

TAMIL NADU AGRICULTURAL UNIVERSITY

PROCEEDINGS

**9th AGRICULTURAL ENGINEERING SCIENTISTS' MEET 2021
(04th May 2021)**

Lead Centre

**Agricultural Engineering College and Research Institute
Coimbatore – 641 003.**

**Directorate of Research
Tamil Nadu Agricultural University
Coimbatore – 641 003.**

9th Agricultural Engineering Scientists Meet

The 9th Agricultural Engineering Scientists Meet was held during May 3-4, 2021 at the Tamil Nadu Agricultural University, Coimbatore, through on-line connecting all scientists across the University College Campuses, Research Stations and KVKs besides main campus. **Dr. K.S. Subramanian**, Director of Research welcomed the gathering and set the stage for the 9th Engineering Scientists Meet. **Dr. N. Kumar**, Vice Chancellor offered opening remarks. He suggested that agricultural engineering plays a pivotal role in agricultural and horticultural production systems that face herculean challenge of acute labour shortage. Complete mechanization and farm automation is order of the day and the Engineers to help in design and delivery of farm implements, machineries for food processing and simple gadgets for soil and plant health monitoring. The NPRC, Vamban may be identified for complete farm automation. Other issues include bird scarers, development of oxygen parks, table top solar dryers, design & fabrication of solar tractors, IR technology for rapid drying and irrigation automation.

The Director of Research flagged off a few researchable issues such as complete mechanization in agricultural and horticultural crops, miniaturized machines to suit Indian Farms, redesigning banana TC planter, combined groundnut harvester and stripper, solar dryers for forages, chillies, coconuts, medicinal plants etc, solar enabled light traps, bird scarers and photovoltaic cells, integrated turmeric processor, coconut and palmyrah neera processing, farm automation using robotics, drones and sensors. The action taken reports on the 8th Scientists Meets were presented by **Dr. B. Sridhar**, Dean, AEC & RI, Coimbatore. During the pre-review, the Deans of the two Agricultural Engineering Colleges and technical directors had reviewed the on-going university research projects (44), action plan projects (9), core projects (7), AICRPs (9) besides externally funded projects (49).

The outcome of the review process was presented by **Dr. A. Surendrakumar**, Prof. & Head, Farm Machinery & Power Engineering, **Dr. P. Subramanian** Prof. & Head, Renewable Energy Engineering, **Dr. P. Rajkumar**, Prof. & Head, Food Process Engineering, **Dr. K. Nagarajan**, Prof. & Head, Soil Water Conservation Engineering. In the closing remarks, the Vice Chancellor said that the design and fabrication of machines can be filed for patents while commercialization besides releasing a book on "**Inventory of Farm Machineries of TNAU**". The Vice chancellor appreciated the Engineering team for bringing out bountiful of innovative technologies in farm mechanization, food processing and renewable energy. The Director of Research concluded the event with a set of points for consideration that include cataloguing of crop specific machineries available for large scale adoption, *bike on palm* technology, documentation on solar drying technologies, demonstration of grading of spherical fruits & coconuts in packhouses and traders points, ground water monitoring using neural networking and vertical mulching for moisture conservation. **Dr. V. Thirupathi**, Dean, AEC & RI, Kumulur, proposed a formal vote of thanks.

The proceedings of the meet are furnished below:

I. Farm Machinery

1. Technologies for OFT
2. Remarks on the ongoing projects
3. Action Plan 2021-2022

II. Renewable Energy Engineering

1. Technologies for OFT
2. Remarks on the ongoing projects
3. Action Plan 2021-2022

III. Food Process Engineering

1. Technologies for OFT
2. Remarks on the ongoing projects
3. Action Plan 2021-2022

IV. Centre for Post Harvest Technology

1. Technologies for adoption
2. Remarks on the ongoing projects
3. Action Plan 2021-2022

V. Soil and Water Conservation Engineering

1. Remarks on the ongoing projects
2. Action Plan 2021-2022

VI. Recommendations on the 9th Agricultural Engineering Scientists' Meet

VII. Contact details of the scientists participated in the 9th Agricultural Engineering Scientists' Meet 2021

I. FARM MACHINERY

1. Technologies for On Farm Trials

a. Picker Combine for field harvested Groundnut

A tractor operated groundnut picker combine harvester was designed and developed for picking up the harvested bunch type groundnut crop from the field and thresh the pods from the dried plants. The groundnut picker combine comprised of main frame, crop pickup header, pre threshing cylinder for separation of soil, crop transferring plates, threshing cylinder, chaff transferring cylinders, oscillating sieve, chaffer, blower, PTO drive mechanism, Chain and Sprockets, pulley and belts, tyres, conveying system and holding bin.

The pickup header picks up the windrowed and dried plants from the ground and transfer to the threshing cylinder. The cylinders were fitted with spring type stripping fingers for conveying and threshing of dried groundnut crop to avoid the damage to the pods. The combing action of the fingers separates the pods from the plants. All the components were mounted on a main frame and covered. The unit is trailed and supported by a pair of wide tyres to support the weight of the combine. A separate hydraulic motor was provided for the action of the reel unit so as to control the reeler separately.



