

INTERIM REPORT- PROJECT

ON

'BIORESOURCE CONSERVATION AND
SUSTAINABLE INCOME GENERATION FOR
COMMUNITIES IN ASSAM AND
MEGHALAYA'



OCTOBER 2001

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RESULTS OF PILOT STUDY

The first phase of the project was a pilot study to establish the parameters of the project and finalize its design.

Project Principal investigator and the research associates traveled in regions of Assam and Meghalaya to conduct surveys to gather data in order to identify areas which could be potential locations for starting the project.

Results of the Pilot project are given below.

1. We held consultations with partner organizations like the North Eastern Network, Grassroots Options and the North Eastern Center for Policy Research, all of who are NGOs working in North Eastern states to discuss the framework and implementation of the project.

2. We also had meetings with some groups, especially women's groups who are working on flood relief; conflict resolution, rehabilitation and training of youth, to get feed back on perceived relevance of proposed project.

3. Gene Campaign and partner organisations had discussions and more or less identified what skills exist within the groups. A work plan with sharing of responsibilities is being worked out on the basis of these skills. Gene Campaign would contribute its expertise in agro-biodiversity and medicinal plants. NEN which will be the main partner organisation, will organise the women into working groups

4. Contacts have been set up with the North Eastern Hill University (NEHU) in Shillong and the station of the National Bureau of Plant Genetic Resources (NBPGR), Barapani, as well as the regional station of the Indian Council of Agricultural Research (ICAR).

The locations that have been tentatively selected for the project are the following:

Assam - Dharikathi, district Sonitpur

Meghalaya- West Garo Hills , District Tura,

Location data from selected areas of Assam and Meghalaya

1. District Kamrup Circle Sonapur

Villages :-

a) Ghogua, Population -245 families with an average land holding of 10 bighas/family.

b) Bamunkhat- population- 350 families (150 of them are tea garden labour without land holding). Rest 200 families have an average land holding of 10 bighas / family.

The main crop of these villages is rice which they grow in two seasons with the waters from nearby springs. However there are villagers with orange orchards, which have gone down in the productivity because of lack of maintenance. Some have opted for amla orchards very recently. The main forest products collected are timber, bamboo, some medicinal herbs, fruits like Jack fruit and Mango. Some of the medicinal plants found in the area are :

- i) *Silikha* (Terminalia chebula), used against cough, asthma, piles, worms, dysentery, tumor.
- ii) *Basaka* (Adhatoda vasica), use against cough, chronic bronchitis, asthma.
- iii) Arjun (Terminalia arjuna) ,used against heart diseases , piles , cough problems.
- iv) *Bhomora* (Terminalia belerica), used against anemia ,eye diseases, asthma,

- v) Amla (Phyllanthus emblica) ,used against asthmatic troubles, smoother of skin, prevent rickets ,maintain oral hygiene.
- vi) Cholkuari (Aloe barbadensis), used against jaundice, high blood pressure, typhoid, fever.
- vii) Bhedailota (Heydyotis scandeus) , used against chronic dysentery, bowel trouble ,rheumatism, diarrhea ,
- viii) Sirata (Moringa concanensis) used against night blindness.

Plenty of Orchids are found in the area although the villagers could name only 4 species. The villagers are willing to give land for cultivation of medicinal herbs/trees which are found in abundance.
Information

Regarding the market facilities for orchids are also collected.

2. District Sonitpur

Village -Dharikathi.

Population:- 240 families

The villagers are dependent on agriculture and minor forest products.

List of forest products obtained from the villagers are :

a) Fruits-

1.Leteku 2.Poniol 3.Wild mango 4.wild lemon 5.Silikha 6.Amla
7.Bahera 8.Wood apple

b) Medicinal herbs:

Tezpata, Pipori,Laham bark, ferns. Also seen growing in the village are olive ,karambola(star fruit),Indian Rhododendron (phutuka) family-Malastomaceae Shrub about 2-3m high Flowers - Purple ,showy,3-5 cm across. Flowering time -Feb-June (almost whole year). Fruit -pulpy & fleshy, deep purple inside when ripe,1-1.5 across.

List of minor forest products once collected in the Chariduar minor forest produce godown are : 1. thatch 2.khoir 3.cane 4.broom 5. sal leaves(to make plates) 6.resin 7.simolo cotton 8.patidoi (used in making ots.)9. pipal tree products 10.Ekra 11.bhatghila 12.laham bark 13.amlal 14. silikha 15.bohera 16.bhomra 17.orchids 18.Rauvolfia serpentina 20. Nageswar seed(iron wood)21. wood apple.

It has been seen that these villagers have several knowledge on traditional ways to cure diseases. But because of the influence of the modern medicines these knowledge are fading away. The villagers are willing to start away with a herbal garden (1 bigha) with the various herbs they can identify which can be extended in future. The garden will be looked after by a committee of 8 youths of the village. There is also a possibility to extend the work in nearby villages at Helem, Monabarie, and further upstream of the river Bhoroli.

In Dharikathi the agricultural sector has a lot to improve. Land holdings are very small and hence a need for cooperative farming arises which can give the benefits of large scale production like low cost of inputs, low transportation cost to the market, etc. The river Bhoroli carries away top soils and deposits sand in every flood from the banks. The rocky bed at 4 feet creates another problem for placing the shallow tubewells. Delays in supply of agricultural inputs by the govt. causes another problem as the farmers can't carry the harvest to the market at the right time. Elephants here are the major pest of all agricultural crops. 12 shallow tube wells have been bought but yet to be installed.

The main cropping patterns here are :-

lowland- sali rice : ahu rice , upland:- a) turmeric. b) ginger. c) potato, tomato, cabbage, cauliflower, mustard (Oct-Jan\Feb):, Colocacea, maize, beans, brinjal (Feb-July) , vandi. d) sugarcane, sweet potato.

Pesticides used are DDT, decis , silcord, malathion, of which DDT is the most dangerous. Indofil M 45 issued for the fungal diseases. Soil type here is sandy loam in most parts and sandy in towards the river. Because of the forest land nearby diversity can be found in many medicinal herbs, fruits (olive, berry, amla, guava). The village faces the same sets of problems in extension works by the govt. officials , seeds, irrigation, pests, fertilizers as in Namphakie village.

