. However, in Mulgol and Bhairumbe, Cocoa has been beneficial from its yield and environmental interaction point of view.

Growing of Glyricidia along the fence perimeter has been demonstrated to provide a large quantity of quality green manure with minimum labour cost in Bhairumbe village. Cover crops such as Pueraria, Centrosema and calapagonium are being experimented with in the same village. In one farm, I saw Guatemala grass (Trypsacum laxum), one of the best mulch materials, which is also a non-host of nematodes.

Those farmers who are using a blend of betta loppings and fertiliser (organic and inorganic) are obtaining better yields and spending less on labour, or inefficient farm practices. In many ways, the case is for a blend of the old and new, rather than a sweeping away of the old and introduction of the new.

Wherever virus disease is seen in banana and cardamom the diseased material must be completely removed and the cycle broken for a year or two. Fresh disease free V.P. material could be introduced after soil fumigation.

All this would have come about if the farmers had been exposed to proper extension service. At present, there is no communication with either the Forest department or the Horticultural Office. I was surprised to find that the Horticultural office at Sirsi does not maintain rainfall records for Sirsi taluq.

Fuel

The ASTRA oven (Hosa Ole) has been demonstrated to be efficient and consumes very little fuel. This is a clear case of new, albeit appropriate technology that has been accepted by the farmers. Recently, an educated spokesman commented, " We dont need your new technology!" The moral of the story is not to thrust new technology on any one, but to make it available and let people see for themselves.

Compost

The farmers could be easily shown how to compost cowdung with crop debris, wood ash and superphosphate, with proper aeration and drainage at the bottom of the pit. Pit composting is suitable only for relatively dry areas. In very wet area, like Salkani, either a roof should be provided for the pit or heap-roofed composting should be done.

Silage and Range Management

The farmers in Salkani have not heard of Silage. This would greatly compliment the paddy straw used in stall feeding.

Planting up the Minor Forest with superior grasses with a clear understanding as to how the crop would be shared appears to be the first step to be tried in a Range management programme.

Minor Forest and Reserved Forest

In Salkani, there is 59.08 acres of Minor Forest, which, due to common access and unlimited entry, has been reduced to scrub desert. Low country migrant labour are seen living individually and in groups in these area. They need material for housing, fuel, and tool/implement handles. Since it is not available in the Minor Forest, and since they may not enter the betta forests for their requirements, go to the most obvious place - The Reserved Forest.

Therefore, while we talk of degradation of bettas, it is really the reserve forest that are being regularly assaulted by migrant labour and Kari Vokkaliga marginal farmers. There is a ready market for firewood in the villages and Sirsi town itself.

Several "radicalised or sensitised" visitors I met at Sirsi tried to convince me that there is a method and rationality in the agrarian technology of the area. If this is so, the fact that women in the Sirsi area may not enter the kitchen or their bedchambers during their menstrual periods is rational. The fact that women who have just given birth are expected to cover themselves in blankets and sit before a fire to sweat copiously before eating ghee and sweets every day is equally rational.

Appiko and "Informed altruism"

Despite the apparent environmental concern of many Areca farmers, it would appear that much of their anger is directed towards the arrogance and poor public relations of the Forest bureaucracy.

Abstract ideals like "greening the ghats" do not appear to take into account the enormous cost of

raising forest nurseries, and the labour that would have to be donated or paid for. Sustaining the tempo of sucha a movement is admittedly not easy, particularly in the face of poverty and hardship among the farmers.

The Appiko movement has virtually stopped indiscriminate Departmental felling. It faces its greatest challenge in persuading farmers to manage their bettas more carefully and plant more trees. This can be done only through personal example, and can be very exacting.

Finally, for any Conservation Programme to be successful, a Conservation Community approach is necessary. Very little can be achieved if the Appiko, the Forest Department and the Academics pull in different directions, well meaning as they may be.

Policy angles

At present, the farmers of Salkani have begun to talk about an afforestation programme. An awareness has been created. To convert this into action, dynamic leadership and financial backing are required. Both are sadly lacking.

A programme of planting requires farm more planning than merely how, when and where to germinate seeds. All good programmes also include details of upkeep of the plants to maturity, which may be several years into the future.

Once the plan has been evolved and some finance arranged, leadership of the type demonstrated by Chandi Prasad Bhat of the Dasohli Gram Swarajya Mandal has to be found. Such quiet and dedicated work will tend to attract extra community and in particular official assistance instead of alienation.