Salient features:

- Power requirement: 55 hp tractor
- The machine can be used for picking and threshing groundnut from the field.
- The field capacity of the machine is 0.093 ha h^{-1}
- The cost of the machine is about Rs. 2.5 lakhs.

Location : ARS, Bhavanisagar and farmers field.

b. Tractor operated planter for tissue culture banana

A tractor operated two row planter was developed to increase the field capacity. It consisted of Chisel type furrow opener, Furrow enlargers, Seedling dispensing units, earthing up assembly and Press wheel. The main frame carries two sub frames in which all the functional components were mounted. The row spacing can be adjusted from 4 to 8 feet by moving the sub frame on the main frame. The seedling metering mechanism consisted of ground wheel, cam and lever and oscillating spoon type valve. Seedling dispensing unit was placed inside at the rear end of the sheet metal wings. The automatic actuation for plant dispensing mechanism was developed to open the valve automatically at fixed plant to plant spacing through ground wheel metering system. The lever which oscillates the valve is lifted by the eccentric cam. The operator seats were provided on the supporting frame to facilitate the easy feeding of the tissue culture banana plant on the planting mechanism.



Salient features:

- The machine can plant the tissue culture banana in two rows at recommended spacing of 1.5 m.
- The machine loosens soil by 300 mm depth and plants at 150 to 200 mm depth which ensures the better establishment plants
- The field capacity of the machine is 2.5 ha day⁻¹.
- The machine resulted in 70 % saving in time and 90 % saving in labour.
- The cost of operation of machine planting is Rs. 2750 ha⁻¹ whereas the conventional planting is about Rs. 18500ha⁻¹(Rs. 6/plant) and resulted in 85% saving in cost
- The same machine can be used for transplanting other similar type of seedling such as Red gram by suitably altering the automatic actuation assembly.
- The cost of the machine is Rs. 90000.

Location: GRS, Theni and Farmers field.

c. Studies on ergonomic interventions in semi-automatic vegetable transplanters

An ergonomically modified two row vegetable transplanter was developed. The unit consisted furrow opener, electronic metering mechanism, soil compactor and seats for the operators. The metering mechanism consisted of a rubber belt on which number of plastic cups for holding and conveying the seedlings from the operator seat till the furrow opener. Since, the seedlings are released nearer to the ground level, the damage of seedling plugs caused by shock will be eliminated and also ensure the vertical planting position in the field.



Salient features:

- The Ergo refined semi Automatic vegetable transplanter can be used for sowing vegetable seedlings like tomato, chillies etc.,
- The row spacing can be adjusted to suit different type of seedlings.
- The field capacity of the machine is 0.12 ha h⁻¹
- The cost of the machine is about Rs. 0.3 lakhs.

Location: ARS, Bhavanisagar and Department of Vegetables, TNAU, Coimbatore.

d. Mini-tractor operated onion (*ALLIUM CEPA VAR. CEPA*) harvester with detopping unit

The onion harvester along with detopping unit was developed for aggregatum onion. The machine consists of Detopping unit for detopping the onion leaves with rotary and digging unit for digging the onion bulbs after detopping and lifting. The lifted and conveyed bulbs from the digging unit were shaken for removing the soil attached to the onions and to



windrow the onion bulbs in furrows between the beds in the direction of travel for easy collecting by Shaker cum conveying unit.

Salient features:

Cost of the machine, Rs.	: 25,000
Theoretical field capacity, ha h ⁻¹	: 0.06
Effective field capacity, ha h ⁻¹	: 0.052
Field efficiency, per cent	: 86.1
Detopping efficiency, per cent	: 74.58
Digging efficiency, per cent	: 94.17
Conveying efficiency, per cent	: 88.7
Percentage of damaged bulbs	: 27
Output capacity, kg h ⁻¹	: 582.92
Fuel consumption, l h ⁻¹	: 2.5

Location: KVK, Sirugamani and farmers field

COMMERCIALIZATION:

Vibration studies of Mini tractor with attachments

Transmission of vibration from the engine, seat operator system and breaking system causes severe health problems to the operator when they are operating the tractors for 8 hrs in a day. The transmission of vibration to the human body has to be minimum because the human body has resonance in the frequency range of 4-8 Hz for human trunk and 4-5 Hz for lumbar vertebra. But the tractor vibration was found to be in the range of 1-7 Hz which may cause discomfort and health issue to the operator. Hence the study of vibration will be helpful to have suitable operator seat system. Whole Body vibration and hand arm vibration studies have been carried out in the mini tractors in the power range of 11 kW to 20 kW Tractors. The results will be useful to the tractor manufacturers to incorporate in their products.



The data pertaining to the vibration of mini tractor with different attachments will be provided to the mini tractor manufacturers after signing MoU as per the University norms through ABD, TNAU.