3. District Darrang

Villages Amlaiguri and Amjuli

Tribe :- Boro

Population - 200 + 2000 families.

Distance :140 km (3hrs)from Guwahati. Average land holding 12 bighas per family. Cultivation of crops can be done only once in a year due to lack of any irrigation facility and therefore the villagers are much dependent on the forest products for day to day earning. Some of the forest products are marketed to as far as Calcutta. The list obtained from the villagers :- silikha, amla, bohera, baknala bark, takuna seed, sirata, khoir, tekera, imli, broom, cane, thatch.

The knowledge on traditional medicines is fast eroding and malaria is very severe every rainy season when the area is totally cut off from the nearby town because of floods with the rain water from Bhutan. There is also an increase in activities of militants and the army. Although the villagers are willing to give 16 bighas for the herbal garden they want to start with 3 bighas. Seeing the militant activities at a rise it would be wise to wait for the next season in this area.

4. District Dibrugarh.

Village Namphakie

Namphakie village 5 km away from Naharkatia Town in the district of Dibrugarh is a pleasant Buddhist village of 70 families by the river Dihing.

A pleasant atmosphere with people following the age old culture, speaking "Tai" language with great hospitality can be felt as one enters the village. Their colorful attire woven by the women gives them the ethnic look. They also use natural dyes in their clothes. The main source of income of the villagers is agriculture. Abundant cultivated land and virgin land, manpower , indigenous of varieties of rice, medicinal herbs makes it a potential area for agricultural growth. But Dihing flowing through the length of the village makes the village a prey to erosion of the bank every rainy season.

The 'Pathar Parisalana Samiti' owns a tractor with harrow and a cultivator. Of the 70 families 15 of them own power tillers and six of them pump sets for swallow tube well. The yield from the crop is sufficient for the need of the farmer's household and little saleable surplus, However there are farmers with land but no money for cultivating. With rising expenses of other household needs and educating the new generation they have started to feel the pressure with the present state of agriculture. The supply of seeds

and other inputs from the govt. is always late and creates problems as they are unable to produce at the right time.

The main crops are rice, mustard, Potato, Colocacea, Sesamum and some vegetables. The cropping pattern followed for low land is :Sali rice Indigenous and improved varieties) (Sep-Dec) : Ahu rice Occasionally)(April-July) and for Upland are 1. Mustard (Oct-Jan/Feb) Colocacea (April- Oct) 2. Potato + Pea + Leafy Vegetables (Oct- Feb) :Maize (Feb-May) : Sesamum (Jun-Oct).

Other vegetables are grown but for household needs only. one major reason of small scale cultivation is the monkey. Crops like Pumpkin is totally out of the cropping pattern. Some potential crops are Ginger, Turmeric, Okra, Dolichos bean, green gram to come in to the system. The prospects of increasing the production is very high with use of fertilizer, irrigating the fields , use of improved seeds, using modern implements for land preparation thus saving time fit in more crops. The crops are sold to middlemen with a difference of Rs 1-2. Colocacea is sold before harvest and so difference is around half the market price. Paddy is sold at Rs 4.50 -5.50 per kg.

Productivity :- Rice 480 kg/bigha Potato -1000 kg/bigha, Pea -100 kg/bigha. Farmers are not applying fertilizers however some have started using urea, SSP, MOP, in mustard form ABITA at 50% subsidy. Cowdung is the only organic manure used.

Incidences of attack of Gandhi Bug, Shoot borer are seen in rice. Caterpillars and other leaf eaters are seen in leafy vegetables. Cricket is the major pest of Cole crops and potato. Major insecticides are Malathion, Decis, Silcord. Decis and silcord are strong pesticides to be used in vegetables. Fungal diseases are seen in cabbage cauliflower potato and some vegetables where indofil M-45 is used. The villagers do not calculate the amount spent in pesticides. Another major pest is the monkey.

Water is a problem during the dry part of the year. No irrigation facilities have been installed, however six farmers have bought shallow tubewell. Because of financial problem pump-sets and sprinkler irrigation system are out of the farmers field even at subsidized rates.

The soil type is sandy loam suitable for all crops grown in the area. By increasing the organic matter content the soil fertility can be enhanced. No incidence of soil related problems have arisen as yet. Seeds are bought from the local market, Dept. of agriculture, Assam agricultural university and also procured from own crop. The quality is not always satisfactory. they are interested in producing vegetable seeds. The village and the nearby forest has diversity in medicinal herbs but they are ignorant about their economic importance or the market. Genetic variability can be seen in some fruit crops.

Agricultural Extension officers, VLEWs visits the village but at regular intervals. The advises are followed by some and some don't as they fill their traditional methods are better while some don't have the financial strength. The villagers would be happy to send some of the young boys for training but not sure how many will pay for the service they get from the trained.

According to the govt. officials the economic development of the village can be obtained by cooperative farming. The soil is suitable for almost all crops. No hybrid rice has been yet cultivated in the village. It seems that the officer didn't have a clear picture of the villager's agricultural problems like the monkeys. However they are ready to help in what -ever ways they can. Since all the other staffs were out of station no data could be given .

- In addition to this, preliminary surveys were conducted in **Meghalaya**
- **District Tura**, (West Garo Hills)
- **District Shillong** (East Khasi Hills)

Survey on Indigenous Knowledge is being conducted in Assam.

