CENTRES OF EXCELLENCE IN TAMIL NADU AGRICULTURAL UNIVERSITY

Project Proposal No.13.20

Project Cost		**Rs. 1454.00 lakhs**
Implementing Organization	**:**	**Tamil Nadu Agricultural University**
Duration	**:**	**Three Years (2015-16 to 2017-18)**
Assistance required for 2015-16	**:**	**1264.60 lakhs**

A centre of excellence refers to a team, a shared facility or an entity that provides leadership, best practices, research, support and/or training in a focused area to the identified audience. A center of excellence may also be aimed at revitalizing stalled initiatives which sometimes but for support of budget could not have a take-off. The establishment of centres of excellence, otherwise known as competency centres or capability centres in different areas within in an organization is very vital to continue and sustain the excellence in the identified areas. Considering the interest and urge of the young scientists of TNAU for doing cutting edge research, Centres of Excellence in different focus areas were created with the support from the Government of Tamil Nadu and these centres are distributed across TNAU.

1. **Centre of Excellence in Molecular Breeding**: Established with the aims of unraveling the genes controlling the traits of agronomic importance and speeding up the process of evolving ideal genotypes in selected crops by exploiting the potential of molecular marker technology in crop breeding.

2. **Centre of Excellence in Dry Farming**: This centre is established for developing/ fine tuning the technologies that are having an edge over the available technologies in terms of economics, ergonomics and eco friendliness suited for uplifting the livelihood of farmers in dryland areas.
3. **Centre of Excellence in Sustaining Soil Health:** Sustainable soil health or quality maintenance through balanced fertilization in combination of organic and inorganic sources along with addressing the complicated problems of soils of Tamil Nadu through basic and applied research forms the aim of this centre.
4. **Centre of Excellence in Innovation:** This centre which is unique in its nature aims to spearhead innovations in the crops like barnyard millet and mango by developing new cultivars and crop management technologies by employing robust genomic and phenomic selections involving molecular tools, models and algorithms.
5. **Centre of Excellence in Oilpalm**: Main focus of this centre is to standardize the technologies meant for profitable cultivation of oilpalm in the state along with making available the quality planting materials.
6. **Farm Women Knowledge Centre**: This centre brings in an amalgamation of varied technologies developed in the University for the betterment of farm women by imparting regular training / demonstrations.

The year-wise budget requirement (in lakh rupees) expected from NADP for the above six centres

Centre of Excellence	2015-16	2016-17	2017-18	2018-19	Total Amount
Molecular Breeding	100.00	50.00	-	-	150.00
Dry farming	136.00	-	-	-	136.00
Soil Health	420.00	-	-	-	420.00
Innovation	530.60	64.25	10.15	-	605.00
Oilpalm Research	3.00	-	65.00	-	68.00
Farm Women Knowledge Centre	75.00	-	-	-	75.00
Total	**1264.60**	**114.25**	**75.15**		**1454.00**

1. CENTRE OF EXCELLENCE IN MOLECULAR BREEDING

1. Rationale

Accelerating the process of crop improvement by identifying novel genes for the traits of agronomic importance, nutritional value and the resistance to biotic and abiotic stresses and introgressing them into elite genotypes of major agricultural and horticultural crops.

2. Background

Agriculture is the mainstay for the majority of the Tamil Nadu population and the state economy remains to be driven by the agrarian development. About 80.0 lakh farmers practice technology impacted agriculture especially the improved crop varieties released from TNAU. In the recent past, TNAU is exploiting the molecular tools in the evolution process of crop varieties and among the molecular tools, molecular marker technology and marker assisted breeding are major tools augmenting the TNAU plant breeders to come with improved varieties in shorter period. In this process of evolving resource use efficient crop cultivars to suit the changing climate and farm operations, in the place of classical plant breeding approaches, precision breeding involving DNA marker based selection remains as the only alternative. These DNA based tools are very efficient to understand the genetic variability present in a specific crop and trace the genes of various traits. Besides, the DNA markers can be well exploited in the crop improvement activities. The establishment of Centre of Excellence in Molecular Breeding with a high throughput genotyping and phenotyping platforms in TNAU will definitely pave ways to continue the excellence exposed by the TNAU plant breeders in evolving new crop varieties for the benefit of Tamil Nadu farmers. Further, the centre will remain as common facility for all the scientists involved in crop improvement activities in conducting their marker analysis, getting trained in using the advanced tools of molecular marker technology and for executing the post doctoral research in the areas of focused research in plant molecular breeding.