2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
University Research Projects				
1	AECRI/KUM/FMP/2021/001 Development and evaluation of Mini-Tractor operated onion (<i>Allium cepa</i> var. <i>cepa</i>) harvester with	April 2020 to March 2022	Dr. P.K. Padmanathan Asst. Professor (FM), Department of FM&PE, AEC&RI, Kumulur Dr.V.Alex Albert Assistant Prof. (SST)	Field trial carried out in the student research work may be included and conduct field trials for further

	detopping unit.		KVK, Sirugamani.	research.
2	AECRI / KUM / FMP / 2021 / 002- Development and evaluation of Intercropping seed drill for Groundnut and Black gram	April 2020 – March 2022	Dr.S.S.Sivakumar Professor and Head, DFMPE, AEC&RI, Kumalur Dr.V.Alex Albert Assistant Prof. (SST) KVK, Sirugamani.	Refinement in fabrication may be completed and conduct lab and field trials during the ensuing season.
3.	AECRI/CBE/FMP/2021/001 Development of Improved Portable Power Operated Cono-Weeder.	December 2020 to December 2021	Dr.P.Dhananchezhiyan Assistant Professor, Dept. of FM&PE, AEC&RI, TNAU, CBE.	Expedite the fabrication for arriving prototype.
4.	AECRI/CBE/FMP/2021/002 Modification of raised bed seed drill and combine harvester suitable for mechanical harvesting and standardization of crop geometry for mechanized groundnut cultivation.	February 2021 to March 2022	Dr. A.P.Mohan Kumar, AP, Dept. of FM&PE, TNAU, CBE. Dr.A.Valliammai, Asst. Prof.(SWCE), ARS, Bhavanisagar Dr.R.Jegathambal, Professor (SST)	<ul style="list-style-type: none"> The plant population and yield may be compared with the conventional method of sowing. The digging efficiency of the combine harvesters may be evaluated and damage may be arrived.

AICRP on Farm Implements and Machinery

1.	AICRP / AGE / CBE / FMR / 002 / 17 / 003- Design and Development of Picker Combine for field harvested Groundnut	01.04.2017 to 31.03.2021	Dr.R.Kavitha, Professor Dr.B.Suthakar, Asst. Prof., Dept. of FM&PE, AEC&RI, TNAU, CBE.	Field evaluation has to be conducted during the ensuing season and cost economics may be worked out.
2.	AICRP / AGE / CBE / FMR / 002/2018/02 Development of a tractor operated planter for tissue culture banana	01.04.2018 to 31.03.2021	Dr. B.Suthakar, Asst. Prof. Dr. R.Kavitha, Professor, Dept. of FM&PE, AEC&RI, TNAU, CBE.	Extensive field trials have to be conducted for confirming the cost economics.
3.	AICRP/AGE/CBE/FMR/002/20/001 Evaluation of	01.04.2020 to 31.03.2022	Dr.R.Kavitha, Professor Dr.B.Suthakar,	Lab trials for studying the efficiency of

	autonomous drone spraying system for field /horticultural Crops		Assistant Professor Dr.A.P.Mohan kumar, Assistant Professor, Dept. of FM&PE, AEC&RI, TNAU, CBE.	different nozzles fitted in the drone has to be carried out.
4.	AICRP/AGE/CBE/FMR / 002 / 20/002 Design and Development of small groundnut combine harvester	01.04.2020 to 31.03.2021	Dr. B.Suthakar, Asst. Prof. Dr. R.Kavitha, Professor Dr.R.Thiyagarajan, Asst. Prof., Dept. of FM&PE, AEC&RI, TNAU, CBE.	Expedite the fabrication. Lab and field trials have to be conducted during the ensuing season.
5.	AICRP/AGE/CBE/FMR/ 002 /20/ 003 Design and Development of mini corn cob harvester	01.04.2020 to 31.03.2022	Dr.R.Kavitha, Professor Dr.B.Suthakar, Asst. Professor Dr.P.Dhananchezhyan, Asst. Prof., Dept. of FM&PE, AEC&RI, TNAU, CBE.	Extensive field trials have to be conducted during the ensuing season
6.	AICRP/AGE/CBE/FMR/0 02/20/ 004 Automation of sowing pelleted vegetable seeds in protray	0.1.04.2020 to 31.03.2022	Dr.R.Thiyagarajan, Assistant Professor Dr.B.Suthakar, Assistant Professor Dr.R.Kavitha, Professor, Dept. of FM&PE, AEC&RI, TNAU, CBE.	Trials have to be carried out for arriving the cost economics.
AICRP on Ergonomics and Safety in Agriculture				
1.	AICRP/AGE/CBE/AMC/0 03/17/001 Vibration studies of Mini tractor with attachments	01.04.2017 – 31.03.2022	Dr.A.Surendrakumar, Professor and Head Dr.R.Mythili, Assistant Professor, Dept. of FM&PE, AEC&RI, TNAU, CBE.	Results may be shared with the mini tractor manufacturers after signing MoU.
2.	AICRP/AGE/CBE/AMC/ 003/ 17/002 Studies on ergonomic interventions in semi-automatic vegetable transplanters	01.04.2017 – 31.03.2022	Dr.A.Surendrakumar, Professor and Head Dr.R.Mythili, Asst . Prof., Dept. of FM&PE, AEC&RI, TNAU, CBE.	Results may be shared with the vegetable transplanter manufacturers after signing MoU.
3.	AICRP/AGE/CBE/AMC/ 003 / 19 /001 Studies on ergonomic interventions in Engine operated auger digger to make it riendly	01.04.2019 – 31.03.2022	Dr. R. Mythili, Assistant Professor Dr. A. Surendrakumar, Professor and Head, Dept. of FM&PE, AEC&RI, TNAU, CBE.	Modifications may be carried out and intensive field trials have to be conducted.