District : - Sonitpur

Name of the Community :- **MISHING**

Name of the Villages:

- a) Baligaon
- b) Buraguri
- c) Chikam
- d) Dharikathi
- e) Hatimora
- f) Jaisiddhi
- g) Kekokuli I
- h) Kekokuli II
- i) Morikuti
- j) Mayong
- k) Patkata
- l) Rehajuli
- m) Rangajan
- n) Sonaimiti
- o) Uttar Dharikathi

District :- Golaghat

Name of the Community :- **AHOM & ASSAMESE**

Name of Villages: -

- a) Bogorijuri
- b) Bosagaon
- c) Diring
- d) Dumjaan
- e) Durgapur
- f) Geleki
- g) Gossanibar
- h) 1 No. Kohora
- i) 2 No. Kohora
- j) Lakhipur
- k) Lukhurakhonia
- l) Mohpora
- m) Panbari
- n) Sepenakubui
- o) Siljuri

District :- Morigaon

Name of the Community :- **TIWA**

Name of Villages:-

- a) Aamsoi
- b) Bargaon
- c) Beltola
- d) Cakrangkuchi
- e) Dabarghat
- f) Daponibari
- g) Deokhal
- h) Gagara
- i) Konabur
- j) Kumarbori
- k) Makrangkuchi
- l) Nellie
- m) Palashguri
- n) Silchang
- o) Tegheria

SURVEY AND COLLECTION OF WILD
RELATIVES OF CROP PLANTS IN THE
NATIONAL
PARKS & SANCTUARIES
OF WESTERN GHATS
OF MAHARASHTRA

- I KALSUBAI HARISHCHANDRAGAD SANTUARY
- II SANJAY GANDHI NATIONAL PARK



I KALSUBAI HARISHCHANDRAGAD SANTUARY

Established	:	1986,
Location	:	Tal. Akole, Dist. Ahmednagar,
Area	:	361.8 sq. km,
Height	:	1654 m (Max),
Avg. temperature	:	22 ⁰ C,
“ rainfall	:	635 mm,
“ humidity	:	Less than 60%,
Type of forest	:	Tropical semi evergreen forest and
Distance from Pune	:	222 km .

Wild crop relatives recorded within sanctuary area

- 1 *Ahelmoschus manihol* (L.) Medik ssp. *tetraphyllus* (Rox. ex Hornem),
- 2 *Canavalia canthartica* Thours.,
- 3 *Vigna khandalensis* (Sant.) Raghwan et Wadhwa.,
- 4 *V. Vexillata* (L.) Rich.,
- 5 *V. angularis* (Willd.) Ohwi & Ohashi,
- 6 *Paracalyx scariosus* (Roxb.) Ali.,
- 7 *Cajanus lineatus* (W & A) Vander masen,
- 1 *Cajanus sericeus* (Ben. Ex. Bak.) Vander masen,
- 8 *Momordica dioica* Roxb. Ex. Willd.,
- 9 *Cucumis melo* L. var. *agrestis* Naud. and
- 10 *Solanum anguivi* Lam.

Associated farming system

Shifting cultivation

This is a slash and burn system, which follows a regeneration cycle. Several operations and rituals are involved including land selection, Clearing and burning, Worship and sacrifice, sowing, weeding and protection, harvesting and threshing and merry making. This type of traditional and primitive form of agriculture is adopted by native agrarian tribes like Mahadeokoli and Thakar. Most of the hill slopes of Sanctuary area are occupied by these tribes. They cultivate various crops on hill slopes by shifting cultivation. However, hill slopes of this Sanctuary like Ghatghar, Ratangad, Bari, Pachnai and Thakarwadi are under cultivation.

Main crops and Native land race diversity

Mahadeokoli and Thakar cultivate land races of different crops especially of rice in their small land holdings. Rice is a main crop of this region. Some land race varieties of Rice are still available like Raibhog, Khadkya, Kolpi and Jini. Along with Rice other kharif crops are also under cultivation.

Eleusine coracana (L.) Gaertn. (Nagali), *Panicum sumatrense* Roth. Ex. Roem. (Wari), *P. millaere* Lamk (Sawa) and in oil seeds, *Guizotia abyssinica* Cass. (Khurasni).

Very few irrigated localities (Thakarwadi & Bari) have improved varieties of rabi crops like *Triticum Vulgare* Vill (Wheat), *Cicer arietinum* L. (Gram) & *Dolichos lablab* L. (Wall)

Irrigation system

For irrigation these agrarian tribes depend on natural water sources like Monsoon rain during kharif' season and rivulets, streams, and waterfall during rabi season. At Thakarwadi rabi crops are irrigated by rivulet.

1 *Abelmoschus manihot* (L.) Medic ssp. ***tetraphyllus*** (Roxb. ex. Hornem.) Borss. in Blumea 14:97:1966. *Hibiscus tetraphyllus* Roxb. ex Horn. Hort Hafn. 661.1815; Cooke, Fl. Pres. Bombay 1:118:1958 (Repr. Ed.). 'Ranbhendi'.

Erect, woody, annual under-shrubs, stem sparsely stiff hairy Leaves 4.5 – 8.5 x 4.5 -11.0 cm., palmately 3-7 lobed or angled, scabrous, short stiff hairy. Flowers axillary, solitary and subracemose towards branch endings; corolla yellow with purple centre. Capsules ovoid, densely hispid; seeds globose, concentrically striate, hairy.

Fls. and Frts. : September – November.

Localities

Thakarwadi, Kadgoop, Gharghar and Bhandardara dam.

Ecological habitat

Few in moist waste places and in grassland. This species favours moist soil and sunlight exposed open land for its vegetative growth. Within Sanctuary area, most of the subpopulations are found in moist waste places, but at Kadgoop one subpopulation is found in grassland.

Population structure

Very fragmented population is observed within Sanctuary area and all studied subpopulation are very sparse with 4-5 individuals.

Dispersion pattern

This species exhibits random dispersion i.e. individuals are found randomly distributed in population.

Associated vegetation pattern

Associated vegetation pattern is of multistoried type. This species is found associated with *Woodfordia floribunda* and *Clerodendron serratum* in herbaceous species also associated with tree species like *Prunus persica* and *Memecylon ambalatum*.

Trends of genetic erosion

Pest attack

This species is found severely affected by insect and beetle bite at every locality. Beetles and larva of the insect are found feeding on leaves, young shoots and buds. This species is found very susceptible to insect bite as compared to its neighbouring plant species and suffering by the threat of destruction of complete plant before its flowering period due to insect bite.

2 *Canavalia cathartica* Thouurs. J. Bot. (Desuank.) 1:81.1813. *Dolichos virosus* Roxb. Fl. Ind. 3:301.1832 (incl. Syn.). 'Abey'.