3. Project Strategy

1. Centre of excellence in molecular breeding will provide a platform to undertake precision breeding activities for the improvement of the major agricultural and horticultural crops of the state.
2. Genes underlying the character variations associated with drought, salt, submergence, heat tolerance, virus resistance, fungal and bacterial disease resistance in cereals and nutritive values will be mapped using genomic principles.

3. The DNA level variation deciphered at the level of Single Nucleotide Polymorphism (SNP) will be exploited as genetic markers for carrying out selection of the desired genotypes.
4. Breeding populations will be synthesized using global and local donors and selection on the basis of functional markers in the form of SNPs would deliver agronomically and nutritively superior crop cultivars.

4. Project Goals

The overall aim is to establish a coordinated platform for genetic enhancement of crops of interest to farming community of the State.

- Development of high performance crops with improved yield, nutrient use efficiency, nutritional quality and tolerance against biotic and abiotic stresses
- Establishing high throughput phenotyping/genotyping (SSR and SNP marker) platforms enabling breeding new crop cultivars
- Bio-prospecting for novel genes and bio-molecules of agricultural importance
- Developing quality manpower in biotechnology and bioinformatics enabling Tamil Nadu the most preferred destination for Biotech R&D industries in Asia and to provide research platform for post-doctoral researchers to carry-out research on innovative ideas.

5. Project cost (Rupees in Lakhs)

The project will be started with the sanctioned budget of Rupees 225 lakhs including the cost of equipments worth of rupees 150 lakhs. Fluidigm EP1 is the equipment proposed under this project which is a second generation sequencing based SNP genotyping high throughput machine.

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	56.25	6.25	6.25	6.25	75.00
B. Lab Equipments: a) Fluidigm EP1 for SNP genotyping	100.00	-	-		100.00
b) Accessories	-	50.00			50.00
Total	**156.25**	**56.25**	**6.25**	**6.25**	**225.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

6. Expected Outcome

1. Evolution of high yielding crop cultivars in crops like rice, mungbean, bhendi and tomato.
2. Improvement of resource use efficiency (nutrients and water) and nutritional value in crops like rice and tomato.
3. Marker assisted introgression of genes associated with specific pest and disease resistance in major crops
4. Evolution of climate resilient rice varieties tolerant to drought, salt, flooding and high temperature
5. Provision of high end research platform for molecular breeding activities of researchers and training platform for the students.

2. CENTRE OF EXCELLENCE IN DRY FARMING

1. Rationale

Evolving, validating and disseminating appropriate technologies for successful crop production during a dry season, utilizing the residual moisture in the soil from the rainy season usually in a region that receives not less than 500mm annual rainfall.

2. Background

There is an urgent need to intensify research on dry farming in Tamil Nadu since 2.6 million ha of cultivated area in the state is solely depending on monsoon rains. Agricultural productivity in dry lands is exclusively water centric as rain water plays a vital role in a crop cycle. The crux of rainfed agriculture lies with soil and moisture conservation supported by soil health and crop diversification. There is a need to selectively grow less water intensive and highly remunerative crops which alone will ensure better productivity and profitability in dry lands. Considering this, TNAU has come up with the idea of establishing a centre of excellence at the Dryland Agricultural Research Station, Chettinad for evolving, validating and disseminating crop production technologies to the farmers of Tamil Nadu for making dry farming as a profitable venture. The proposed centre will intensify its approach with “Hub and Spokes Model” involving other research Stations viz. Regional Research Station, Aruppukottai, Agricultural Research Station, Kovilpatti, Maize Research Station, Vagarai, National Pulses Research Centre, Vamban and Coastal Saline Research Centre, Ramanathapuram as these centres also concentrate mostly on dryland crops. The major research thrust will be on formulating technologies for i*n situ* rainwater harvesting, soil and moisture conservation, mechanization of dry farming practices, evolving and popularizing drought mitigation strategies, enhancing water and fertilizer use efficiency, developing Integrated Nutrient Management (INM) and Integrated Pest and Disease Management (IPDM) strategies specific to dry farming, documentation and utilization of Indigenous Technical Knowledge (ITK) specific to dry farming and introducing the concept of agro forestry. Besides these research activities, the centre will concentrate on imparting training in dry framing to the extensions officials and farmers.

