

Annual Report

2011-12



Directorate of Oil Palm Research
(*Indian Council of Agricultural Research*)
Pedavegi - 534 450, West Godavari (Dt.), Andhra Pradesh



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DOPR Annual Report 2011-12

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1. Preface

Oil Palm is the fastest growing component of Indian vegetable oil sector. Remarkably high yield performance of oil palm in the progressive farmers' fields and better net returns from oil palm cultivation are attracting more farmers to this venture. Directorate of Oil Palm Research (DOPR) is a major player for ushering the growth of oil palm sector and in addressing emerging problems in the field. Over the years, DOPR has contributed significantly in developing and popularizing several viable technologies and high yielding cross combinations which have been widely adopted by growers across the Country. If the number of projects funded by External Sources and Scientists invited for solving location-specific problems in different States are any indication, DOPR is truly the leading light for oil palm research in the Country. I am proud and privileged to present the Annual Report for the year 2011-12 of this illustrious Institute.

During the last year, there has been an appreciable progress on all fronts. Four high yielding oil palm gardens yielding more than 40 tonnes FFB were identified in different parts of the Country that could serve as model farms for all the development personnel and farmers in different States. Several high yielding palms with desirable characteristics were identified in different parts of the country through intensive Germplasm Prospection Programme. These palms are to be subsequently utilized in our crop improvement programmes for bringing about significant improvement in the production potentials. Similarly, innovative tools and machineries for harvesting oil palm have been fabricated in collaboration with Central Institute of Agricultural Engineering that needs further assessment and refinement followed by commercialization.

The technical programme of the Institute underwent a major revision during the year for inculcating more inter-disciplinary research in the Institute by clubbing the activities into nine projects. Recommendations of the QRT, RAC as well as the suggestions offered by Director General, ICAR and Deputy Director General (Hort.), ICAR during their visit to the Institute were duly incorporated while revising the technical programme.

I thank all the Staff Members of the Institute from Scientific, Technical, Administrative and Supporting categories for their willing support and cooperation in achieving our targets.

I am grateful to the Research Advisory Committee and Institute Management Committee for their able guidance and valuable suggestions which helped in fixing our priorities. The contribution of Project Monitoring and Evaluation cell is acknowledged for their role in shaping the content and quality of the research output of the Institute. I appreciate and compliment the Editors of the Annual Report for their efforts in bringing out this Report not only in time but also with high quality output.

I am grateful to Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR and Dr. H. P. Singh, Deputy Director General (Hort.), ICAR who have been driving forces behind us and have extended unparalleled leadership and guidance without which our progress would not have been possible.

Special thanks are due to the extensive financial and moral support extended by the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India for strengthening the oil palm research programmes at DOPR.

Efforts taken by the Administration and Accounts sections are appreciated for shouldering the additional responsibility imposed on them due to the initiation of a large number of new research activities with adequate financial support from ICAR and DAC.

Efforts taken by Dr. K. Suresh and Ms. A. Bhanu Sri in bringing this Annual Report not only in time but also with high quality output are gratefully acknowledged.

(S. Arulraj)
Director

16.06.2012
Pedavegi

2. Executive Summary

Oil palm is recognized as one of the highest edible oil yielding crops giving 5-8 tonnes of oil/ha. Oil palm would be able to help India in marching towards attaining vegetable oil security in the years ahead. At present, oil palm is grown in India to an extent of 2.02 lakh ha and yields more than 20 tonnes of fresh fruit bunches per hectare per annum in well maintained plantations.

India has a well established research system consisting of Directorate of Oil Palm Research and six Centres of All India Coordinated Research Project on Palms, with the required Infrastructural facilities. Directorate of Oil Palm Research could identify germplasm with high production potential, hybrids that could give better yields and crop management technologies along with plant health management measures. The Institute is gearing up to enable it to develop appropriate technologies for these challenge areas so as to make oil palm cultivation more profitable and sustainable.

The Institute has a sanctioned staff strength of 82, including Director, 22 scientists, 18 technical, 15 administration and 26 skilled support staff, of which 62 are in position. Total budget allocation for the Institute for 2011-12 was ₹ 950.98 lakhs and the expenditure was ₹ 901.33 lakhs with a revenue generation of ₹ 71.03 lakhs. The Institute has 9 ongoing research projects and 10 externally funded projects.

During the year, the Institute could achieve remarkable progress especially with reference to the identification of high yielding palms and crop management technologies including innovative harvesting tools for oil palm. Major highlights of achievements recorded during the year are presented here:

Genetic Resource Management : Survey of commercial plantations of oil palm was taken up in Kerala, Andhra Pradesh, Goa, Maharashtra and Andaman and Nicobar Islands. In Kerala, 15 palms were identified with dwarf and high yield characters for further screening. One dwarf dura was selected at Thodupuzha seed garden and seed sample collected. In Andhra Pradesh, 60 palms were identified for further evaluation and selection. Seed samples were collected from two dura and three tenera palms. One promising tenera palm was identified from Goa and seeds were collected. Random survey was conducted in the ANIFPDCL plantation, Little Andaman and nine promising and high yielding individual palms representing various sources were collected.