Extensive woody climbers; leaflets 3, broadly ovate or ovate orbicular, pubescent, 5.5-16x3-13.5 cm, flowers bluish-white in pendended racemes; pods linear-ablong, flat sparsely hairy; seeds oblong, glabrous.

Fls. and Frts. : October- December.

Localities

Bari and Ghatghar.

Ecological habitat

Few along rivulet and streams. All studied subpopulations are found in shady places along rivulet and streams i.e. *Canavalia* sps. favours moist and shady habitat especially along running (flowing) water sources.

Population structure

Fragmented population is observed within area of study. Only 3 subpopulations are found in Sanctuary area and at Bari 5 individuals are found grown in one studied subpopulation.

Dispersion pattern

Slight clumped dispersion : This species exhibit slight clumped dispersion within Sanctuary area. Individuals are found aggregated into patches and interspersed with few number.

Associated vegetation pattern

This species is found grown in shrubby vegetation and in association with shrubby species like *Zizyphus mauritiana*, *Euphorbia ligularia* tree sps. like *Ficus* species and *Pongamia glabra*.

Trends of genetic erosion

Exploitation of roots and barking

Roots and bark are used medicinally for killing intestinal worms by local people. However, exploitation of roots causes extinction of individual from its genepool.

3 *Vigna Khandalensis* (Sant.) Raghvan. et Wadhwa in Curr. Sci. 41:429.1972; Singh and Kulkarni in Re.Dat.Boo.Ind.Pl.3:153.1990. *Phaseolus Khandalensis* Sant. In Kew Bull. 1948:276.1948. 'Samara'.

Herbs upto 1.4 m high, appressed hairy. Leaflets 9-14 cm long, terminal 3-lobed, lateral frequently 2-lobed with the lower lobe small or at times 3-lobed, sparsely hairy on both sides. Stipules leafy 2-4 cm broad.

Inflorescence of axillary, spicate racemes. Flowers yellow. Pods 4.5-5.5x0.3 cm, cylindric. Seeds 8-10, dark brownish black.

Fls. And Frts. : September – October.

Locality

Bari (Kalsubai hill).

Ecological habitat

On extreme hill slope. Only single individual is found grown along bund (on edge of the terrace upland) of field on hill slope.

Population structure

Only single well grown individual is found within Sanctuary area.

Associated vegetation pattern

This species is found associated with herbaceous species like *Senecio grahami*, *Cucumis melo* var. *agrestis* and *Clerodendron serratum* and tree species like *Emblica officinalis*, *Lagerstromia lanceolata* and *Zizyphus jujuba*.

Trends of genetic erosion

Shifting cultivation

According to IUCN Red Data Book of Indian plants (1992) status of this endemic species is Rare and its distribution is restricted to Sanhyadri ranges of W. Ghats and also very scattered in distribution in Ahmednagar, Pune and Satara districts of Maharashtra only.

However Kalsubai is a only locality in Ahmednagar district where I got single individual on October 11, 1999 and during second visit (march 9, 1999) this individual found distructed due to one operation of shifting cultivation (clearing and expansion of field as this individual is found on bund of field).

Now this species is having biggest alarming threat in the form of shifting cultivation, if any individual is remaining on this hill.

4 *Vigna vexillata* (L.) A. Rich.Hist.Fis.Polit.Nat.1.Cuba (Spanish ed.). 11:191.1845. *Phaseolus vexillatus* L. Sp.Pl.724.1753. 'Halunda'.

Twining or trailing herbs with fusiform roots; leaflets 3, ovate-lanceolate or ovate rhomboid, acute-acuminate, appressed-pubescent; flowers pink, purplish or rosy in subumbellate, condensed racemes; pods 8-10x0.1-0.5 cm, linear-subterate, brownish, pubescent; beaked; seeds 10-16, dark red, subreniform.

Fls. and Frts. : September – October.

Localities

Bari (Kalsubai), Pachnai (Harishchandragad), Ghatghar, Kadgoop and Ratangad.

Ecological habitat

Frequent on hill slopes. All individuals are found grown on moist eroded soil and under the shade of shrubs i.e. this species favours moist and shady habitat for its growth.

Population structure

Less dense population is observed within Sanctuary area. 14 and 9 individuals are found in two different subpopulations at Bari and Ghatghar respectively.

Dispersion pattern

Individuals are aggregated into patches and found distributed at different localities with few number i.e. this species exhibit slight clumped dispersion pattern within Sanctuary area.

Associated vegetation pattern

As mention earlier, this species grows under the shade of shrubs. Associated vegetation pattern is found dense shrubby with sparse herbaceous ground flora. This species is found grown in association with shrubby species like *Carissa congesta*, *Lantena camera* var. *aculeata*, *Cajanus lineatus*, *solanum anguivi* and *Woodfordia floribunda*.

Trends of genetic erosion

i Exploitaion of tuberous roots

Children of native tribes like delicious tuberous roots very much. They get these perennial tubers by digging in early summer ca 8 individuals are found exploited from one subpopulation at Ghatghar.

ii Pest attack

At Bari, mature pods of this species are found severely affected by bittles. Larva and mature individuals of bittles are found feeding on seeds of pods, however pest attack control the overproduction and migration of species.

5 *Vigna angularis* (Willd.) Ohwi and Ohashi in J.jap.Bot.44:29.1969.
Dolichos angularis Willd.sp.pl.3:1051.1802.*Phaseolus mungo* acut.non.L.
(1753); Baker in Hook.f.FI.Brit.India 2:203.1876. 'Halind'.

Twining or trailing hairy herbs; leaflets broadly ovate-rhomboid, appressed pubescent, 3.5-9x2.8-10.5 cm, flowers yellow; incipitate racemes; pods linear-ablong, densely hairy, seeds subquadrate, greenish-black.

Fls. and Frts. : August - October.

Localities

Ghatghar, Bhandardara dam and near Kadgoop.

Ecological habitat

Occasional on hill slopes and plains (plateau). Mostly all individuals are found grown under the dense shade of shrubs in shrubby community i.e. this species favours shady and protected habitat for its growth.