3. Project Strategy

The Centre of Excellence for Dry Farming will have the following research strategies

1. Developing dry farming technologies for better crop production based on location specific weather advisory service.

2. *In situ* rainwater harvesting and soil and moisture conservation technologies and evolving new drought mitigation strategies and popularization
3. Enhancing water and fertilizer use efficiency in dry land crops
4. Integrated Nutrient Management (INM) and Integrated Pest and Disease Management (IPDM) strategies specific to dry lands
5. Mechanization of dry farming practices wherever and whenever possible
6. Improved post-harvest technologies for reducing the post-harvest losses and value addition
7. Building and maintaining drought tolerant germplasm of dry land crops
8. Multiplication and distribution of quality seeds/planting materials
9. Introducing the concept of rainfed agro forestry
10. Creating awareness about organic farming under rainfed conditions
11. Generating Information Communication Technologies (ICT) for dry farming
12. Capacity building for department personnel/farmers/entrepreneurs by imparting both institutional and on field training
13. Strengthening infrastructure facilities in the research stations to improve both research and training capabilities and building a stronger Inter institutional corridor for experience sharing
14. Documentation and utilization of ITKs pertaining to dry farming

4. Project Goals

- To develop suitable technological strategies for sustainable dry farming systems in the rainfed areas
- To diversify dryland cropping system with less water intensive, high value crops, short life crops
- To formulate special strategies of INM and IPM suited for dry farming
- To develop alternative land uses like arid zone fruit gardens, silvopasture, agro-horticulture and tree farming through IFS mode
- To implement *in situ* rain water harvesting management practices and micro irrigation for dry land crops to enhance productivity through recycling of rain water from farm ponds
- To promote mechanized cultivation under dry farming condition
- To impart skill oriented trainings and capacity building to farmers, officials and rural youths in specialized areas to support high tech dry farming
- To establish inter institutional linkages

- To document and utilize ITKs on dry farming

5. Project cost (Rupees in Lakhs)

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	101.50	51.50	46.50	46.50	246.00
B. Equipments and machineries (a+b)	136.00	-	-		136.00
Total	**237.50**	**51.50**	**46.50**	**46.50**	**382.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

a) List of Equipments

Name of the Equipments	Rupees in lakhs
Soil N analyzer	2.00
UV-Visible Spectrophotometer	3.00
Flame photometer and Penetrometer	3.00
Atomic Absorption Spectrophotometer with cooling system	15.00
TOC analyser with cooling system	15.00
Water potential meter	6.50
Soil and Plant digester	2.00
Soil moisture probe	1.00
Electronic balance with work table	1.00
Mechanical shaker& water bath& work table	1.00
Water distillation unit	1.00
Laminar air flow chamber& pH meter& EC meter	2.00
Leaf area meter/Conveyor belt	5.00
Growth Chamber and accessories	7.00
Automated Rainout shelter and accessories	7.00
Centrifuge and accessories	2.00
Deep freezer/ Refrigerator	1.00
Rhizo structure with weighing balance	2.00
Homogenizer	0.50
Millipore water unit	2.00
SPAD /Chlorophyll content meter	1.50
Auto clave	0.50
Total	**81.00**

b) List of Machineries

Name of machineries and Implements	Rupees in lakhs
Tractor with accessories - 1No	10.00
Water tank	1.00

Plant protection spraying equipments	1.00
LMV / GPV	10.00
Bore well/Electrification/motors	15.00
Mini bus for training purpose	13.00
Generator cum power pack facilities for training hall and research complex	5.00
Total	**55.00**

6. Expected Outcome

- Recommendation of crops and cropping system based on soil, rainfall, length of growing season, *etc.*, which will be beneficial to the farmers to increase crop yield in sustainable manner in reasonable time.

