# Judicious use of deforested hilly land for horticulture, plantation, spices and forage crops in Andamans

**Shyam Singh and B. Gangwar**

THE nature has endowed Andaman and Nicobar Islands with lush green tropical luxuriance, covering from water's edge to hill tops. The forest occupy 7144 km² (5611 km² in Admaman and 1533 km². in Nicobar group of Islands) constituting about 86 per cent of geographical area of the territory (8293 km²). Approximately 7 per cent of the forest area is unfit for any purpose being too small and largely rocky, 13 per cent forms the coastal belt which has to be preserved for protection against the soil erosion, both by sea and rain, 35.5 per cent earmarked for the aboriginal tribes under the provisions of Andaman and Nicobar islands Regulation, 1956 and 14 per cent under the revenue settlement (Annonymous, 1985). So far, about 1150 km² forest area has been diverted for penal settlement, resettlement of displaced persons from erest while East Pakistan, settlement of repatriates from Sri Lanka, Burma and Ex-servicemen. With the increase in population and various activities including defence services and tourism in the island, there is likelihood of more areas may be diverted for settlement and other purposes. Moreover, there is a great demand for taking up cultivation of cash crops like Red oil palm in an area about 68,000 ha. Similarly there are plans to raise the rubber plantations in an area about 2400 ha (including the present area about 614 ha) and cashew plantations in 500 ha land in terrasa. Due to increase in population pressure on land in recent years the number of encroachments have also taken place resulting deforestation in an area about 2847 ha.

The diverted land from forests for one reason or the other is not judiciously used so far resulting considerable soil loss and a matter of ecological considerations. Even the area alloted to settlers through the revenue department is not properly utilized particularly, that of hilly land. The total area under horticulture and plantation crops is reported to be around 30,000 ha including area under coconut in Car Nicobar (Singh and Gangwar, 1986). This area also under used. Therefore, an attempt is made to identify the possible horticulture, plantations, spices and forage crops which can be raised for using the soil resource judiciously and reducing the hazards of deforestation in Andaman and Nicobar Islands. Planting of horticultural, plantations, spices and forage crops on deforested land and partially cleared forests can rescue the eco-biological balance through the beneficial effects of species and their interrelated factors.

The Central Agricultural Research Institute is trying to increase the manifold quality production of paddy, maize pulses, oilseeds, fruits, vegetables, tuber, plantation, spices and forage crops. At present substantial quantities of fruits and vegetables are being imported from the mainland to meet requirement of the existing population of 1,88,741 (1981-census). To fill up the gap between the demand and supply, suitable technology may be generated with social, political, economical and ecological perspectives. This would call for afforestation of filled forests with fruits, vegetables tuber, plantation, spices and forage crops. This type of farming will yield edible fruits, vegetables, rubber, spices, firewood, wind breaks, fence, supply fodder and also act as raw materials for

Central Agricultural Research Institute, Port Blair - 744 101.

**Table 1**

**Promising fruit crops and their varieties**

| Fruit crop | Bot. Name | Promising varieties | Suitablity for mixed forests | Special features |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| Mango | *Mangifera indica* | Banganapalli, Rumani Neelum, Mulgoa, Bangalora, Suvarnrekha, Alphonso. | Yes | Mango is large tree with deep rooted system. The overall yield for country is about 3-4 tonnes/acre. Alphonso is good for storage. Mango malformation is the major problem which can be controlled to some extent by spraying 0.1 per cent captan. Unripe fruits, innercore of Pseudostem, inflorescence are cooked as vegetables. |
| Banana | *Musa accuminata* | Virupakshi (Hill Banana) Chini Champa, Malbhog, Jahajee, Robusta. | Yes | Banana flour, powder chips, fig common in use. Three suckers should be maintained. |
| Papaya | *Carica papaya* | Coorg Honey Dev, Washington, Solo, Co-1, Co-2. | No | It is rich in enzyme. Papain which help in digestion of protein. The papain decreases rapidly as fruits ripens. Co-2 is good variety for papain. |
| Guava | *Psidium guojava* | Allahabad safeda, Red-fleshed, L-49, Chittidar, Bangalora, Seedless. | Yes | It makes excellent jelly and Vit-C in fresh fruits 100-260 gms/100 gms pulp. Hardy fruit. |
| Sapota | *Achras zapota* | Kalipatti, Criket Ball, Dwarapudi | No | Planting distance 8-9 meters. Root stock Khirnee (*Mimsops hexandra*). Seedlings and layering successful. |
| Jackfruit | *Artocarpus heterophyllus* | Rudrakshi, Singapur, Ordinary | Yes | Fruits borne on small leafless stalks arising from the trunk and main branches, spacing 10-13 meters. Air layering successful with Seradix-A-0.025 per cent & NAA. |
| Aonla | *Phyllanthus emblica* | Banarasi, Chakaiya | Yes | Fruits richest source of Vit-C, 500-750 gms pulp. |