In order to reach towards this goal, there are three distinct policy alternatives. These are,

1. A well planned, externally funded plantation programme.
2. Subsidies and incentives to farmers for tree planting.
3. Gradualism, involving concentrated lab to field demonstrations and exposure.

Any externally funded plantation programme would have to be done either through the Forest Department or through an independent voluntary agency. The Forest Department is distrusted by the people and even if there are officers with a high degree of 'people skills', they would have an uphill task.

An independent Voluntary agency appears to be a good idea, if it can mobilise the enthusiasm of the villagers The involvement could be limited to supply of good planting material and technical advice. There is no point in undertaking the planting, only to find that the farmers are neglecting the plants. The motivation must come entirely from the farmers. Such an agency could also fulfill the vacuum created by the non-performance of the Horticultural Department - provide extension service.

It has been repeatedly demonstrated in this study that if the farm technology is upgraded, it would be immediately reflected in reduced dependence on the forests.

However, farmers steeped in traditional practices must be treated with understanding and kindness. Technology change in traditional sectors is known to be associated with psychological and environmental problems.

The point to be borne in mind is that due to scarcity of family and migrant labour, farmers will be obliged to reduce the quality of farm operations work or seek new labour saving methods in the near future.

If farmers are to reduce the quality of farm operations work, or allow their wet lands to remain uncultivated, they would be placed in great difficulties both physical and psychological. For example, having to buy rice from the market is considered to be disgraceful for a landed farmer.

When the difficulties brought on by labour shortage begin to converge, suitable agriculture cum forestry extension service should be readily available.

While subsidies and incentives are theoretically an essential part of any resource policy plan, in a practical situation as in Salkani, they can be discarded out of hand. Consider the cost of administering such a plan and also the possibilities of corruption and misuse of funds. Further, why should only one taluq or one village be selected for special treatment in a country where denuded forests are a common sight?

Therefore, it would appear logical that the best approach is a policy of gradualism, highlighted only by providing quality technology which is well communicated to the farmers. The best form of communication is through action and not necessarily confrontation or media publicity.

As a strategy for such action, it would be necessary to identify a few farmers in each region as natural leaders. But it would be seen that these 'natural leaders' are the richer farmers with more than 5 acres of Areca land. Therefore some extremely poor farmers

would also have to be selected. Thereafter, a special outreach programme would have to be initiated, with the help of energetic officers with proven people skills. This is necessary as a rural 'elite' caucus, close to the seat of power and technology is already believed to be developing There is some resentment against this elite, and poorer farmers may deliberately refuse to follow their example. This leads, of course, to the classical situation of the rich getting richer while the poor got poorer.

Finally, any such plan requires an integrated and sympathetic management approach. We are dealing with a communication problem, compounded by fear of officialdom and a tendency to cling to the tried and trusted methods of the past. The reality is that the world around the farmers in Salkani has changed, and they need help to change their own behaviour and practices to suit their environment.

NOTES

1. Wingate R.T. - Letter No.191 dated 20th Oct.1891 from Forest Settlement Officer to the Commissioner S.D.

2. Davidson J. - Letter to the Commissioner S.D. 2/6th January 1894.

3. Thippiswamy S.C. and Shanmukhappa G. - Kanara Working Plans 20/12/1961

4. - Letter from the Collector of Kanara No.F.O.R., Strip/C-1, dated 4th/7th January 1921 to the Commissioner S.D. (Woodland and Tongya Schemes File).

5. - Government of Bombay - Agriculture and Forests Department, 7th December 1950 page 7, para 5 of Press Note.

6. - Appendix C to Commissioner S.D.'s letter No.1242 dated 21st March 1894.

7. Nugent J. - Letter from Commissioner, S.D. to Chief Secretary to Government, 25th June 1894.

8. - Quoted by Davidson J. 19th March 1894.

9. - Handbook of Agriculture (ICAR) 5th Edition, Page 918

10. - Letter No.22/166/20 of 24/1/1943 from Conservator of Forests S.C., to Collector of Kanara.

11. - Letter from Deputy Director of Agriculture Bombay Presidency to Survey Commissioner and Director of Land Records and Agriculture No.245, 1st May 1899.

12. - Letter from Deputy Director of Agriculture, Bombay Presidency to The Survey Commissioner and Director of Land Records and Agriculture No.547 of 1899.