3. ACTION PLAN 2021 - 2022

Theme I: Small Farm Mechanization

Action Plan 1: Design and Development of small groundnut combine harvester

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected out come
Design and development of small groundnut combine harvester Performance evaluation of the small groundnut combine harvester Design refinement and field trials	Dr. B. Suthakar Dr. R.Kavitha Dr.R.Thiyagarajan	Fabrication of digging and stripping systems were completed.	Assembly of components Field tests with the prototype groundnut combine harvester Calculation of saving in cost and BC ratio	Prototype mini combine harvester of digging of groundnut plants from the field and strip the pods from the vines suitable for small farms will be developed.

Action Plan 2: Design and Development of mini corn cob harvester

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected out come
Design and development of self propelled corn cob harvester. Performance evaluation of self propelled corn cob harvester Design refinement and field trials	Dr.R.Kavitha Dr.B.Suthakar Dr.P.Dhanan chezhiyan	Fabrication of prototype self propelled corn cob harvester was developed.	Field tests with the prototype self propelled corn cob harvester Calculation of saving in cost and BC ratio	Prototype single row corn cob harvester for snapping the corn cobs and harvesting the maize stalk for fodder suitable for small farms will be developed.

Action Plan 3: Development of Bird scarer

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected out come
<p>To study the different models of bird scarer and to select the suitable mechanism</p> <p>To develop a prototype bird scarer</p> <p>To evaluate the performance of prototype in the field</p>	<p>Dr.A.Surendrakumar Dr.R.Thiyagarajan</p>	<p>Studied different models of bird scarer (developed by Mettupalayam and commercially available) and their working principles</p>	<p>Fabrication of unmanned aerial bird scarer and field evaluation</p>	<p>Bird scarer</p>

Action Plan 4: Development of Tractor Drawn Groundnut cum Blackgram Seeder

Activity	Name of the scientists	2020-21	2021-22	Deliverables / expected out come
<p>To optimize base and intercrop geometry.</p> <p>To evaluate suitable metering mechanisms for groundnut and blackgram.</p> <p>To develop a prototype of groundnut cumblackgram seeder.</p> <p>To evaluate the</p>	<p>Dr. S.S. Sivakumar Professor & Head Department of FM&PE, AEC&RI, Kumalur</p> <p>Dr.V.Alex Albert Assistant Prof. (SST) KVK, Sirugamani.</p>	<p>Study of crop and field parameters and optimize the crop geometry</p> <p>Development of suitable metering mechanisms for groundnut and blackgram (selection of suitable sensor</p>	<p>Development of prototype Groundnut cum Blackgram Seeder</p> <p>Performance evaluation of developed prototype seeder in lab and actual field conditions</p>	<p>Tractor operated Groundnut cum blackgram seeder</p>

performance of prototype in laboratory and actual field Conditions.		devices) Fabrication of components seed planter	viz., Data of yield and crop parameters field efficiency	
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Action Plan 5 : Development of Package of machinery for Sesame

Activity	Name of the scientists	2021-22	Deliverables/ expected out come
Formulation of protocol for mechanization of Sesame Adoption of machinery for sowing and harvesting sesame	Dr.A.P.Mohankumar Dr.A.Surendrakumar Dr.P.Dhananchezhiyan	Adoption of sowing machinery viz., Tractor / Powertiller operated air assisted seed drill for sowing sesame / Tractor operated pneumatic precision planter Adoption of reaper / reaper binder for harvesting	Development of complete mechanization protocol for Sesame

Action Plan 6: Development of Improved Portable Power Operated Cono-Weeder

Activity	Name of the scientists	2021-22	Deliverables/ expected out come
Weight reduction of existing Power operated cono weeder and provision for turning at Head land. Replacing the chain drive and belt drive from the existing power operated cono-weeder by provision of gear box. Providing clutch mechanism for both drive wheel and weeding cone.	Dr.P.Dhananchezhiyan Dr.A.Surendrakumar	Development of improved portable power operated cono weeder Performance evaluation of improved portable power operated cono weeder	Improved portable power operated cono weeder

Theme II: Mechanization of Horticulture crops

Action Plan 7: Automation of sowing of vegetable seeds in protray

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected outcome
Development of automatic needle seeder for sowing of vegetable seeds in protrays	Dr.R.Thiyagarajan Dr. B. Suthakar Dr.R.Kavitha	Design of components Fabrication of mechanical components of automated protray seeder PLC Programming for automation and sequencing of operations	Laboratory tests for sowing of different vegetable seeds. Calculation of saving in cost and BC ratio	Automatic precision seeder for sowing vegetable seeds in protrays will be developed.
Performance evaluation				
Design refinement				

Action Plan 8: Ergonomic studies in Vegetable transplanter

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected outcome
Design modification of tractor operated vegetable seedling transplanter	Dr.A.Surendrakumar Dr.R.Mythili	Ergonomic evaluation of existing vegetable transplanters Refinement of components based on ergonomical evaluation	Field trials Ergonomical evaluation	Ergonomically refined transplanter for transplanting protray grown vegetable seedlings will be developed.
Ergonomic evaluation				

Action Plan 9 : Studies on interventions in self-propelled auger digger suitable to women farmers

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
Design modification of self-propelled auger digger to suitable for women farmers Ergonomic evaluation	Dr.R.Mythili Dr.A.Surendrakumar	Ergonomic evaluation of existing self propelled auger digger Refinement of components based on ergonomical evaluation	Field trials Ergonomical evaluation	Ergonomically refined self propelled auger digger suitable for women farmers will be developed.