(*Table 1 Contd.*)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Custard Apple | *Annona squamosa* | Lal Sitaphal, Mammoth Washington, Balanagar. | Yes | Root stock *Annona Reticulate*, ripened fruit has 16.5 per cent sugar. Spacing 4 meters. |
| Pineapple | *Ananas sativus* | Giant kew, Queen | Yes | Propogation by suckers, crown & slips. Close planting 30 × 60 × 90 cm—43036 plants/hect. Maximum plants 63,758/hect. with 22.5 × 60 × 75 cm. spacing. Giant kew for processing purpose & Queen good for Table purpose. |
| Kamrakh | *Averrhoa carambola* | Sweet type, Sour type | Yes | Bears succulent fruits which are about 7 cm. long and most prominently ridged. Substitute of Tamarind in cooking. Average yield 50-100 kg. per tree. |
| Bael | *Aegle marmelos* | — | Yes | It is every effective for the treatment of dysentry and also make excellent squash propagated by seed, budding root cutting & layering. Yield 300-400 fruits every year. |
| Jaman | *Syzygium cuminii* | — | Yes | Large and small fruits. Whitish pulp, propagated by seed. |
| Karonda | *Carissa carandas* | Whitish, Pink | Yes | It is shrub in form of thorny hedge plant. Bears a profusion of berries. |
| Pummelo | *Citrus maxima* | Bhogotay, Pink fleshed, Deep Pink fleshed | No | |
| Lime | *C. aurantifolia* | Round, oval | No | |
| Lemon | *C. Limon* | Kagzikalan, Baramasi, Seedless, Assam | Yes | The presence of juice sacs in fruits. These are rich source of Vit-C and contain vit-P which keeps small blood vessels in our body healthy condition. Sweet oranges can stand more humidity than Mandarine. Pumelo can stand in more rainfall. |
| Sweet Orange | *C. sinensis* | Mosambi, Valencia | No | |
| Mandarin | *C. reticulata* | Khasi, Coorg, Nagpur | No | |

industries as well as will be helpful in maintaining the eco-biological balance in these islands.

Andaman and Nicobar islands have tropical humid climate with a rainfall duration of 8 months which creates a peculiar situation. All crops and their varieties do not perform well under all situations. Therefore, the promising varieties suitable for these conditions should be taken up for planting in the deforested land and as mixed forests (Table 1).

**Filler and intercrops with fruits**

Most of the fruits start fruiting after 4-5 years and space between plants remain vacant. In order to obtain some income in initial stage of fruit plants planted, the filler crops and intercrops may be adopted. These crops will also protect the soil erosion as well as supress the weeds growth. Filler crops and intercrops should be stopped when main fruit plants start fruiting. Filler crops will give fruits within 12-18 months and intercrops 4-6 months. Farmer should select either filler crop or intercrops or both considering the positions of main fruit plants demand and feasibility etc. The appropriate filler/intercrops which can be raised with fruit crops in these islands are as follows :

| Main crops | Filler crops | Intercrops |
|---|---|---|
| Mango | Banana | Brinjal |
| Aonla | Papaya | Chillies |
| Jack fruit | Pineapple | Tomato |
| Sapota | Kauranda | Radish |
| Guava | | Cauli-flower |
| Citrus | | Sweet Potato |
| Jaman | | Bottle-gourd |
| Tamrind | | Sponge-gourd |
| Kamrakh | | Bitter-gourd |
| Custard apple | | |

In these islands vegetable cultivation has not received due emphasis. The daily consumption per head of starchy roots, vegetables and fruits in advanced countries is 316 gm and 362 gm respectively while in India it is only 30 gm and 80 gm. According to the dieticians, an individual should consume about 115 gm each leafy and other vegetables and 70 gm of root vegetables daily for a balanced diet.

The main constraints in vegetable growing in these islands might be :

1. Non-availability of better seed in time.
2. Vegetables cultivation will keep farmers busy all the time as it needs more attention.
3. More incidences of insect, pests and diseases due to humid climate.
4. Lack of training to the farmers for improved cultural practices.
5. Lack of transport facilities.
6. Lack of organised marketing centres for vegetables.
7. Non-availability of cold storage.
8. Few processing units
9. Not much extension support.
10. Lack of literature for these islands condition.
11. Free grazing of animals after rainy season crops.

If the proper care of these aspects is taken by all the farmers/departments then vegetables will flourish here (Table 2) Vegetables cultivation may be taken up separately, with fruit trees and plantations crops. For immediate step, the islanders who have vacant land around their houses may take up kitchen gardening with fruits, vegetables, flowers and plantation crops. The family will get fresh produce, additional income and children will be fully aware with the basic life cycle of nature.