Characterization and evaluation of germplasm for water use efficiency indicated that accessions differed significantly for canopy spread, stalk length, height increment, dwarfness and position of leaflets ensuring maximum exposure to sun light for better photosynthetic efficiency etc.

Fruit form analysis and characterization of old germplasm indicated that a progeny of Indian dwarf palm planted at DOPR, RC, Palode had very low vertical growth and belongs to *dura* fruit form. Minimum descriptor has been developed for twenty selected germplasm materials at DOPR, Research Centre, Palode.

Under Multi location evaluation of African germplasm, four high yielding dura palms have been identified for improvement and seed production. Four dura palms have been identified in African germplasm being evaluated at Pedavegi which had FFB yield of more than 200 kg per palm per year. The selected palms are being used in

crossing programme for developing high yielding dura populations.

Evaluated the selfed progeny of dwarf tenera and 7 palms were shortlisted based on the yield (minimum of 125 kg) and height increment (below 25 cm per annum). The mean height of population was 134 cm during 6th year with an average increment of 22.33 cm per year. Backcrossing programme of inter specific hybrids at Palode resulted in development of crosses like 48 x 66, 48 x 214 and 49 OP. At Pedavegi, eight top ranking inter specific palms viz. 25, 27, 28, 38, 41, 44, 57, 76 were shortlisted.

Photosynthetic rate in African duras at 100 percent moisture level ranged from 11.22 to 16.05 $\mu\text{mol m}^{-2}\text{s}^{-1}$, while it was between 11.23 to 13.98 $\mu\text{mol m}^{-2}\text{s}^{-1}$ at 50 percent moisture level. At both the moisture regimes, the highest photosynthetic rate was observed in Source V - 8. Evaluation of D x P hybrids for drought parameters in nursery indicated that 193CD X 110P hybrid possesses greater Intrinsic and instantaneous water use efficiency and hence could be considered better tolerant to drought compared to the other hybrids. Promising dura palms selected in African germplasm are being utilized in developing D x P hybrids utilizing pisifera identified in T x T block. Of these developed hybrids, planting materials had been supplied to AICRP system for multi-locational evaluation.

Pollen count methodology was standardized. Standardized *in vitro* germination method (using media containing 2.5 % sucrose, 100 ppm Boric acid and 10 % PEG). Standardized the method of viability assessment through MTT method (2,5 diphenyl tetrazolium bromide, a new dye for oil palm). Pollen grains stored at -5°C showed the maximum viability as well as germination percent after 40 days compared to room temperature as well as refrigerated storage. Storage in various organic solvents showed significant difference in viability after 40 days. Out of five solvents tried, diethyl ether retained almost complete viability and germination *in vitro*.

A total of about 1.28 lakhs and 0.75 lakhs oil palm sprouts were supplied from DOPR, Pedavegi and DOPR, RC, Palode seed gardens respectively to different entrepreneurs for the production of planting materials. Plantlet regeneration was obtained from inflorescence tissues. The plant formed good root growth in basal media with IBA (4mg/l) and has been transferred to soil for hardening. Markers were identified for *E. oleifera* and *E. guineensis* which could be used for marker assisted selection of interspecific crosses. RAPD primer (OPP-8) was identified to differentiate *E. oleifera* and *E. guineensis* palms.

Genetic diversity analysis of 23 *E. oleifera* palms available at DOPR, Research Centre, Palode indicated that Eo-04 and Eo-05 were genetically more similar (0.895), along with other three pairs of palms of same value (Eo-07 & Eo-09; Eo-10 & Eo-11; Eo-20 & Eo-21). Eo-22 and Eo-23 formed a separate group. Palm Nos. Eo-16 and Eo-01 showed the least similarity (0.74). Results could be used for *E. oleifera* improvement programme involving the genetic diverse palms.

Production System and Produce Management: Heliconia, red ginger, bush pepper and cocoa could be grown successfully as inter crops in oil palm gardens. Studies on biofertilizers in nursery indicated that combination of bio-fertilizers and chemical fertilizers was better than individual treatments. Maximum seedling height, number of fronds, stem girth and total dry matter were observed with 25% Recommended Dose of Fertilizers (RDF) + Bio-fertilizers. Similarly, higher microbial count has been observed with 25% RDF + Bio-fertilizers.