Action Plan 10 :Feasibility testing of commercially available coconut/ arecanut climber

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
Study of commercially available coconut/arecanut tree climbers Selection and Procurement Feasibility testing in coconut / arecanut farms	Dr.A.Surendrakumar Dr.R.Kavitha Dr.B.Suthakar	Procured the commercial available tree climber. Modifications based on lab testing and suggestions of the Vice-Chancellor and the Dean(Engg)	Modifications will be intimated to the Manufacturer to incorporate in the coconut climber Demonstration in the University farms	Engine operated coconut/arecanut tree climbers

Action Plan 11 : Development of Mini-Tractor operated onion (*Allium cepa* var. *cepa*) harvester with detopping unit

Activity	Name of the scientist	2020-21	2021-22	Deliverables / expected out come
<p>To investigate the crop parameters and suitable mechanism for harvesting the onions.</p> <p>To develop a prototype onion harvester with detopping unit on the basis of optimized parameters</p> <p>To evaluate the performance of the prototype unit under the actual field conditions.</p>	<p>Dr. P.K. Padmanathan Asst. Professor (FM), Department of FM&PE, AEC&RI, Kumalur</p> <p>Dr.V.Alex Albert Assistant Prof. (SST) KVK, Sirugamani.</p>	<p>Study of crop and field parameters</p> <p>Selection suitable mechanism for detopping and digging of onion</p> <p>Fabrication of components viz., detopper, harvester mechanisms, power transmission systems for mini tractor</p>	<p>Assembling of components and development of prototype unit</p> <p>Performance evaluation of developed prototype onion harvester cum detopper</p>	<p>Mini tractor operated harvester cum detopper for onion</p>

Action Plan 12 : Development of package of machinery for mechanization of Turmeric cultivation

Activity	Name of the scientists	2021-22	2022-23	Deliverables/ expected out come
<p>Development and adoption of tractor operated planter for sowing</p>	<p>Dr.R.Kavitha Dr.A.Surendrakumar Dr.A.P.Mohan kumar</p>	<p>Adoption and Modification of tractor operated planter for turmeric</p>	<p>Modification of root crop harvester for de-topping of plants,</p>	<p>Development of protocol for mechanization of turmeric cultivation</p>

<p>turmeric rhizomes & Protray seedlings</p> <p>Development of harvester cum collector for turmeric</p>		<p>rhizomes</p> <p>Adoption of Vegetable transplanter for protray turmeric seedlings</p> <p>Adoption of weeder cum earthing up</p>	<p>digging and collection of turmeric rhizomes</p>	
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Theme III: UAV in Agriculture

Action Plan 13: Evaluation of spraying characteristics in field crops and horticultural crops

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
<p>Study the machine components of autonomous drone sprayer</p> <p>Evaluation in laboratory condition</p> <p>Performance evaluation in selected field crops</p> <p>Performance evaluation in selected horticultural crops</p>	<p>Dr.R.Kavitha</p> <p>Dr. B. Suthakar</p> <p>Dr.A.P.Mohankumar</p>	<p>Establishment of laboratory for testing of spraying characteristics</p> <p>Evaluation of drone sprayer in lab condition viz. droplet size, spray width, spraying pattern, VMD, NMD etc.,</p> <p>Evaluation of drone sprayer in selected field crops (paddy, groundnut)</p>	<p>Evaluation of drone sprayer in selected horticultural tree crops (mango, sapota)</p> <p>Standardisation of operational parameters viz., height of spray, speed of operation etc., based on crops and diseases.</p>	<p>Autonomous drone spraying will be standardized and spraying characteristics will be studied for different crops.</p>

II. RENEWABLE ENERGY ENGINEERING

1. Technologies for On Farm Trials:

a. Solar parabolic trough concentrator

Solar parabolic trough concentrator consists of 8 parabolic silica glass plates of area 12 m^2 , absorber tube of area 0.244 m^2 coated with black chrome and 1 hp single phase self-priming pump. The concentrated solar radiation is used to heat water which is passed through the central pipe line and steam is generated at about 180°C with 8 kg/cm^2 pressure. The single-axis tracking system is done using GPS and LDR sensors. The steam generation capacity of the system is 4 kg/h. The efficiency of the system is between 55 and 65 %. This unit can be used for pasteurisation of rice straw for mushroom production.



Salient features:

Absorber tube : Line focus - Stainless steel pipe with black chrome

Medium of fluid: Water

Solar tracker: Single axis, GPS module, LDR (Light Dependent Sensor), rotary encoder and drive for capturing Direct Normal Irradiance (DNI).