In case of plantation crops, the fruiting starts after 8-10 years. The low income in early period of bearing and the fluctuations in the market price of plantation crops from year to year make them ideal for intercropping. Moreover, intercropping also checks soil erosion during heavy rains. Coconut, arecanut and cashewnut can be grown successfully in deforested land. Keeping in mind the benefit of farmers as well as for utilising resources properly, coconut, arecanut and red oil palm may be used as base crop for planting other crops in three tier systems, There will not be much competitions for light, space and nutrition as they will be performing on different-tiers. Additional fertilizers will have to be applied for the need of each crop growing in composit block. The

**Table 2**

**Promising vegetable crops and their varieties**

| Vegetable crops | Bot. Name | Promising varieties | Suitability for mixed forest | Special features |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Tomato | *Lycopersicon esculentum* | Pusa early dwarf, Pusa Ruby, Sioux, Marglobe, Best of all, Fire ball, Sl-120 | No | It is used for soup, salad, pickles, ketchup, puree, sauces and in many other ways. Seed 400-500 gms/hect. Spacing 75 × 60 cm. Yield 160-240 quintals/hectare. |
| Brinjal | *Solanum melongena* | Pusa purple round, Pusa purple long, Pusa Kranti, PPC, Arka sheel, Arka Kushumakar | No | White brinjal good for diabetic patients. It can be grown throughout the year. Seed rate 375-500 gm/hect. Spacing 75 × 60 cm. Yield 200-250 quintals/hectare. |
| Chillies | *Capsicum annum* | Arka Shirish, NP-46A, G-1, G-2 | No | It is used in spices condiments, sauces, pickles. It grows throughout the year. Seed rate 1-2 kg/hect. Yield 5-10 quintals dry/hect. Green chillies 3-4 times more than dry chillies. |
| Radish | *Raphanus sativus* | Japanese white, Pusa Desi, Pusa Rashmi, Pusa Himani, White icicle, Arka Nishant | No | It is consumed as raw, salad & cooked form. Seed rate 10 kg/hectare. Yield 150-330 quintals/hectare. |
| Cauliflower | *Brassica oleracea var. batrytis* | Early Patna, Pusa Katki | No | It's white tender head or curd consumed. It needs more care. Also use in form of curries, soups and pickles. |
| Pumpkin | *Cucurbita moschata* | Arka Suryamukhi, Arka Chandan | Yes | Arka chandan is carotene rich (3332 IU of Vit-A per 100 gm) edible portion. Plant will climb on forest trees. Seed rate 7-8 kg per hectare. Av. yield 250 q/hectare. |
| Bittergourd | *Momordica charantia* | Pusa Domosami | Yes | It is also used for the protection against Malaria. |

(*Table 2 Contd.*)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Sponge gourd | *Luffa cylindrica* | Pusa chikni | Yes | Fruit is edible when young. The dry inner fibre portions of the mature fruit is used for bathing purpose, cleaning utensils in making shoe and as filters in factories. |
| Bottlegourd | *Lagenaria siceria* | Pusa profile long, Pusa Summer Prolific round | Yes | Fruit used for curry as well as sweets preparation. The hard shell of fruits used as water jug, domestic utensils, musical instruments, floats for fishing nets. |
| Sweet potato | *Ipomoea batato* | Pusa suffaid, Pusa lal, Pusa sunheri, Velmon V-12, V-6, V-8 | Yes | Main use for human consumption, making starch & alcohol. Yield 200-300 q/ha. |
| Bhindi | *Ablemoschus esculentus* | Pusa sawani | No | The stem of plant is used for the extraction of fibre. Seeds ripened are sometime roasted and used as a substitute of coffee. Seed rate 18-20 kg/hect. Yield 60-70 q/ha. |

important crops and their varieties suitable for raising in tier systems are as follows :

| Crops and tier system | Promising varieties |
|---|---|
| *Ist tier crops* | |
| Coconut | Dwarf yellow, Dwarf orange, Dwarf green, Andaman Tall and Katchal Tall. |
| Arecanut | Mangala (VTL-3) and Calicut-17 and Calicut-35. |
| *IInd tier crops* | |
| Black pepper | Panniyur-1 |
| Banana | Dwarf cavendish, Amritsagar and Robusta |
| Clove | Locally grown |
| Cinnamon | Locally grown |
| Nutmeg | Locally grown |
| Tapioca | H-226, H-1687, H-97. |
| *IIIrd tier crops* | |
| Pineapple | Giant Kew and Queen |
| Elephant foot yam | Locally grown |
| Ginger | Poona, Nadia, China |
| Turmeric | Sugandham, G.L. Puram, Kasturi and Tanaka |
| Sweet potato | Pusa lal, Pusa suffaid |
| Napier grass | NB-21 |
| Slytosanthus | Scabra. |

Clove, nutmeg, cinnamon, pepper may also be grown in deforested area separately in different blocks, with mixing and in forests without much disturbance. Pepper vine will get the support of forest trees and in this way may reduce its cost of cultivation etc. The Rubber, Coffee, Aronatic oil yielding plants like cymbopogon sp. (Citronella) and medicinal plant Dioscorea (for diosgenin) may also be cultivated in deforested land as in forests.

