Increasing Production and Productivity in the Existi Coconut Gardens of Lakshadweep Islands

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Introduction

Lakshadweep, the smallest union territory of the Indian Union, is an archipelago consisting of 22 islands and 5 attached islets, of which only ten are inhibited. It is a unidistrict territory with an area of 32 sq. km. These coral islands lie scattered in the Arabian sea between 8 and 12^0 north latitude and 71-74^0 east longitude. They lie about 225-450 km away from the Kerala coast. The climate in the islands is almost similar to the west coast of Kerala. The average annual rain fall is 1600 mm and the temperature varies from 24^0C to 36^0C. The humidity in the islands is as high high as 75 per cent.

Cropping Pattern - Past and Present

Coconut is the main crop in all the islands and it has been grown for centuries. It is believed that the coconut cultivation started in the islands with early settlers. The islanders do not follow any definite pattern for planting the coconut seedlings as far as the spacing is concerned. Due to the rapid subdivisions and fragmentation of holdings, the owners practise very close planting and strikingly plant more seedlings on the boundaries and corners to mark one's field. This has resulted in overcrowding of palms in all the islands. It has been estimated that on an average 400-500 coconut palms of all ages are growing in one hectare of land as against 170-200 normally recommended for optimum yield. This has resulted in a very low nut yield even in the absence of any major diseases. In olden days the seed nut selection was made by judging the larger size of the sprouting eye of the nut. The seed nuts were used to be put near a well in beds and transplanted in the second nursery where they used to remain for two to three years and planting of two to three year old seedlings was the common practice. Probably this was the only way to protect the seedligs from the cows and goats which are left free in all the islands. The island farmers also believed that maximum establishment of seedling was realised from this type of delayed transplanting of seedlings in the field. However there was a delay in flowering of palms by two to three years.

Coconut Production and Productivity

The coconut palm population is around 0.6 million with a production of 30 million nuts annually. The average annual per palm yield of bearing palms in the islands is about 58 nuts. The average per hectare yield of nuts is estimated to be 12,718. This is comparatively low and is attributed to the high density of plants per unit area (Anonymous, 1989 and 2002).

Other Crops of Minor Importance

Next to coconut, banana is cultivated in all the islands in a limited way. The local variety Mysore poovan or palayankodan is the one commonly grown. The other varieties like njalipoovan, robusta and monthan are also grown in some islands. Moringa comes up well in all the islands but the island people were not consuming the same till recently. Bread fruit is grown in isolated pockets and is consumed in all the islands. Papaya is also grown in most of the islands. Sapota is also found to perform well under the i conditions.

Strategies for Increasing Productivity

Since there is no scop expanding the area for crop prod in the Islands, the future str depends on increasing the prod and productivity of unit holdings. formulating the technologi achieving the targets in this reg is necessary to strictly adhere land use planning taking consideration the environm factors, soil fertility problem ground water potential of the Keeping these factors in min following approaches are discus

Collection and conservation of l available coconut germplasms

The gene pool of cocon Lakshadweep is unique in aspects. It has got the val germplasms like Laccadive which has got the maximum oil c (75%) among all other cultivars world. Laccadive Ordinary with 7 content, is profuse bearer and is a parent for producing both DxT an hybrids. Jacob and Kishnamo (1982) had classified the diff coconut cultivars in Lakshadwee highlighted the need to conser declining population of Lacc Micro cultivar.

Under the island conditions v the palms are growing very c different hybrid combination naturally formed as a resu introgression. This has led t production of many non-typical and if this process continues the

of the materials will be lost in the long run. There is also likelihood of loss of the valuable palm population due to natural calamities like cyclone. Hence establishing separate blocks of different germplasms by planting the *inter se* mated progenies, will ensure the purity of the varieties. This will also serve as a nucleus material for the production of quality planting materials for distribution to different islands for gap filling in the existing gardens.

Soil enrichment/production of biofertilizers

The soil in the islands is highly calcareous formed by disintegration of coral debris. It is strongly alkaline, the pH being 7.8-9.1 and it contains 80-90% calcium carbonate. The available nitrogen is very low and also potassium whereas phosphorous is moderate. Organic content is very low and the water and nutrient holding capacity is very poor. Hence without the application of sufficient organic matter, the cultivation of vegetables and other fruit crops becomes very difficult. Moreover, due to the nonavailability of the ground water for irrigation, the application of inorganic fertilizers is very difficult. Further, as the application of inorganic fertilizers will adversely affect the quality of the drinking water, the production of biofertilizers has a significant role in increasing production and productivity in the island ecosystem.

Vermicomposting of coconut wastes, especially the coconut leaves that are available in plenty in the islands is an easy technique that can be exploited for the enrichment of soils in Lakshadweep. Trials conducted at CPCRI have revealed that the coconut leaves could be composted in 75-80 days by *Eudrilus* sp. of earthworm.

Chemical fertilizer substitution by sunnhemp (*Crotalaria juncea*) is another means of enriching the soil. Experiments carried out at this Centre have revealed that 98% nitrogen and 28% each of potassium and phosphorous could be substituted by growing sunhemp in the interspace of coconut. Cultivation of *Gliricidia maculata* as a green manure crop is also another practical method for increasing the fertility status of the soil in the island conditions.