Population structure

Very sparse population is observed within Sanctuary area. In studied subpopulations, 7 individuals are found grown on hill slop near Kadgoop while only 2 individuals are found at Ghatghar in moist soil.

Dispersion pattern

Individuals are found randomly distributed in area of study however this species exhibits random dispersion pattern.

Associated vegetation pattern

As this species found grown in dense shrubby community, associated vegetation is of shrubby type. This species is found associated with *Carvia callosa*, *Strobilanthus* sps. and *Senecio* sps.

Trends of genetic erosion

At present this species is free from all kinds of threats of genetic erosion.

6 *Paracalyx scariosus* (Roxb.) Ali in Univ. Steud. (Karachi) 5(3):95.1968.

Cylista scariosa Roxb. Pl. Cor. t.92.1975; Cooke, Fl.Pres. Bombay 1:412.1958 (Repr. Ed.). 'Baraware'.

Extensive, woody, grey-pubescent climbers; leaves 3-foliolate; leaflets, the terminal rhomboid-ovate, the lateral obliquely ovate, coriaceous, fulvous-pubescent, 4.6-9 x 3.5-5.2 cm.; flowers yellow in terminal, axillary racemes, calyx persistent and scarius; pods pubescent, enclosed in calyx; seeds 1, black, reniform.

Fls. and Frts. : September – March.

Localities

Bari (Kalsubai), Pachnai (Harishchandragad) and Ghatghar.

Ecological habitat

Frequent in plain and hilly forest areas. Especially on open scrubby vegetation plains. Species favours bright sunlight and spreading (on the top of bushes and shrubs) habit.

Population structure

Less dense population is observed within area of study. Few profusely grown and dense subpopulations are found within Sanctuary area ca 40 individuals are found in one studied subpopulation at Bari.

Dispersion pattern

Studied population exhibit clumped dispersion pattern i.e. individuals of this species are aggregated into patches and interspersed with large number.

Associated vegetation pattern

As per ecological habitat of this species, associated vegetation is of scrubby type. This species is found strongly associated with shrubby species

like *Carissa congesta* while other associated species are *Cajanus lineatus*, *lantena camera var. aculeata* & *Meyna laxiflora*.

Trend of genetic erosion

Exploitation of roots

Roots of this species are exploited by native tribes (Mahadeokoli and Thakar) for its medicinal use. Fresh roots are used as remedy for stomachache.

7 *Cajanus lineatus* (W and A) Van der maesen in Agri. Univ. Wageningen pap. 85 (4):65.1986. *Atylosia lineata* Wight and Arn. Prodr. 258.1834; Cooke, Fl. Pres. Bombay 1:408.1958 (Repr. ed.). 'Rantur'.

Tomentose shrubs, upto 150 cm; leaflets 3, appressed silky-villous when young, glabrescent at length, 1.8-3x0.7-1 cm; flowers yellow, axillary, solitary or in pairs; pods linear, turgid, hairy; seeds 2, black.

Fls and Frts. : October – December.

Localities

Bari, Pachnai, Ghatghar, Thakarwadi and Harishchandragad.

Ecological habitat

Frequent on plateaus and along hilly forest areas. Some dense subpopulations are found on eroded plateau areas like Harishchangad and Ghatghar also few profusely grown subpopulation are found on wasteland (left out fields / terrace uplands left after shifting cultivation) along hill slopes of Pachnai.

Population structure

Sparse population is observed within area of study. Few dense grown subpopulations are found with more than 20 individuals in each subpopulation. In one studied population, on Harishchangad plateau, ca 40 individuals are found grown in eroded soil.

Dispersion pattern

Population in area of study exhibits extreme clumped dispersion i.e. many individuals are aggregated into dense patches and interspersed with many number.

Associated vegetation pattern

As per ecological habitat of species, associated vegetation is sparse shrubby. This species is found associated with succulent shrubby species like *Euphorbia* sps. and other species like *Solanum anguivi*, *Carissa congesta*, *lantena camera var. aculeata* and *woodfordia floribunda*.

Trends of genetic erosion

i Forest fire

At Harishchandragad plateau, this species is found strongly affected by forest fire. Due to dense glandular Coilglands hairy habit, this species catch fire immediately. Few subpopulations are found depleted from this region due to forest fire which is now become alarming threat for this species in this Sanctuary area.

ii Overgrazing

According to native tribe Mahadevkoli, this species is a favourite fodder of their cattle. Cattle are attracted towards lush green leaves and bright yellow flowers.

8 *Cajanus sericeus* (Ben. ex Bak.) Van der masen in Agri. Univ. Wageningen pap. 85-4:65.1986. *Atylosia sericea* Benth.ex Baker in Hook f. Fl. Brit. India 2:213.1876; Cooke, Fl. Pres. Bombay 1:408.1958 (Repr. ed.). 'Turati'.

Undershrubs, 80-160 cm.; leaflets 3, sessile, densely silky pubescent, prominently 3 nerved from base, 1.2-2.4x0.2-0.4 cm; flowers yellow, axillary, solitary or paired; pods linear-oblong, oblique, silky tomentose, beaked; seeds 2, blakish, compressed, smooth.

Fls. and Frts. : September – October.

Locality

Only at Bari (Kalsubai).

Ecological habitat

Very few on hill slope. Only 5 individuals are found at Bari in which 3 are found along fencing of field and remaining two are found on extreme slope under the shade of trees.

Population structure

Very fragmented population is observed. All these studied 5 individuals are found distributed at distant places.

Dispersion pattern

Population exhibits random dispersion pattern.

Associated vegetation pattern

This species is found associated with herbaceous species like *Lantena camera* var. *aculeata*. *Thespepsia lampas* and *Paracalyx scariosus*.

Trends of genetic erosion

i Shifting cultivation

This species is suffering by various operations of shifting cultivation like clearing and burning of herbaceous and shrubby species (Rap) for nutrient supply and dumping of earth (soil and stones) on slopes of hills during preparation and expansion of land (field).

ii Overgrazing

According to native tribe Mahadeokoli, this species is also a favourite fodder of their cattle. Cattle are attracted by whitish green colour and herbaceous habit of *Cajanus* sps. This species is having these 2 alarming threats of genetic erosion in this region.