Wild fruits like Karuna (*Carissa spinarum*), Aonla (*Emblica officinalis*), Wild strawberry ((*Fragina indica*), Curry leaf tree (*Murraya Koenigia*) and Ban ber (*Zizyphus jujuba*) may also be tried in the forests of Andaman & Nicobar islands as they have immese medicinal value and will also give the raw materials for the industries dependent on forest. Paddy, maize, oilseeds, pulses cannot be taken on hilly land because of their more water requirement, intercultural operations, fertilizer applications etc. These operations will disturb much soil on slopes which will wash down in rains. In case of fruit trees, the slopy/undulated land can be utilized safely upto 30-35° by making halfmoon terraces with triangle system of planting. The light soil work will be done only in halfmoons not in whole area. The grasses between the halfmoon may be chopped from the ground level so that roots of grasses can keep soil particles intact. After 2-3 lines of fruit trees main tillers, two-three lines of pineapple with traingle system can also be planted which will check soil loss. Between the halfmoon at base of the slope, cucurbits can be planted which will climb on slopy land and cover the surface between halfmoons. These crops will check soil loss as well as supress the weeds growth. The area type of farming. The fruit, vegetable and plantation crops can also be planted in the forests with slight cleaning of the area for halfmoon terraces or planting as followed in forest trees. Vegetables specially cucurbits may be tried which will climb on the forest useful timber plant.

Cultivation of forage crops is completely unknown in these islands. Acute shortage of forage is experienced particularly, in dry season. Animals are stall fed with haulms of local paddy variety C-14-8 in rainy season and allowed to graze in dry season where vegetation mainly consisting of *Axonopus cempres-*

*ses, cynodon dactylon, Eleusine indica, chrysopogon aciculatus, Ischaemum timorense Themeda trindra, Bothriochloa pertusa, Hetropogon centortus* and *Paspalum coniugertam* exist (Gangwar *et al.*, 1983). The newly cleared jungles slopes and terraced lands need to be covered with the grasses and legumes which will not only provide good quality fodder for animals but also protect the soil from erosion, which itself is a big problem. In rainy season grasses like *Pennisetum pedicellatum, P. Polystachion Panicum Locifolium,* Buffel grass, Gatten panic, *Desmastica* sp. *Bracharia mutica* Blue panic, coastal bermuda, *paspalum plicatulum*(var. Hartely, Rodding Bay), setaria anceps (var. Nandi & Narok) *Bracharia ruzi[illegible]sis* and Guinea grass (var. Makunei & Rivere's dale) can successfully be grown alone (Pal, 1985) or in combination with forage legumes like rice-bean, cowpea and pasture legumes like Siratro and Centro. The fodder tree like Leucaena and Sesbania can also be grown along the boundaries, intercropped in forests and in areas unfit for cultivation. In dry season, the foot hills and terraced land can be covered with forage legumes like rice-bean, moong bean, velvet bean, urdbean and cowpea.

The scope of fruits, vegetables, tuberm Aeromatic oil yielding, medicinal plants, plantation crops, spices and forage can be adequately realised from the long list of crops mentioned here by considering their feasibility under the agro-climatic conditions of Andaman and Nicobar Islands. This area is suitable for growing tropical horticulture and plantation crops because congenial conditions prevailing for large scale by utilising the slopy/undulated land in deforested area. This type of farming will maintain the eco-biological systems and on other hand meeting the requirement of people of these islands with major success.

**References**


1. Annonymous, (1985). Review of management practices in the Forests of Amdaman and Nicobar Islands. Official publication of Forest Department, Andaman and Nicobar Administration, PP 1-87.
2. Gangwar, B., Jayan, P.K. and Singh, B. (1983). Promising fodder crops for Andamans. *Indian Fmg.* 33 (1) : 19-21.
3. Pal, R.N. (1985). Introduction of new exotic grass germplasm Ann. Rep. CARIANGI (8) : 132-33.
4. Puri, G. S., Homji, V. M., Meher, Gupta, R. K., and Puri, S. (1983). Forest Ecology-Photogeography and Forest conservation, 1 (II edn.) 504-43.
5. Singh, N.T. and Gangwar, B. (1986). Efficient Cropping system for Andaman and Nicobar Islands. Paper submitted for presentation in National Seminar on "Efficient cropping systems for Climatic Zones of India" to be held at IARI, New Delhi from 23-26th June, 1986.