- Efficient utilization of harvested rain water for supplemental micro-irrigation and nutrient use efficiency to enhance crop productivity and livelihood of dryland farmers.

- Effective technology transfer from lab to land for increasing the productivity under dry framing through trainings and on-farm demonstrations.

3. CENTRE OF EXCELLENCE FOR SOIL HEALTH

1. Rationale

Soil health otherwise known as soil quality is the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans. The centre of excellence for soil health in TNAU is established to do basic and applied research towards managing soils of Tamil Nadu to have sustainable crop production to produce food and fibre without affecting the ecosystem.

2. Background

Soil has both inherent and dynamic qualities which are responsible for the performance any crop. Dynamic quality of a soil changes with ways and means how the soil is managed over period of time and space. In other words, management choices affect the amount of soil organic matter, soil structure, soil depth, and water and nutrient holding capacity thus affecting the functionality of the soil. Soils respond differently to management practices because of its inherent qualities and the surrounding landscape. Understanding soil health or quality is very vital for sustainable crop production and it needs right ways and means of assessment and management practices so that the soil functions optimally.

The major causes for low productivity in agriculture is because of non-availability of proper soil health assessment and management practices to establish the status of soil organic matter, soil fertility status, land degradation and water quality resulting in improper fertilization and reclamation practices. Considering the problems associated with soil health assessment and management, the establishment of centre of Excellence for Soil Health at ADAC&RI, Trichy is felt with support of Government of Tamil Nadu. This centre will take studies on nutrient dynamics, identification of soil physical and chemical constraints, crop quality and management of polluted soils (heavy metals and pesticides) to come out with better soil quality assessment and management practices. Research strategies also have to be developed to tackle the effect of climate change phenomena on soil carbon dynamics, fertility and productivity of crops. Thus, concerted research efforts have to be made to tackle the issues of soil health by effective resource management to enhance and sustain the potential productivity of crops. Out of the total geographical area of 13.0 m.ha of the State, 4.69 lakh ha of land has been affected by sodicity/ salinity. The salt affected soils of Tamil Nadu based upon their geographical distribution have been classified into coastal saline soils (1.67 lakh ha) and inland saline or sodic soils (3.02 lakh ha). In arid and semiarid regions, ground water quality is salty and when used for frequent irrigation may enrich the soils with salts in the absence of sufficient natural leaching. The yields of crops are

very low in salt affected soils due to excess salt and other soil related constraints. Though many technologies are available for management / reclamation of salt affected soils, it needs to be refined for location and crop specific situations for enhancing the yield and soil health. Further, soil organic matter status in different Agro-climatic regions are very poor due to neglected/minimal use of FYM or organic manures and further use of high analysis fertilizer lead to decline in soil health and drastic reduction in crop productivity. Hence a holistic way of improving soil health in problematic as well as rainfed dry lands of different regions and evolving suitable reclamation and management strategies based on soil test and crop response is needed.

3. Project strategy

The establishment of Centre of Excellence on Soil Health Management at ADAC&RI, Trichy will have following research strategies for evolving suitable soil health assessment and management practices for the benefit of Tamil Nadu farmers.

1. Identifying the physical, chemical and biological indicators of soil health or quality across the soils of Tamil Nadu.
2. Developing soil health database for assessing the inherent and dynamic properties of soils of Tamil Nadu
3. Interpreting the indicator data to derive status of soil health or quality in different agro-climatic zones of Tamil Nadu.
4. Deriving the soil health or quality index to establish the functionality of soils of Tamil Nadu for better crop production

4. Project goals

- Understanding the health or quality of Tamil Nadu soils to perform functions (both inherent and dynamic) that are essential for crop production and other ecosystem services.
- Identifying soil factors influencing resistance and resilience to establish soils with ecosystem stability and sustainability for better crop production (agro-ecosystem stability and sustainability).
- Establishing improved package of practices based on the soil physical, chemical and biological and other spatial and temporal factors that affect soil health.
- Evolving tools, management practices, resource guides and soil maps to maintain the health or quality of Tamil Nadu soils for better and sustainable crop production.