9 *Momordica dioica* Roxb. ex Willd. Sp. Pl. 4 : 605. 1805; Cooke, Fl.Pres.Bombay 1:563.1958 (Repr.ed.); Chakravarty in Fasc.Fl.India 11:94.1982. 'Kartoli'.

Climbing herbs with tuberous roots; leaves ovate, mucronate, base emarginated, variously lobed, minutely denticulate and punctate beneath, 3.5-9.4x2.6-7.8 cm, flowers yellow, solitary, pendunculate; fruits ovoid, bright red at maturity; seeds yellow, ovoid, emarginate.

Fls. and Frts. : June – September.

Localities

Ghatghar and Pachnai (Harishchandragad).

Ecological habitat

Occasional on hill slopes and on plains. Wellspread individuals are found on top of the shrubs and small trees i.e. this species favours bright sunlight for its growth.

Population structure

Sparse population is observed within Sanctuary area. Maximum 7 individuals are found in one studied subpopulation at Ghatghar (where male and female individuals are in same subpopulation).

Dispersion pattern

Individuals are aggregated into patches and found distributed at different localities with few number i.e. population exhibit slight clumped dispersion pattern.

Associated vegetation pattern

Individuals are found grown in shrubby vegetation and in association with *Carissa cangesta*, *Solanum anguivi* and tree species like *Terminalia tomentosa*, *Careya arborea* and *Olea dioica*.

Trends of genetic erosion

i Exploitation of tuberous roots and fruits

Tuberous roots are used medicinally by native tribes to cure piles and fevers while fruits are collected on large scale as fruit vegetable which is now become an alarming threat for this species within Sanctuary area.

ii Loss of habitat

For the need of fuel wood, tribal women prefers shrubby wood because it is more easy for them to cut down the shrubs, however clearing of shrubby

vegetation results habitat loss. In this way few individuals are found depleted from one subpopulation at Ghatghar due to exploitation of roots and shrub falling.

10 *Cucumis melo* L. var. *agrestis* Naud. Ann. Sci. Nat. 4 (11):73.1859; Cooke, Fl. Pres. Bombay 1:569.1958 (Repr. ed.); Chakravarty in Fasc. Fl. India 11:35.1982. 'Mek'.

Prostrate, monoecious herbs; leaves ovate-cordate, 3-7 lobed, lobes obtuse, hairy, 4-7.2x3.5-7 cm; flowers yellow; fruits ca 3.5 cm across, ellipsoid or turbinate, green with white streaks; seeds ovoid.

Fls. and Frts. : September – October.

Localities

Bari (Kalsubai), Thakarwadi and Bhandardara dam.

Ecological habitat

Few on hill slopes and plains (plateau). Mostly all individuals are found grown in open places having ground herbaceous flora only, however this type of situation is found more on plains where maximum number of individuals are observed. It means that, species favours bright sunlight and sparse associated vegetation for its growth.

Population structure

Fragmented population is observed within Sanctuary area. Very few subpopulations are found grown within large area of 361.8 sq.km Maximum 5 individuals are found grown in one subpopulation at Thakarwadi while at other localities only 1-2 individuals are observed.

Dispersion pattern

Population of this species exhibit random dispersion pattern.

Associated vegetation pattern

As this species is found on open places, its associated vegetation pattern is of herbaceous type. This species is found associated with herbaceous species like *Senecio grahami*, *Vigna angularis* and *Abelmoschus manihot* . ssp. *tetraphyllus*.

Trends of genetic erosion

At present this species is free from all kinds of threats of genetic erosion.

11 *Solanum anguivi* Lam.III.2:23.1794. *S.indicum* auct.nonL.1753; Cooke, Fl.Pres.Bombay 2:336.1958 (Repr.ed.); Deb in J.Econ.Tax.Bot. 1:47.1980. 'Katheringani'.

Undershrubs or shrubs upto 1.5 m high. Leaves 3-10x1.5-6.0 cm, broadly elliptic or elliptic-oblong or ovate, prickly on nerves. Inflorescence of extra axillary racemose cymes. Flowers blue-violet. Berries ca 0.7 cm in diam., globose, yellowish-red when ripe. Seeds orange, spherical, flat.

Fls. and Frts. : July – December.

Localities

Bari (Kalsubai), Ghatghar and Kadgoop.

Ecological habitat

Occasional on plains and in wastelands. Few individuals are found grown in dense shrubby community, under the shade of shrubs and small

trees i.e. this species prefers cool and shady habitat surrounded by shrubs and trees.

Population structure

Sparse population is observed within Sanctuary area. 7 individuals are found grown in one subpopulation at Ghatghar in which 2 individuals are attending height of ca 7 ft.

Dispersion pattern

Individuals are found randomly distributed within area of study i.e. population of this species exhibit random dispersion pattern.

Associated vegetation pattern

As mentioned earlier, this species is found grown in shrubby community, obviously the associated vegetation pattern is of shrubby type. This species is found associated with shrubby species like *Carissa congesta*, *Woodfordia floribunda*, *Cajanus lineatus* and tree species like *Terminalia tomentosa* and *Careya arborea*.

Trends of genetic erosion

At present this species is free from all kind of threats of genetic erosion.

II SANJAY GANDHI NATIONAL PARK

Established	:	1980,
Location	:	Borivali, Dist.-Thane,
Area	:	104 sq. km,
Height	:	30 m – 468 m.,
Avg. temperature	:	27 ^o C (Max 35 ^o C & min 15 ^o C),
“ rainfall	:	2500 mm,
“ humidity	:	60% (80% in monsoon),
Type of forest	:	Southern tropical semievergreen forest and
Distance from Pune	:	182 km .

Wild Crop relatives recorded within National Park area.

- 1 *Abelmoschus manihot* (L.) Medik ssp. *tetraphyllus* (Rox. ex. Hornem.),
- 2 *Canavalia cathartica* Thours.,
- 3 *Cajanus scarabaeoides* (L.) Thours,
- 4 *Luffa acutangula* (L.) Roxb.,
- 5 *Cucumis callosus* (Rttl.) Cogn.,
- 6 *Solanum anguivi* Lam. and
- 7 *Sesamum mulayanum* Nair.