Thermal control system: Water level, temperature and PLC for managing steam pressure based on the desired set point (limit)

Paddy straw pasteurization SS vessel: 50kg/batch

Pasteurization steam pressure & Temp: 1 kg/cm^2 & $65-70^\circ\text{C}$

Steam generation capacity: 4 kg/h

Maximum Steam pressure and Temperature: 8 kg/cm^2 & 180°C

Aperture area of the reflector: 12 m^2

Cost of the Unit: Rs. 2.5 lakhs

Location: Mushroom Industries in and around Coimbatore

b. Forced combustible cook stove

The forced combustible cookstove of 2 kg/h capacity is made up of mild steel and is fitted with a blower for the supply of air for combustion. By supplying separate primary and secondary air in the combustion chamber, better combustion is ensured. Thermal efficiency of 32.35 % was achieved with air supply in combinations of primary (30 %) and secondary (70 %). The thermal capacity



of the cook stove is 1.82 kW. This can be effectively used for low thermal applications like gruel making for cattle, tea shops, meals preparation in anganwadi etc.

Salient features:

- Fuel consumption rate: 2 kg/h
- Thermal efficiency: 32.35 % (30 % primary & 70 % secondary air supply)
- Thermal capacity: 1.82 kW
- Emission reduction: 62 % lesser CO (1.02 g l⁻¹) & HC (122 g l⁻¹) than conventional cook stoves
- Cost of cook stove with blower & valve fitting : Rs. 3,900/-

Location: Sattakalpur, Coimbatore district and any Anganwadi centre in and around Coimbatore.

c. CIAE 8kW biomass combustor

CIAE 8 kW biomass briquette based combustor was provided with automated fuel feeding and air flow system. The blower is powered by a 12 V, 7 Ah battery. Thermal efficiency of the combustor is 38 % and the fuel consumption rate is 4.5 kg/h. Flame temperature found to vary from 450 to 700 °C with varied air flow rates.. In order to utilize the locally available fuel such as wood chips, agro residues etc., modification was made in the fuel feeding system of the combustor. This can be used for thermal applications in farm households, tea shops, arecanut boiling and other agro-industrial applications.



Salient features:

- Fuel consumption rate: 4.5 kg/h
- Thermal efficiency of the combustor: 38%
- Flame temperature: 450 to 700°C
- Cost: Rs. 12,000/-

Location: FC&RI, Mettupalayam and suitable agro industries in and around Coimbatore.

2. Remarks on the ongoing research projects

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
University Research Projects				
1.	AECRI/CBE/BOE/2018/CP148 Evolution of higher energy producing	January 2019 to Dec. 2020	Dr. P. Subramanian, Prof. & Head (REE)	Results may be informed to the cashewnut processing

	techniques for fuel and chemical generation from cashew nut by-products.			industries for further collaboration.
2.	AECRI/CBE/BOE/2018/CP089 Comparative study of solar tunnel dryer with different cover materials for drying agricultural produce.	November 2018 to October 2020	Dr. P. Vijayakumary, Asst. Prof. (REE) Dr. S. Pugalendhi, Professor (REE)	Results may be communicated to Agricultural Engineering Department
3.	AECRI/CBE/BOE/2020/001 Feasibility Studies on the pre-processing of bamboo for varied Energy Generation.	April 2020 – March 2022	Dr. R. Mythili, Assistant Professor (REE) Dr. S. Karthikeyan, Professor (Microbiology)	Expedite the work as per the objectives.
4.	AECRI/CBE/BOE/2020/002 Exploration of high energy products from bamboo blended with ignocellulosic biomass.	September 2020 to August 2021	Dr. P. Vijayakumary, Asst. Prof. (REE) Dr. M. Sivaprakash, Asst. Prof. (Forestry)	Expedite the work to get the results.
5.	AECRI/KUM/BOE/2020/001 Design and Development of Portable Forced Convective Solar Dryer.	April 2020 to March 2022	Dr.S. Joshua Davidson Associate Professor & Head, Department of Basic Engineering and Applied Sciences, AEC&RI, Kumulur.	Expedite the work as per the objectives
6.	SDPC/AEC/KUM/REE/2020/R011 Promotion of sustainable agriculture for economic empowerment of Malayali Tribes of Pachamalai.	April 2020 to March 2023	Dr.S.A.Ramjani, Asst. Prof. (REE) Dr.S.S.Sivakumar, Prof. &Head (FM&PE) Dr.J.JohnGunasekar, Prof. &Head (REE) Dr.Dhandapani, Asst. Prof. (PBG) Dr.Alex Albert, Asst. Prof. (SST)	Expedite the work as per the objectives.