5. Project cost (Rupees in Lakhs)

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	56.25	6.25	6.25	6.25	75.00
B. Lab Equipments and instruments	420.00	-	-	-	420.00
Total	**476.25**	**6.25**	**6.25**	**6.25**	**495.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

List of lab equipments and instruments

Items	Cost
Microwave Plasma Atomic Emission Spectro photometer (MP-AES)	45.00
Gas Chromatograph coupled with Spectrometer (GC – MS)	50.00
Microwave Digester with Accessories	20.00
Auto distillation unit with block digesters	15.00
Deep Freezer	5.00
High Pressure Liquid chromatography	20.00
Electronic Balance 0.0001 g accuracy	2.00
Ion analyser	10.00
Pressure plate apparatus	15.00
Refrigerated Centrifuge	5.00
Generator 25 KV	5.00
pH Analyser with high Accuracy	2.00
Dissolved oxygen meter	3.75
Automated Glassware washing machine	0.75
CHNS Analyser	45.00
Water purifier system (Milli.Pore)	10.00
Soil CO2 Flux analyser	30.00
Gamma ray Spectrometer (with Germanium deduct)	25.00
Remote sensing and GIS equipments (Spectro radio meter, A0 plotter, GIS work station, GPS, GIS – ARC-GIS , ERDAS)	30.00
Bench top bio-reactor with micro processor based control system	25.00
Microbial Identification system	39.00
Infrared spectrophotometer	17.50
Total	**420.00**

6. Expected out come

Effective monitoring and co-ordination of all the Research and Development activities connected with soil health management studies of different research centres of TNAU can be achieved through establishing Centre of Excellence for Soil Health.

- Low cost, ecofriendly viable green technology through the use of improved and efficient bio-fertilizer inoculums with assured quality and enhanced shelf life of Agro products can be achieved.
- Reassessment and delineation of problem soils and water sources provides an insight on the severity of problem in the state and also gives vision for the policy planners for sustainable development.
- The site specific management technologies will be of highly useful to the end users to rejuvenate their problem soils and water bodies at safer level. Special package on coastal soil and water management technologies evolved will improve the standard of living in coastal regions
- The saline/sodic tolerant tree species and field crops identified will provide additional income to the farmers and in turn improves the standard of their living.
- Arresting of further land degradation and bringing more land under cultivation and afforestation.
- Effective utilization of sewage and industrial wastes for maintenance of soil health without causing damage to environment.
- Capacity building for the technical persons and educate farmers on soil testing, soil constraints and fertility and their management

4. CENTRE OF EXCELLENCE FOR INNOVATIONS

1. Rationale

Growing mobility, intensifying global competition for students and talent, changing demands and new methods of education are some of the factors that are forcing new innovations through cutting edge research in the field of agriculture. The establishment of Centre of Excellence for Innovations at the Agricultural College and Research Institute is one such activity of the Government of Tamil Nadu.

2. Background

Agricultural College and Research Institute (AC & RI), Madurai is one of the constituent colleges of TNAU celebrating its Golden Jubilee for its services to the student and farming community across the nation. Improving research facilities of this institute is very vital considering the expertise of scientists those who are involved in teaching and research. Combining excellence in teaching and research by establishing the centre for doing focused research in crops and crop production technologies suitable for southern districts of Tamil Nadu will form the theme of this centre. This needs establishment of large scale research facilities to use the tools of science with large investments in state of the art equipment and associated infrastructure. The opportunity for establishing the “Centre of Excellence for Innovations” will further boost its services since the centre will work towards 1) providing access to research expertise and equipment, 2) building regional clusters of technological excellence, 3) advancing research and adding value to technology, 4) facilitating partnerships and collaborations, 5) training and mentoring entrepreneurs and 6) establishing incubating startups.

3. Project strategy

The State Government has supported the creation of Centre of Innovation at AC & RI, Madurai to take up advanced research in the focus areas of Southern agro climatic ecosystems of Tamil Nadu.

1. Approach to quality education to all undergraduate and postgraduate students through high end research innovations in the fields of agriculture and horticulture.
2. Establishing approaches to creating value from research, in collaboration with allied enterprise, social and cultural partners.
3. Establishing partnerships for improved education and training to have continuous support to innovations and entrepreneurship

4. Establishing viable innovation system which can remain as the base for sustainability of education, research, innovation and entrepreneurship at national and global level.