Associated farming system

Subsistence agriculture

Most of the National Park area is well preserved except land under cultivation at Patonapada and Saibangoda. Subsistence agricultural system is practiced at Patonapada. It is a traditional form of agriculture done in small landholdings (plots) often with mixed cropping of various crops required by the farmers for their own use. Most crops are of multipurpose types. Seed harvested is also used for the next sowing, which is a best source of landrace diversity adapted to local conditions of moisture stress, disease / pest attack, etc.

Main crops and native landrace diversity

Native tribal communities like Mahadeokoli and Warli cultivate various crops in their small landholdings like, *Oryza Sativa* L. (Paddy), *Eleusine coracana* (L.) Gaertn. (Nagali), *Panicum sumatrense* Roth. ex Roem. (Wari.) and *Gizotia abyssinica* Cass. (Khurashi) in Kharif season only, at Patonapada Orchard : Date palm, Banana and Guava are planted in orchard at Saibangoda.

Native land race diversity : Jini a well known land race variety of rice is still under cultivation in this region along with other part of Thane district.

Irrigation system

For irrigation, cultivators of Patonapada depends on natural water source like, Mansoon rains water during kharif season i.e. land is under rain feed condition. While orchard of Saibangoda is irrigated by pumped water from nearby water reservoir of Vihar lake.

1 *Abelmoschus manihot* (L.) Medic. ssp. ***tetraphyllus*** (Roxb. ex. Hornem.) Borss. in Blumea 14:97:1966. *Hibiscus tetraphyllus* Roxb. ex Horn. Hort Hafn. 661.1815; Cooke, Fl. Pres. Bombay 1:118:1958 (Repr. ed.). 'Ranbhendi'.

Erect, woody, annual under-shrubs, stem sparsely stiff hairy Leaves 4.5 – 8.5 x 4.5 -11.0 cm., palmately 3-7 lobed or angled, scabrous, short stiff hairy. Flowers axillary, solitary and subracemose towards branch endings; carolla yellow with purple centre. Capsules ovoid, densely hispid; seeds globose, concentrically striate, hairy.

Fls. and Frts. : September – November.

Localities

Chunapada, Yeoor, Patonapada, Vihar lake, Near Kanheri and Saibangoda.

Ecological habitat

Frequent along roadsides and in moist waste places. Most of the dense subpopulations are observed along roadsides and in moist soil while few subpopulations are found grown in moist waste places which are near housing colonies of native tribes. This means that species favours bright sunlight and open moist habitat for its growth.

Population structure

Dense population is observed within area of study. ca 45 individuals are found grown in one subpopulation at Chunapada also one dense subpopulation is found near Kanheri caves with 16 individuals. Minimum number of individuals (2) is found on Bund of Vihar lake.

Dispersion pattern

Individuals are found aggregated into patches and found distributed at different localities with many number of individuals in these patches i.e. this species exhibit extreme clumped dispersion within Sanctuary area.

Associated vegetation pattern

This species is found grown mostly in shrubby vegetation and seen in association with *Sesamum malayanum*, *Abutilon indicum*, *malachra capitata* and tree species like *Tectona grandis* and *Mitragyna parviflora*.

Trends of genetic erosion

At present this species is free from all kinds of threats of depletion within reserve area.

2 *Canavalia cathartica* Thouurs, J. Bot. (Desuank.) 1:81.1813. *Dolichos virosus* Roxb. Fl. Ind. 3:301.1832 (incl. Syn.). 'Abey'.

Extensive woody climbers; leaflets 3, broadly ovate or ovate orbicular, pubescent, 5.5-16 x 3-13.5 cm, flowers bluish-white in penduncled racemes; pods linear-ablong, flat sparsely hairy; seeds oblong, glabrous.

Fls. and Frts. : October- December.

Localities

Katipada, Near Dahisar and Bhainder.

Ecological habitat

Occasional along roadsides and on moist plains. Individuals are found grown (spreading) on the top of the shrubs in uniform shrubby community along roadsides and plains.

Population structure

Sparse population is observed within reserve area. Although individuals are distributed at restricted localities, found abundant wherever species occurs. one largest dense subpopulation is seen near Dahiser having length of 0.5 k.m. i.e. subpopulation is distributed in a belt along roadside (National highway from Mumbai to Ahmedabad).

Dispersion pattern

Individuals are found aggregated into patches and distributed at restricted localities with few number of individuals i.e. species exhibit slight clumped dispersion within reserve area.

Associated vegetation pattern

As this species is seen in shrubby plant community, found associated with shrubby species like *Carissa congesta*, *Lantena camera* var. *aculeata*, and small tree species like *Pangamia glabra*.

Trends of genetic erosion

At present this species is free from all kinds of threats of depletion from reserve area.

3 *Cajanus scarabaeoides* (L.) Thouars in Dict. Sc. Nat. 6:617.1817; van der Maesen in Agric. Univ. Wageningen papers 85-4:183 (1985) 1986. *Dolichos scarabaeoides* L. Sp. Pl.726.1753. *Atylosia scarabaeoides* (L.) Benth. In Miq. Pl. Jungh 2:242.1852; Cooke, Fl.Pres.Bombay 1:409.1958 (Repr.ed.).

Twiner, branches striate, pubescent. Stipules small triangular scales, caduceus. Leaflets 2.0-4.5 x 0.5-1.5 cm, ovate-elliptic or obovate, subacute at

apex, upper surface thinly and lower surface densely pubescent. Flowers yellow. Pods ca 2.2x0.5 cm, oblong, pubescent with deep obliquely transverse lines between seeds. Seeds rectangular-rounded.

Fls. and Frts. : October – November.

Localities

Patonapada, Chunapada and Saibangoda.

Ecological habitat

Occasional along roadsides and in open places. Individuals are found grown (spreading) on herbs and shrubs in open places and along roadside. This species is observed both at higher altitude (Yaoor plateau) and at lower altitude (patonapada).

Population structure

Very sparse population is observed within area of study. One sparse population with 11 individuals is found grown along roadside at patonapada while other localities only 1-3 individuals are seen in open places.