13. Whyte R.O. - The Grassland and Fodder Resources of India - ICAR, New Delhi.

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APPENDIX - I

RAINFALL DATA FOR HULEKAR/SIRSI

NOTE: Salkani village is within the Hulekal Circle, Rainfall data for 1980 and 1982 for Hulekal was apparently not available, Data for Sirsi has been inserted in the table instead.

Month	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
January	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	0.60
April	6.5	-	-	-	-	-	23.80	90.00	-	1.00
May	-	110.10	-	-	-	-	47.80	4.40	-	108.10
June	684.70	428.70	-	1078.20	443.80	988.50	506.30	1159.20	520.40	492.70
July	1022.30	1217.80	740.80	311.80	896.20	1154.80	629.40	1088.80	834.10	1302.30
August	644.00	755.30	711.50	466.00	410.20	780.20	898.20	793.60	1372.00	1298.20
September	80.20	196.30	357.50	202.00	368.20	159.80	160.80	223.40	219.80	98.00
October	104.20	37.50	123.70	22.50	180.70	141.00	53.10	98.80	93.80	100.40
November	17.50	-	81.90	74.3	93.20	83.60	135.60	32.20	3.80	62.90
December	-	-	-	-	-	-	-	6.40	-	-
TOTAL	2559.40	2745.70	2015.40	2154.80	2392.30	3307.90	2455.00	3496.80	3043.90	3464.20

SOURCE : Office of the Tahsildar, Sirsi

APPENDIX - II

YIELD OF ARECA IN KARNATAKA

	District	RAW NUTS			PROCESSED NUTS	
		Area in hectares	Production in tonnes	Av.yld kg/ha	Production in tonnes	Av.yld. kg/ha
1		2	3	4	5	6
1.	Bangalore	662	4,502	6,801	935	1,413
2.	Kolar	70	477	6,816	99	1,413
3.	Tumkur	5,442	31,090	5,713	6,743	1,239
4.	Chitradurga	3,526	16,671	4,728	3,431	973
5.	Shimoga	10,138	73,257	7,226	15,410	1,520
	Bangalore Division	19,838	1,25,997	6,351	26,618	1,342
6.	Mysore	604	2,140	3,543	433	717
7.	Mandya	647	4,401	6,802	914	1,412
8.	Hassan	1,614	8,730	5,409	1,593	987
9.	Chickmaglur	7,496	46,033	6,141	8,673	1,157
10.	S.Kanara	16,385	1,38,535	8,455	29,526	1,802
11.	Kodagu	691	4,699	6,800	976	1,413
	Mysore Division	27,437	2,04,538	7,455	42,115	1,535

APPENDIX - III

1. SCORES AWARDED FOR TREES/ACRE IN PLOTS INSPECTED

Trees/Acre	Score
0- 9	10
10- 19	9
20- 29	8
30- 39	7
40- 49	6
50- 59	5
60- 69	4
70- 79	3
80- 89	2
90- 99	1
100- 149	-2.5
150- 199	-5.0
200- 249	-7.5
250 and above	-10.0

Notes

A) As per the Working Plan for Sirsi and Siddapur ranges, Kanara South Division 20.12.1961 'The density of the growing stock varies from 200 trees/ha in deciduous type to 273 trees/ha in evergreen type'.

B) Since Salkani betta forest would fall under deciduous type forest, 200 trees/ha or 81 trees per acre is taken as a rough reference point.

2. SCORES AWARDED FOR MEAN GIRTHS

Mean Girth	Score
Below 0.50m	10
0.50 to 0.59m	9
0.60 to 0.69m	8
0.70 to 0.79m	7
0.80 to 0.89m	6
0.90 to 0.99m	5
1.00 to 1.21m	4
1.22 to 1.50m	3
1.51 to 2.00m	2
2.01 and above	1

Appendix - III (Contd.)

3. SCORES AWARDED FOR MEAN HEIGHTS

Mean Height	Score
Less than 8.00m	10
8,00m to 8.49m	9
8.50m to 8.99m	8
9.00m to 9.49m	7
9.50m to 9.99m	6
10.00m to 10.99m	5
11.00m to 11.99m	4
12.00m to 12.99m	3
13.00m to 13.00m	2
14.00m and above	1

NOTE: 1. A tree below 0.50m is extremely slender and can pass only as a sapling, stunted tree or low canopy tree in a multi-tiered system.

2. The choice of 8.00m as a cut-off point is based on the height of trees in the Reserved Forest which had a mean height of 14.41m.