7.	AECRI/TRY/BIO/2019/001 Development of solar operated bird scarer cum insect trap system.	October 2019 To September 2021	Dr.D.Ramesh, Assoc. Prof. (Bioenergy), Dr.M.Chandrasekaran, Asst. Prof. (Agrl. Ento.)	Expedite the work as per the objectives.
Core Research Project				
1.	AECRI/KUM/BIE/2018/CP035 Development of Fluidized Bed gasifier for Leafy Biomass.	Dec 2018 to Nov 2021	Dr.S.A.Ramjani, Asst. prof. (REE) Dr.J.JohnGunasekar, Prof. &Head (REE) Dr. P.Vijayakumary Asst. Prof. (REE)	Extensively may be used in the experiential learning course for B.Tech students.
Externally Funded Projects				
1.	NASF/AEC/CBE/BEN/2019/R004 Studies on thermal degradation of crop residues for kinetics, bio-polymeric transitions and value-added products.	April 2019 to March 2022	Dr.P.Subramanian, Professor & Head (REE) Dr.K.ChandrakumarAsst. Prof. (Biochem.)	Work may be expedited as per the objectives.
2.	DST/AEC/CBE/BEN/2019/R003 Scientific and technical basis of creation of a complex of energy technology processing of biomass for obtaining substances with new properties and increasing their commercial value.	April 2019 – March 2021	Dr.S.Pugalendhi, Professor (REE) (Up to 28.02.21) Dr.P.Subramanian, Professor & Head(REE) Dr. R. Mythili, Assistant Professor (REE)	The results may be taken and incorporated in the project and recommended to close the project.
3.	CDB/AEC/CBE/REE/2020/R005 Production of Carbon Molecular sieves from	April 2020 – March 2022	Dr. S. Pugalendhi, Professor (upto 28.02.2021) Dr. P. Subramanian, Prof. & Head (REE)	Expedite the work as per the stipulated objective.

	coconut residues / wastes.		Dr. R. Mythili, Asst. Professor (Bioenergy) Er. D. Praveen Kumar, Student SRF	
4.	MPNG/AECRI/CBE/BEN/2019 Program on Energy Conservation to Agricultural officials, students and farmers	April 2019 – March 2022	Dr. S. Pugalendhi, Professor (till 28.02.2021) Dr. P. Subramanian, Professor and Head Dr. R. Mythili, Assistant Professor Dr. P. Vijayakumary, Assistant Professor	Conduct programmes as per the objective.
5.	ICAR-NICRA/CRIDA Strategies for management of rice straw and microbial carbon use efficiency under changing climate.	September 2018 To March 2021	Dr.S.Karthikeyan, Professor (Microbiology) Dr.S. Pugalendhi, Professor (REE) Dr.P.Subramanian, Prof. and Head(REE) Dr.S. Marimuthu, Asst. Prof. (Agronomy)	The microbial consortium developed may be given to other institutes for confirmation.
AICRP Projects				
1.	CMB/EAAI/DRET-BCT/2019/1 Development of Biomethanation system for food processing industry.	April 2019 to March 2021	Dr.P.Subramanian, Professor and Head (REE) (Up to 28.02.2021) Dr.D.Ramesh, Associate Professor (REE) (From 01.03.2021) Dr.S.Karthikeyan, Prof.r (Microbiology)	Technology may be transferred to food processing industry.
2.	CMB/EAAI/DRET-BCT/2019/3 Exploration and optimization of pretreatment processes for efficient biomethanation of lignocellulosic biomass.	December 2019 to March 2022	Dr.P.Subramanian, Professor and Head (REE) (Up to 28.02.2021) Dr.D.Ramesh, Associate Professor (REE) (From 01.03.2021) Dr.S.Karthikeyan, Professor (Microbiology)	Optimize the different pretreatment methods and recommend the best one for adoption.
3.	CMB/EAAI/DRET-BCT/2019/2 Bioaugmentation in an anaerobic	April 2019 To March 2021	Dr.S.Karthikeyan, Professor (Microbiology) Dr.P.Subramanian,	The cultures developed may be test verified at tannery industry,

	reactor for treating community wastewater.		Professor and Head (REE)(Upto 28.02.2021) Dr.D.Ramesh, Associate professor (REE) (From 01.03.2021) Dr.K.Chandrakumar, Asst. Professor (Biochemistry)	Erode.
4.	CMB/EAAI/DRET-BCT/2020/1 Electrochemical bioreactor for enrichment of hydrogenotrophic methanogens for biomethane production.	April 2020 To March 2022	Dr.S.Karthikeyan, Professor (Microbiology) Dr.P.Subramanian, Professor and Head (REE)(Upto 28.02.2021) Dr.D.Ramesh, Associate professor (REE) (From 01.03.2021)	Expedite the design of the reactor and test verify the results.
5.	CMB/EAAI/DRET-TCT/ 2020/1 Design and development of prototype reactor for the continuous production of biochar	April 2020 To March 2022	Dr. S. Pugalendhi, Professor (REE) (up to 28.02.2021) Dr. P. Subramanian, Professor and Head (REE)(from 01.03.2021)	Expedite the work as per the objective for developing a reactor for continuous biochar production.
6.	CMB/EAAI/DRET-TCT/ 2020/2 Development of forced combustible cook stove for industrial application.	April 2020 To March 2021	Dr. S. Pugalendhi, Professor (REE) (up to 28.02.2021) Dr. P. Subramanian, Professor and Head (REE)(from 01.03.2021)	Conduct OFT in selected Anganvadi and other rural applications.
7.	CMB/EAAI/DRET-LBT/2019/1 Process development for catalytic upgradation of bio-oil from agro residues.	April 2019 to March 2021	Dr.S.Sriramajayam, Asst. Prof.(REE), Dr.K.Chandrakumar, Asst.Prof.(Biochem.)	Conduct large scale trial in the developed reactor with selected biomass for confirmation.
8.	AICRP/AGE/CBE/BE N/001/DRET-LBT/2020/1	April 2020 to March 2022	Dr.S.Sriramajayam, Asst. Prof.(REE), Dr.K.Chandrakumar,	Explore the possibility of industrial