In source manipulation experiment, number of bunches and bunch weight were more in palms whose fronds were removed from 33rd frond onwards. Palms whose fronds were cut from 9th leaf onwards, recorded the lowest bunch number and bunch weight. In sink manipulation experiment, higher glucose and sucrose were recorded in palms where 50 % removal of bunches was done, while palms whose bunches



were cut completely possessed higher starch and sugar contents. Glucose, sugars and sucrose contents were more in palms where fronds were cut from 33rd frond onwards compared to that of other treatments.

Standardized the detection of stress in oil palm by measuring canopy temperature difference with the help of infrared thermometer. Standardized CCM-200 for easy and indirect estimation of chlorophyll/nitrogen content in oil palm. Also standardized the digital color image with the help of scion image for indirect and faster estimation of foliar nutrients.

A self propelled hydraulic operated machine, back pack mounted and trolley mounted motorized harvesting tools were fabricated for harvesting of oil palm FFB. In addition, designed and developed an elevated platform for harvesting from tall palms. Testing and evaluation are to be undertaken for their assessment and refinement.

Plant Health Management : Pupal parasitoid *Goryhus bunoh* was collected from the pupae of psychids causing parasitism ranging between 16.66 to 73.68%. Heavy parasitism was observed during November and low to very low parasitism was observed during December month. Inundative releases of egg parasitoid *Trichogramma embryophagum* could control the leaf web worm incidence in an endemic garden in Denduluru Mandal, West Godavari dt., Andhra Pradesh.

Studies on life history of leaf webworm were carried out in the laboratory. Adult female moth on an average laid 63 eggs. The eggs hatched in 4-5 days. The larval period was completed in 16-24 days after passing 7 instars. The prepupal and pupal periods lasted for about 1 and 5-6 days respectively. The adults lived for about 6-7 days. The total life cycle from egg to adult stage lasted for about 32-43 days.

Association of natural enemies of leaf web worm and their potential in the field condition

was studied and it was found that larval stage of leaf web worm was parasitized by two parasitoids namely, *Apanteles* sp., a solitary endoparasitoid and *Elasmus brevicornis*, a gregarious endoparasitoid. The pupal stage was attacked by a Chalcid parasitoid (identification awaited).

Diagnostic protocol was standardised with already validated primers for rapid detection of Basal Stem rot pathogen on oil palm. Native *Trichoderma* sp isolates were isolated and tested for their efficacy against basal stem rot pathogen *Ganoderma* sp. Nine pesticides were tested for their compatibility with *Trichoderma* sp using poison plate technique and phorate granules were found to be compatible in all the concentrations tested. Etiology of the bud rot disease could be provisionally confirmed. The bacterial isolate BRI-5 is proved as causal agent of bud rot disease. Further confirmation and identification of the organism through molecular studies are in progress.

Social Sciences : During the year 2011-12, 241 officers and 962 farmers were trained in various training programmes organised by DOPR. Farm Innovators' Day with the theme "Tools and machineries for harvesting oil palm bunches" was celebrated at DOPR on January 6, 2012. On this occasion, tools developed at DOPR were displayed. A technical session was conducted on 'Farmer innovations', wherein a total of 120 personnel comprising of oil palm growers, processors, officers of Andhra Pradesh State Department of Horticulture and Scientists of DOPR participated.

Kisan mela was organised at DOPR on February 15, 2012 in commemoration with Institution Foundation Day. Two oil palm growers, one each from the states of Karnataka and Andhra Pradesh were awarded with "Best Oil Palm Grower" award for achieving highest FFB yield in oil palm. Various issues relating to Oil Palm Development Programme in the country and oil palm Research were discussed by oil palm farmers, processors, officers of State Department of Horticulture and Scientists of DOPR.



Agricultural Education Day was organized on January 24, 2012 at DOPR. About 200 students from six schools attended the programme. Quiz competition on Agriculture was organized. A presentation on 'Opportunities in Agriculture and Agricultural Education' was made to motivate the school students towards agricultural education.

Studies were conducted for prioritization of research needs in oil palm. Farmers perceived the need for research on the following research areas in that order viz., Harvesting, Planting material, Irrigation management, Fertilizer Management, Raising of seedlings in nursery, Pruning of leaves, pest management, Inter/mixed crops, Basin

Management, Planting distance, Disease Management, Soil Management, Weed Management, Land Preparation, Mulching, Green Manuring, Waste utilization, Pollination, Leaf breaking, Leaf Analysis, Economics of Oil Palm Production, Oil Extraction Ratio, Pit Making and Ablation.

Oil Palm Kisan Mobile Message Services (OPKiMMS) were launched by DOPR for transfer of technologies on oil palm cultivation to oil palm growers by using mobile message service.

During the year, two meetings of IMC, RAC, IRC along with one QRT meeting were conducted at DOPR.

