

Coconut is a major irrigated horticultural crop in Konkan region of Maharashtra, where agro-climatic conditions are very much congenial for its cultivation. Government of Maharashtra has launched an ambitious Employment Guarantee Scheme (EGS) for fruit crop cultivation in 1990, which led to the expansion of the total area under coconut cultivation to 22,750 ha by 2015-2016 with productivity of 9,775 nuts/ha. In Maharashtra 95 per cent area under coconut is concentrated in Konkan region and most of the orchards are situated near the seashore, majority of them are sole coconut orchards.

In Maharashtra coconut farmers are facing problems like fragmented holdings, scattered production, homestead nature of cultivation, lack of skilled manpower, incidence of pest and diseases, lack of adoption of scientific cultivation practices, lack of appropriate mechanization for harvesting and small scale processing and lack of awareness about

“ Regional Coconut Research Station Bhatye contribute to the farming community through development of improved varieties of coconut along with evaluation and dissemination of location specific crop production and protection technologies. ”

improved technologies.

To address the problems faced by farmers, the Indian Central Coconut Committee established a Regional Coconut Research Station in Bhatye. The objective of this station is to carry out research in coconut for catering to the needs of coconut growers in this region. The Research Station is situated on

**V. V. Shinde, H. P. Maheswarappa\*, Jilu V. Sajan\***

Regional Coconut Research Station (ICAR-AICRP on Palms), Bhatye, Ratnagiri, Maharashtra

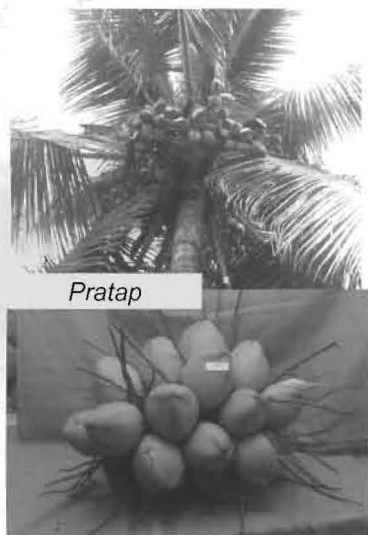


## Region specific technologies for doubling income of coconut farmers: in Maharashtra



RCRS, Bhatye

the coast of the Arabian sea of village Bhatye near to Ratnagiri town and is located at 17.00° N Latitude and 73.40° E Longitude and 3 m above mean sea level. The station was established on 1<sup>st</sup> July, 1955 under the administrative control of the State Department of Agriculture. The centre was under Mahatma Phule Krishi Vidyapeeth, Rahuri up to 1969 and presently it is under the Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. The station has an area of 25.84 ha for conducting research on mandate crops i.e., coconut and spices.



Pratap

The station undertakes research and extension programmes under ICAR- All India Coordinated Research Project (AICRP) on Palms and National Agricultural Research Project (NARP). This research station contributed to the farming community through development of improved varieties of coconut along with evaluation and dissemination of location specific crop production and protection technologies.

## Research Achievements of the Station

### Crop improvement

#### Coconut varieties/hybrids released

**Pratap:** A high yielding tall coconut variety, pratap was released in the year 1987, which was a selection from Banawali. It is having green colour round

shaped nuts and an average yield of 140-145 nuts/palm with dry copra yield of 120-160 g/nut and 68% oil content. The variety is recommended for cultivation in Konkan region of Maharashtra.

#### **Konkan Bhatye Coconut Hybrid 1 (GBGD x ECT):**

The hybrid was released in the year 2007, with an average yield of 120-122 nuts/palm and copra content of 160-169 g/nut with 67.1% oil content. Nuts are green coloured, oval shaped with tender nut water content of 330 ml/nut. The hybrid is resistant to stem bleeding disease and is moderately resistant to leaf blight and bud rot. This hybrid is also recommended for cultivation in Konkan region of Maharashtra.

Based on the performance, varieties/ hybrids like Chandra Kalpa (Laccadiv ordinary), Kera Sankara (T x D), Kera Chandra (Philippines ordinary), Chandra Sankara (DxT), Kera Bastar (Fiji Tall) and Godavari Ganga (ECT x GBGD) have been recommended for cultivation in Maharashtra.

#### **Nucleus seed gardens for released varieties**

Nucleus seed gardens for released varieties were established in the centre for ECT, Gautami Ganga (GBGD) and Kera Bastar, which will cater to the needs of quality planting material in the region.

#### **Crop Production**

**Fertilizer requirement:** A fertilizer dose of 1 kg Nitrogen, 0.5 kg phosphorus and 1 kg potash per palm in three splits (June, October and February) was recommended for coconut in sandy soils of Konkan region of Maharashtra. The dose should be applied in three splits i.e. 1/3 N and full dose of P<sub>2</sub>O<sub>5</sub> along with FYM in June and remaining 2/3 N and K<sub>2</sub>O in splits in October and February.