4. Project goals

- Focusing on high end research to understand the molecular basis for the accumulation of micronutrients in small millets and exploiting the process of value addition for better human nutrition and healthcare.
- Combing the classical and molecular tools of plant breeding to understand the genetic diversity of small millets and major horticultural crops to speed-up the process of evolving superior genotypes for framers' cultivation.
- Understanding the physiological and phenological basis associated with abiotic stress tolerance to evolve suitable crop management technologies.
- Conducting soil quality research to identify major constraints associated with the cultivation of small millets and major horticultural crops to give suitable nutrient management practices to the farmers
- Understanding the role of Integrated pest and disease management in major agricultural and horticultural crops and formulating novel bio-control agent's and bio-inoculants.
- Surveying the socio-economic factors associated with sustainable and successful crop production in Southern Districts of Tamil Nadu by having inter-institutional collaborations at TNAU level.

5. Project cost (Rupees in Lakhs)

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	104.13	54.03	54.03	52.81	265.00
B. Lab Equipments and instruments	530.60	64.25	10.15	-	605.00
Total	**634.73**	**118.28**	**64.18**	**52.81**	**870.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

List of laboratory equipment and instruments required during 2015-2016

Particulars	Cost (Rupees in Lakhs)
Deep Freezer (4, -4, -20, -80C)	20.00
Centrifuges with different capacities	15.00

Distillation units	20.00
ICE maker	2.00
Work table with chairs (10 Nos.)	5.00
Voltage stabilizer for senstive instruments	2.00
Instrument housing benches	15.00
PCR machine (4 blocks) - 2 Nos	25.00
Autoclaves - 2 units	15.00
Gel documentation unit (1 No)	6.00
Electronic balance (different sensitivity0.1, 0.01, 0.001) - 3 nos	6.00
Hot air oven (2 nos.)	2.00
Generator	20.00
AC units 4 tonne (10 units)	20.00
UV Spectrophotometer	8.00
ELISA Reader	5.00
Lyophilizer	10.00
Vortex mixer/magnetic stirrer	1.00
Pipettes (2, 10, 20, 100, 200, 1ml , 5ml)	2.00
Electronic colony counter	2.00
ELISA reader	8.00
Cryopreservation can (2)	0.50
Fume hood	2.00
N auto analyser	3.00
Flame photometer	2.00
Pressure plate apparatus	7.00
Soil moisture probe	2.00
Nuclear magnetic Resonance	1.00
UV-Vis spectrophototmeter	6.00
Amino acid analyzer	20.00
Muffle furnace & soil digestion units	5.00
Electrophoresis units (3 nos) with power pack	9.00
GC-MS	26.00
Auto analyser	15.00
High resolution digital projector for live imaging with accessories	12.00
Image analyser along with software	7.00
Stereo zoom research microscope with image analyzer software	4.00
Phase contrast research microscope	5.00
Epiflourescence microscope	16.00
Microscope accessories: Digital camera with computer (3) and printer cum copier	12.60
Digital shaker (5 units)	3.00
Insect Collecting Kits	1.00
Insect Storage Cabinets	3.00
Insect rearing cages	2.00

Anaerobic glove chamber	8.00
Incubator aerobic and anaerobic	11.00
Incinerator	2.00
Biosafety cabinet	2.00
Growth chambers (multi stack)	40.00
Steady state porometer	9.00
Portable photosynthetic system	6.00
Leaf area meter	8.00
Infra red thermometer	2.00
Digital moisture meter	0.50
Root sampler	2.00
SPAD meter	2.00
Photosynthesis system	5.00
Textro meter, Retort packaging machine	21.00
Networking including cable and laying	9.00
E-resources (e books and e journals)	10.00
Software packages for statistical, genetics and molecular analysis	20.00
Grand Total	**530.60**

6. Expected outcomes

- Development of small millets with high iron and zinc and synthesis of value added products.
- Development of crop varieties of major agricultural and horticultural crops with resistance to biotic and abiotic stresses.
- Development of nutritive value added products to safeguard the human health
- Development of suitable IPDM practices and new bio-control agents for the control of important pests and diseases.
- Development of soil quality assessment and management practices, integrated nutrient management practice, bio-inoculants and suitable crop management technologies.
- Linking education, research, and entrepreneurship through innovations