Dispersion pattern

Individuals are found randomly distributed within Sanctuary area i.e. population of this species exhibit random dispersion pattern.

Associated vegetation pattern

This sps. is found associated with herbaceous species like *Cassia tora*, *Smithia* sps., and shrubby species like *Sesamum mulayanum*, *Abelmoschus manihot* ssp. *tetraphyllus* and *Zizyphus jujuba*.

Trends of genetic erosion

At present this species is free from all kinds of threats of depletion.

4 *Luffa acutangula* (L.) Roxb. Fl. Ind. 3:713.1832; Cooke, Fl. Pres. Bombay 1:566.1958 (Repr.ed.). *Luffa acutangula* var. *amara* (Roxb.) C.B.Cl. in Hook f. op. cit.; Cooke, op. cit. 567. 'Kadudodaka'.

Climbers, extensive. Leaves 4-11 x 4-11 cm, entire or palmately 5-7 angled or sublobate, broadly orbicular or ovate in outline. Flowers pale-yellow, 2.5-3.0 cm in diam. Fruits 5-6x1.8-2.0 cm, obovoid obtusely conical at both ends, 10-ribbed, green. Seeds ovate, black.

Fls. and Frts. : September-October.

Locality

Chunapada.

Ecological habitat

Very few in residential colony of tribe in waste places very near to huts of native tribe.

Population structure

Very very fragmented population is observed within area of study. Only 3 individuals are found grown very near to each other on tall trees at Patonapada.

Dispersion pattern

Only 3 individuals are found randomly dispersed in their population.

Associated vegetation pattern

This species is found associated with tree species like *Acacia chundra*, *Ficus amplissima* and *Oroxylum indicum*.

Trends of genetic erosion

At present this species is free from all kinds of threats of depletion.

5 *Cucumis callosus* Rottl. Cogn. In Engl. Pflanzenr. 88:129.1924; Chakravarty in Fasc. Fl. India 11:31.1982 *cucumis trigonus* Roxb. Fl. India 2:722-1824; Cooke, Fl. Pres Bombay 1:569.1958 (Repr. ed.).

Prostrate or climbing herbs with scabrid stem; leaves suborbicular or ovate, cordate, 4-12 x 3.7-12 cm.; flowers yellow, axillary, solitary; fruits obovoid, yellowish-green with 8-10 longitudinal, green stripes; seeds oblong, white.

Fls. and Frts. : July – January.

Localities

Kanheri caves, Patonapada and Chunapada.

Ecological habitat

Frequent in moist waste places especially near residential colonies. Most of the individuals are found places spreading on rocky wall at moist open waste places. This means that species favours bright sunlight and protected moist habitat for its growth.

Population structure

Sparse population is observed within reserve area. Few subpopulations are found at Chunapada and at Kanheri hills which are having 9 and 4 individuals respectively.

Dispersion pattern

Individuals are found distributed in patches at restricted localities with few number of individuals in their subpopulations i.e. population exhibit slight clumped dispersion pattern.

This species is found associated with herbaceous species like *Lavandula bipinnata*, *Justicia prostrata* and *Heteropogon contortus*.

Trends of genetic erosion

Exploitation of fruits

Native tribes collect the mature oval fruits on large scale and sold them into nearby markets of Mumbai. 2 equal cut parts of fruits are used in lighting the lamps during religious processes by urban peoples. Species is suffering by this threat of commercial exploitation of fruits.

6 *Solanum anguivi* Lam. III. 2:23. 1794. *S.indicum* auct.non L.1753; Cooke, Fl.Pres.Bombay 2:336.1958 (Repr.ed.); deb in J.Econ.Tax.Bot. 1:47.1980. 'Katheringani'.

Undershrubs or shrubs upto 1.5 m high. Leaves 3-10 x 1.5-6.0 cm, broadly elliptic or elliptic-oblong or ovate, prickly on nerves. Inflorescence of extra axillary racemose cymes. Flowers blue-violet. Berries ca 0.7 cm in diam., globose, yellowish-red when ripe. Seeds orange, spherical, flat.

Fls. and Frts. : July – December.

Localities

Patonapada and Saibangoda.

Ecological habitat

Occasional in hilly forest region. Most of the individuals are found grown at interior of hilly forest under the dense shade of trees and on eroded soil. It means that this species favours shady, undisturbed eroded places habitat for its growth.

Dispersion pattern

Individuals are found randomly distributed within area of study i.e. population exhibit random dispersion pattern.

Associated vegetation pattern

This species is found associated with tree species like *Tectona grandis*, *Mitragyna parvifolia*, *Pongamia glabra* and *Dalbergia latifolia*.

Trends of genetic erosion

At present this species is free from all kinds of threats of depletion.

7 *Sesamum mulayanum* Nair in Bull. Bot. Surv. India 5:251.1963.

'Rantil'

Erect, glabrous, aromatic herbs; leaves variable from below to top, heteromorphic, opposite or alternate; flowers pale violet; capsules quadrangular, acuminate with a short beak, pubescent; seeds brownish black, reticulately rugose.

Fls. and Frts. : August – October.

Localities

Kanheri, Saibangoda, Chunapada and Patonapada.

Ecological habitat

Common along the roadsides and on open plains. individuals are found in both dry eroded soil and in moist soil near water reservoir but all subpopulations are observed at open places i.e. species favours bright sunlight.

Sparse population is observed within reserve area. Although population is sparse, found abundant wherever it occurs. ca 60 individuals are found grown in one dense subpopulation near Kanheri caves.

Dispersion pattern

Individuals are found aggregated into patches and interspersed with many number of individuals i.e. this population exhibit clumped dispersion.

Associated vegetation pattern

This species is found associated with shrubby species like *Abelmoschus manihot* ssp. *tetraphyllus*, *Thespesia lamps* and *Abutilon indicum*.

Trends of genetic erosion

Forest fire

Increasing anthropogenic activities like tourism, picnic spots encroachment in open places for construction and burning of dried ground flora as an entertainment by urban youngsters are responsible for the depletion of this species. This species is suffering by these threats.