**Micronutrient application:** Application of recommended dose (1:0.5:1 kg NPK/palm/year) with 1.5 kg Ormichem micronutrient mix (Zn 3.15 %, Mg 1.8 %, Cu 0.65 %, Fe 1.97 %, Mn 2 %, Mo 0.05 % and B 0.68 %) recorded the maximum nut yield in



Konkan Bhatye

coconut and also the percentage increase in yield was higher in post treatment period yield when compared with pretreatment period.

**Drip irrigation:** Water requirement through drip irrigation for coconut was 30 litres/palm/day during October to January and 40 litres during February to May with six drippers placed at a distance of 1 m away from the coconut bole in the sandy loam soils of Konkan region.

**Drip fertigation:** Application of 1 kg N, 0.5 kg P<sub>2</sub>O<sub>5</sub> and 1 kg K<sub>2</sub>O per palm per year was recommended through drip irrigation in eight splits from October to May.

**Effect of water quality on survival and growth of coconut seedling:** An experiment was conducted to assess the influence of quality of irrigation water on growth of one year old newly planted 'West Coast Tall' coconut seedling in coastal sandy soil. Irrigation with sea water had detrimental effects, at any growth phase throughout the duration of the experiment, due to primary salt stress, which was responsible for membrane disintegration and disturbance in metabolic process. The dilution of seawater with sweet water reduced the extent of primary stress injury but imposed salt injury causing decrease in uptake of mineral elements, which resulted into poor growth of seedling.

**Coconut based cropping/ farming system:**

Intercropping system of spices in coconut: On the basis of the net economic returns realized, it is recommended to plant nutmeg, cinnamon and clove as intercrops in well spaced coconut garden in the Konkan region of Maharashtra state. Excellent growth and good bearing capacity of cinnamon, nutmeg, black pepper and clove planted in coconut as intercrops proved that these crops can be cultivated on commercial scale in the Konkan region of Maharashtra. After planting spice crops as intercrops in coconut plantation, the average yield of coconut per palm has increased from 25 to 93 per cent at the end of 26th years as compared to the average yield of previous 4 experimental years. Nutmeg (at 22 years age) proved as the best intercrop in coconut plantation. Nutmeg and coconut together gave Rs. 1,23,970 as net returns per hectare, whereas only nutmeg gave Rs. 47,240/ha. Coconut as a monocrop recorded net profit of Rs. 31,349/ha only (based on 2004-09 data).

**Intercropping of fruits and tubers in coconut:** Crops like turmeric, banana, pineapple, amorphophallus and tapioca were recommended as



*Lily as intercrop in coconut*



*Heliconia as intercrop in coconut*

intercrops in coconut plantation.

**Flower crops as intercrops in coconut:** When five flowercrops viz., *Jasminum sambac*, *J. multiflorum*, *Lily* spp., *Heliconia* spp., and *Michelia champaka* were evaluated as intercrops in the coconut garden, the yield of coconut was significantly higher in coconut +



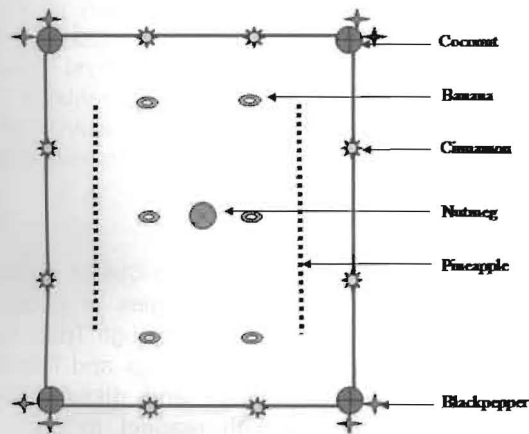
*Medicinal and aromatic plants in coconut garden*

lily followed by coconut + *J. multiflorum* and coconut + *M. champaka* with net returns of Rs. 4,79,975/ ha, Rs. 3,37,501/ha and Rs. 2,18,905/ha respectively, compared to coconut monocrop (Rs. 1,30,705/ ha) (based on 2012-16 data).

**Vegetables as intercrops in coconut:** Cultivation of chilli (variety "Jwala" and "Konkan Kirti") is recommended due to its higher yield and increased net returns as intercrop in coconut orchard. On the basis of economic returns obtained per man days per hectare, dolichos bean could be used as the most remunerative vegetable crop, whereas tomato

cultivation provided better employment opportunities and gave attractive yield. Rainfed vegetables such as ridge gourd, cucumber, snake gourd and bitter gourd are recommended in coconut plantation during rainy season. Four intercrops viz. turmeric, banana, pineapple and tapioca has recommended in coconut plantation in Konkan region of Maharashtra for getting more economic returns.

**Lakhi Baug:** On the basis of mixed cropping experiment on spices and coconut, University has propagated the 'Lakhi Baug' concept, which is a high density multi storied (HDMS) cropping model including spices (nutmeg, cinnamon and black pepper) and annual fruit crops (banana and pineapple). This model has a potential to earn profit of more than Rs. one lakh per acre and hence popularized as Lakhi Baug. By following this system, gross return of Rs. 1,84,010/acre and net return of Rs. 1,25,760/acre was obtained within 10 years of planting in Maharashtra. The model of the system is given below.