5. CENTRE OF EXCELLENCE FOR OILPALM

1. Rationale

Improved genotypes development with enhanced oil yield and for standardizing the agro techniques for cultivating the oil palm in Cauvery Delta Zone, adequate supply of quality seedlings by fixing up seedling standards

2. Background

Palm oil is also known as palm fruit oil. Palm oil is said to be nature's gift to the world. Consumed for more than 5,000 years, its nutritional value, health benefits and value as a natural resource continue to be discovered even today. Palm oil is produced from the fruit of the oil palm tree *Elaeis guineensis*. Oil palm is the only fruit that can give two types of oil *i.e.,* palm fruit oil and palm kernel oil. Since it is a vegetable oil, not an animal or dairy product, and therefore does not contain cholesterol. Virgin palm oil is rich in carotenoids (pro Vitamin A), tocotrienols and tocopherols (Vitamin E) and it contains no trans fatty acids. To meet the increasing demands of edible oil in India, Oil Palm which produces 6 to 8 tonnes of edible oil per hectare per year will help more than any other oilseed crop which have productivity levels below one ton / ha (DOPR website).

A key event in the domestication and breeding of the oil palm was loss of the thick coconut-like shell surrounding the kernel. Modern *E. guineensis* has three fruit forms, dura (thick-shelled), pisifera (shell-less) and tenera (thin-shelled), a hybrid between dura and pisifera. The pisifera palm is usually female-sterile. The tenera palm yields far more oil than dura, and is the basis for commercial palm oil production in all of southeast Asia. Studies undertaken by Rajinder Singh, Nature (2013) (doi:10.1038/nature12356) resulted in identifying the the SHELL gene responsible for the different fruit forms which is because of two independent mutations in the DNA-binding domain of a homologue of the MADS-box gene SEEDSTICK (STK, also known as AGAMOUS-LIKE 11) which controls ovule identity and seed development in Arabidopsis. It was found that the SHELL gene is responsible for the tenera phenotype in both cultivated and wild palms from sub-Saharan Africa and this finding provides a genetic explanation for the single gene hybrid vigour (or heterosis) attributed to SHELL, via heterodimerization. This gene mutation explains the single most important economic trait in oil palm and has implications for the competing interests of global edible oil production, biofuels and rainforest conservation.

Thus oil palm crop needs an intrinsic look for developing suitable ideotypes that would have more amount of palm oil with better qualities. Considering the area that could be made available for the cultivation of oil palm in Cauvery Delta Zone, this Centre has been established to have strengthened research in understanding the

genetics behind the development of ideal types and standardizing agronomic protocols for profitable cultivation.

3. **Project Strategy**

- Identification of high yielding varieties with high oil recovery having compact canopy
- Mass propagation of elite palm materials through rapid protocols
- Studies on nutrient, weed and water management in oil palm in an integrated approach
- Influence of climatic parameters on setting of bunches, oil yield and recovery and retentivity of the quality of oil
- Physico chemical, bio chemical changes in the quality of oil and ways of reducing them
- Elite seedling production and distribution by establishing seedling standards
- Mechanizing the cultivation of oil palm by addressing the key issues in crop husbandry, harvesting and post harvest operations
- Standardizing the use of bio wastes after extraction of oil fitting with ecological intensification
- To adopt strong market and industry-oriented research and development programmes for promoting the cultivation of oil palm

4. **Project Goals**

- Developing climate resilient oil palm hybrids fitting for extracting the best quality palm fruit and palm kernel oil
- Maximum recovery of oil through adoptive procedures and utilization of bio wastes
- Maximizing the shelf life and quality of oil recovered

5. **Project cost (Rupees in Lakhs)**

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	68.60	18.90	21.50	-	109.00
B. Lab Equipments and instruments	3.00	-	65.00	-	68.00
Total	**71.60**	**18.90**	**86.50**	**-**	**177.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

(Please include the equipments to be purchased for Rs. 68 lakhs)