Proper spacing for higher yield in coconut

Experiments conducted at this Centre have also shown that when coconut seedlings were planted at a distance of 7.5 x 7.5 m, the annual average per palm yield was 135 nuts as against 39 in double the density of planting (Muralidharan, 1999). As there is no space available for fresh planting in the islands, the unhealthy/non yielding palms may be removed/ thinned to regulate the number of palms for increasing the yield from the existing gardens.

Production of quality planting materials

Trials conducted at this Centre have further proved that the hybrids produced by crossing the locally available cultivars perform better in yield and early bearing in contrast to the local Laccadive Ordinary as well as the varieties/hybrids brought from outside (Anonymous, 2000). The gap filling wherever possible done with high yielding hybrid seedlings, will also help in increasing the productivity per unit area.

Developing micro irrigation system

In view of the limited fresh water availability in the islands, conventional irrigation system for the cultivation of vegetables and other crops is not a practical proposition. Developing suitable micro irrigation system will help in increasing the production of vegetable and fruit crops.

Rain water harvest

Huge quantity of water is going waste every year during monsoon. Rain water tanks constructed presently are too small to contain the entire run off water from the root. Refinement of the existing rain water harvesting system so as to collect the excess water from each tank to a centrally located common tank, will provide water for irrigation purposes.

Post harvest technology

Coconuts are harvested during the seven months in the non monsoon period from October to April. There is no definite time schedule for harvest as in the case of mainland where the nuts are harvested once in fortyfive days. One of the main reasons attributed for this irregular harvest is the nonavailability of climbers in recent days. During the monsoon season, nuts are not harvested due to the lack of facilities for drying the copra. During the fair season 3-4 harvests are generally made and the nuts are made into copra by sundrying and taken to the mainland and disposed. Installation of small oil extraction units and selling the oil within the islands will enhance income. By installing the copra drier designed by CPCRI, the copra can be dried during the monsoon period and thereby the loss due to the nonharvest of nuts can be avoided.

Introduction of new crops

Testing the suitability/adaptability of high value crops like vanilla in the island conditions is another line of approach. Islands like Madagascar, Comoros, and Reunion are the biggest producers of vanilla in the world. If vanilla is found to perform better in the island ecosystem, it will generate more income and provide employment opportunities to the farm women and the unemployed youths in the artificial pollination of this crop.

Control of Rhinoceros beetle attack

Heavy loss of nuts due to the attack of rhinoceros beetle had been reported from the islands like Andrott and Minicoy. The attack was brought down

from 60% to 10% by the release of baculovirus (Mohan *et al.*, 1989). However the attack began to increase slowly after a period of ten years. This highlights the need for the periodic check and release of the virus to keep the attack under control. Extension of this programme in all the islands will help in reducing the loss of nuts by the beetle attack and increasing the production

Rodent control

Rats are causing heavy damage in the standing crop of coconut in most of the islands. About 25-50% crop loss has been estimated in different islands by rodent attack (Bhat and Sujatha, 1989). Adopting the control measures more effectively and collectively, the production of coconut can be enhanced.

New Cropping System

Trials conducted at Minicoy have demonstrated that the nendran variety of banana performs well under the island conditions and it can be cultivated profitably. Papaya is another fruit crop that can be raised without much efforts. Vegetable crops like chillies, tomato, bitter gourd, snake gourd, cucumber, pumpkin, brinjal and amaranthus have been proved to be suitable for cultivation under Lakshadweep conditions. Intensification of the cultivation of these crops in the interspace of coconut that become available as a result of thinning of unproductive/senile palms, will lead to the increased production and productivity per unit area. Cultivation of tuber crops such as tapioca, sweet potato colocasia and yams will be an added advantage.

Transfer of Technology

The impact of the technologies developed, will be reflected in the field, only if they are transferred to the farmers for implementation. Hence concerted efforts may be made for the transfer of technology in all the islands through *Kisan* mela, interface programme and training at periodic intervals.

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How to Prepare Tebaloi

Tebaloi is a delicious snack which is a specialty food from Sarawak. The origin of the product is from the M area, located at the central region of Sarawak, a Malaysian State on the Island of Borneo. The main ingredien tebaloi are grated coconut meat and sago flour. Banana leaf is also important as it is the main material used in suppo the uncooked mixture. Tebaloi is eaten as snack and is a popular souvenir for tourist visiting Sarawak. A typical te snack is prepared from the following ingredients, Coconut, preferably freshly grated coconut meat, sago flour, sugar and natural colouring agent (e.g. turmeric powder from *Curcuma domestica*) The work begins with prep the coconut meat by selecting quality mature coconut. The nuts are halved, peered and meat finely grated, wei and set aside. About equal proportion of sago flour is weighed and poured into the mixing bowl with some suga and turmeric powder. The ingredients are mixed thoroughly before use.

Fresh banana leaf is washed and cut to convenient sizes along the midrib and a typical piece is about 20 width and with a length of 40 cm. The mixture is then spread thinly on the fresh banana leaf. Traditionally, the s of mixture on banana leaf is then placed on top of the earthen stove with wooden fire below. By carefully adjustir fire, the spread is cooked. The banana leaf is peeled off as soon as the mixture is cooked and the cooked pieces, still soft, are cut to different size and placed on the hot stove until it is finally baked into a golden yellow, delicious snack. With the advent of modern facilities, ovens heated by fossil fuel or electricity are used inste earthen stoves and wood fuel. The finished cookie, once cooled, are stored in airtight containers or sealed in alum foils or plastic films to maintain the freshness and crispness.

The coco