**Plant population/ acre**

- Coconut : 70
- Nutmeg : 54
- Banana : 324
- ☆ Cinnamon : 246
- ◆ Blackpepper : 70
- Pineapple : 4320

**Biomass recycling through vermicomposting in HDMSCS:**

The dried biomass obtained from coconut in the form of leaves and spathe and fresh/dry biomass of annual/ biennial intercrops after their harvest and fresh biomass from pruning of perennial intercrops can be used for vermicomposting. It can be done with the help of earth worm, *Eudrilus sp.* and the biomass can be recycled in the system. The vermiwash can also

be collected during the process of vermicomposting and applied to coconut and intercrops. Recycling of biomass minimized the application of inorganic fertilizer and there by reduced the cost of production per acre. In Lakhi Baug model, coconut palms gave maximum recyclable biomass productivity of 2 t per acre which was followed by nutmeg (740 kg), banana (738 kg), pineapple (432 kg), cinnamon (142 kg) and black pepper (14 kg). Hence the total biomass available from one acre of Lakhi Baug was around 4t which produced approximately 2 t of vermicompost.

**Crop Protection**



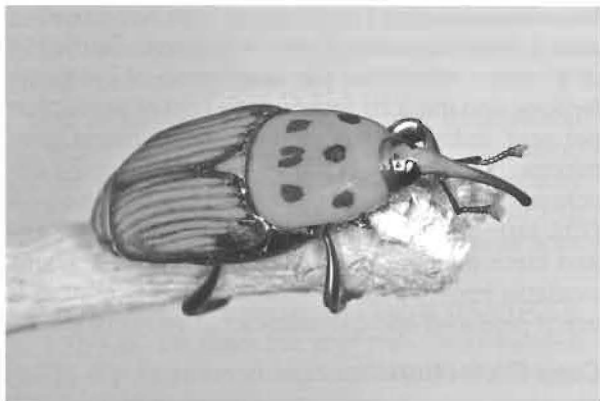
*Bio-control lab for large scale production of parasitoids*



*Release of parasitoids in the field*

Identified and documented occurrence of insect pests in different coconut growing regions of Maharashtra.

**Red Palm Weevil:** The use of PO29 Ferro lure 400 mg per trap at an interval of three months is recommended for the management of coconut red palm weevil. For the monitoring and mass trapping of coconut red palm weevil, economically feasible and eco-friendly attractant pheromones lures (Ferrolure)



developed by CPCRI were field tested. The NPR CPCRI lures developed by CPCRI were also continuously evaluated for two years and were found superior to PCI lures available in the market both in terms of efficacy and longevity.

**Rhinoceros Beetle:** The dead and decaying organic debris in the coconut gardens may be properly disposed off. Removal of beetles with iron or aluminum hooks from the palm crown without causing injury to the growing point particularly during peak period of population build up. Attraction and trapping using false breeding material trap by digging of ten pits per hectare of the size 2 x 2 x 2 feet filled with breeding material is very effective in trapping the pest in coconut gardens. Release of Baculovirus infected adults of rhinoceros beetle @ of 10 to 15 per acre was found to be effective.

**Black headed caterpillar:** The hotspot areas for black headed caterpillar were earmarked in Thane, Kolhapur, Solapur and Pune districts. Parasitoids



*Drenching of Eriophyid smash*



were multiplied and released in the garden for effective management of the pest. A larval parasite *Goniozus nephantidis* should be

released at the rate of 3,500 adult parasitoids per hectare. Need based spraying with 0.05 % Dimethoate in severely affected areas would give satisfactory control of the pest. Root feeding with systemic insecticides Azadirachtin 10000 ppm @ 10 ml in 10 ml of water per palm were effective in controlling black headed caterpillar.

**Eriophyid Mite:** Root feeding of Azadirachtin 50,000 ppm @ 7.5 ml + 7.5 ml water or Azadirachtin 10,000 ppm @ 10 ml + 10 ml water is found effective. Spraying with Azadirachtin 10,000 ppm @ 4 ml per litre of water on fourth bunch onward reduces pest population. Drenching of Eriophyid smash (Azadirachtin 0.03 per cent + micronutrients) at the rate of 250 ml in 20 lit of water per palm at an interval of three months is recommended for the management of coconut eriophyid mite.

### Extension activities

The Regional Coconut Research Station, Bhatye disseminated improved technologies in coconut cultivation to 3440 tribal families through Tribal Sub Plan (TSP) programme in Nandurbar and Palghar district. Supplied seedlings and disseminated improved technologies with respect to coconut cultivation for providing better income and livelihood for tribal people. The station organized trainings and field days, published leaflets, booklets and extension folders and celebrated World Coconut Day every year for awareness creation and skill development of the community.

### Nursery seedling production

Along with the research and extension activities, the station is producing quality coconut seedlings and supplying to the farmers. Seedlings of Pratap, D x T, T x D and Dwarf varieties/hybrids are available from the station.

*For further information, contact : Regional Coconut Research Station (ICAR-AICRP on Palms) Bhatye, Ratnagiri, Maharashtra - 421 612, Phone: 02352-255077, e-mail: aicrpratnagiri@gmail.com, Website: <http://www.aicrppalms.res.in>. ■*