6. **Expected Outcome**

1. Development of oil palm hybrids with astounding oil content
2. Standardized procedures for cultivation of oil palm in Cauvery Delta Zone
3. Utilization of bio wastes into resources

6. FARM WOMEN KNOWLEDGE CENTRE

1. Rationale

Improving the standard of living of farmers through farm women empowerment executed by effective technology delivery, efficient adoption of elite technologies and enhancing the income

2. Background

Based on 2012 data, India is home to the fourth largest agricultural sector in the world. India has an estimated 180 million hectares of farmland with 140 million of which are planted and continuously cultivated. Indian agricultural system faces a lot of hardships owing to the fragmented landholdings, owner absenteeism, non availability of needed inputs at right point of time, labor, mechanizing tools etc. According to 2011 statistics, the average farm in India is about 1.5 acres, minuscule when compared the average of 50 hectares in France and or 178 hectares in United States and 273 hectares in Canada. Improving the efficiency of Indian farming especially requires improvement in farm mechanization which cannot be achieved in all the holdings simultaneously. On the other hand, improving the cultivation practices with increased efficiency of water, nutrients will definitely help in achieving increased productivity of crops. This improvement could be achieved by suitably advising the farm women who takes care of many of the important farm operations.

The Working Group on Agricultural Research and Education constituted by the Planning Commission for the formulation of the Eighth Five Year Plan (1992-97) recommended the establishment of a National Research Centre for Women in Agriculture (NRCWA). Accordingly, the Indian Council of Agricultural Research established the NRCWA in April 1996, at Bhubaneswar later upgraded as Directorate of Research on Women in Agriculture (DRWA) in the year 2008 and renamed as “ICAR-Central Institute for Women in Agriculture” (ICAR-CIWA) in the year 2015. A similar centre at State level is felt optimum to address the issues affecting women and their opportunities in agriculture as agriculture is the subject of state and the requirements, perception differs from state to state.

This centre primarily aims to infuse know how in the minds of farm women on the key technologies which have to be necessarily concentrated in growing the crops. Thus, the cost cutting technologies, improved cultivation methods, drudgery reduction and improving the working ambience, values of post harvest addition and marketing etc. would be passed on. The Women's Empowerment in Agriculture Index (WEAI) is a ground-breaking tool to measure the empowerment, agency and inclusion of women in the agriculture sector. Launched in March 2012 by Oxford Poverty and Human Development Initiative (OPHI), University of Oxford with the United States Agency for International Development (USAID) and the International Food Policy Research Institute (IFPRI), the WEAI tracks women's engagement in agriculture in five areas: production, resources, income, leadership, and time use. Unlike any other tool, it also measures women's empowerment relative to men within their households, providing a more robust understanding of gender dynamics within households and communities. This centre would certainly strive to improve the WEAI.

3. Project strategy

- Identifying the key areas in Agriculture and Horticulture wherein the trainings could be given to the farm women for enriching their knowledge domain
- Facilitating the farm women to venture in the farm operations in a larger scale through linking them with rural banks
- Promoting confidentiality among the trained farm women for setting up retail outlets of the value added food packages

4. Project Goals

- Empowered women farmers with enhanced Women's Empowerment in Agricultural Index (WEAI)
- Self centric sustainable farming of the trained farm women

5. Project cost (Rupees in Lakhs)

Item	2015-16	2016-17	2017-18	2018-19	Total
A. Capital and other expenditures	54.92	5.76	5.66	5.66	72.00
B. Lab Equipments and instruments	75.00	-	-	-	75.00
Total	**129.92**	**5.76**	**5.66**	**5.66**	**147.00**

A: Share from Government of Tamil Nadu and TNAU; B: Share from NADP

(Please include the equipments to be included for Rs. 75 lakhs)

6. Expected outcome

- Sustaining the livelihood of farmers through stable income with able guidance
- Enhancing the Agricultural and Horticultural crop's productivity through adoption of Good Agronomic Practices
- Improvement on the availability of value added food products at village level itself by the trained farm women
- Encouraged participation of farm women in farm operations through sustainable interventions
- Promoting healthier relationship among the farm women engaged in certain field operations by forming groups