	Co-pyrolysis of plastic waste and lignocellulosic biomass for high recovery fuel oil		Asst.Prof.(Biochem.)	collaboration since the results are encouraging.
9.	CMB/EAAI/DRET-LBT/2019/2 <i>Yarrowialipolytica</i> as a tool for production of biofuel and utilization of glycerol in circular economy.	November 2019 to March 2021	Dr.K.Chandrakumar, Asst.Prof.(Biochem.) Dr.S.Sriramajayam, Asst. Prof.(REE) Dr.S.Karthikeyan, Professor (Microbiology)	Results may be communicated to biodiesel production unit for utilisation of glycerol.
10.	CMB/EAAI/DRET-LBT/2020/2 Removal of furfural for maximizing the yield of biofuel production.	April 2020 to March 2022	Dr.K.Chandrakumar, Asst.Prof.(Biochem.) Dr.S.Sriramajayam, Asst. Prof.(REE)	Intensive trials may be carried out to get fruitful results.
11.	CMB/EAAI/DRET-SET/2020/1 Integration and optimization of solar parabolic trough concentrator for paddy-straw pasteurization.	April 2020 to March 2021	Dr.R.Mahendiran, Asso. Professor (REE) Dr.S.Sriramajayam, Asst. Professor (REE)	OFT may be conducted in selected mushroom industries.
12.	CMB/EAAI/DRET-SET/2020/2 Development and evaluation of PVT (Photovoltaic-Thermal) hybrid collector.	April 2020 to March 2022	April 2020 to March 2022	Development of the collector may be expedited.
13.	CMB/EAAI/DRET-SET/2020/3 Development of Solar powered prime mover.	April 2020 to March 2022	April 2020 to March 2022	Expedite the work as per the objectives
14.	CMB/EAAI/EMA/2017/1 Energy auditing in sugarcane cropping system	April 2017 to March 2021	Dr.R.Mahendiran, Assoc. Professor (REE) Dr.P.Subramanian, Professor & Head(REE)	A booklet may be prepared based on the analysed results for the use of stakeholders.

15.	CMB/EAAI/DRES/2 019/1 Installation and evaluation of biogas plant at selected users' site in Tamil Nadu.	April 2019 to March 2021	Dr. P. Vijayakumary, Asst. Prof.(REE)	Periodical observation may be carried out to fulfil scheme objective.
16.	CMB/EAAI/DRES/2 019/2 Multi location trials of 8kW biomass combustor developed by CIAE.	April 2019 to March 2021	Dr. P. VijayakumaryAsst. Prof.(REE)	OFT may be carried out at FC & RI, Mettuplayam
17.	ICAR/CRP- EA/2019/1 Production of carbon molecular sieves from Ligno - cellulosic biomass using chemical vapour deposition.	April 2019 to March 2021	Dr. P. Subramanian, Professor & Head Dr. S. Sriramajayam, Asst. Prof.(REE)	Project may be closed as the same work is being conducted in CDB project
18.	ICAR/CRP- EA/2019/2 Development and optimization of biomass-to-liquid fuel production process through biomass gasification integrated Fischer- Tropsch synthesis	April 2019 to March 2021	Dr. P. Subramanian, Professor and Head Dr. S. Sriramajayam, Asst. Prof.(REE) Er.V.Karuppasamy Vikraman, Student SRF	Expedite the work to complete the project
19.	ICAR-CRP-EA Bac-Algae consortia for Fuel production and Resource recovery from Wastewater.	April 2020 to March 2022	Dr.S. Karthikeyan, Professor (Microbiology) Dr.S. Sriramajayam, Asst. Professor (REE)	Expedite the process as per the objectives

Other Projects

1.	MNRE/AEC/CBE/BEN/20 15/T001 GoI-Biogas Development and Training centre.	April 2020 to March 2021	Dr.P.Subramanian , Prof. Head(REE) Dr.D.Ramesh, Assoc. Prof. (REE) (From 01.03.2021) Dr.R.Mahendiran, Assoc. Prof. (REE)	As per the objectives carry out the programmes
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3. Action Plan for 2021-22

SI. No.	Activity	Name of the Scientists	2021-22	Deliverables/ expected outcome
Action Plan 1: Biochemical Conversion Technology				
1.	Identifying the pretreatment processes for efficient biomethanation of lignocellulosic biomass	Dr.D.Ramesh Dr.S.Karthikeyan Dr.R.Mahendiran Dr.P.Vijayakumary	Optimization of pretreatment processes for selected biomaterials	<ul style="list-style-type: none"> • Efficient pre-treatment technologies for enhancing biogas yield • Reactor for enhanced biomethanation
2.	Development of microbial consortia for enhanced biomethanation through electrochemical process		Process variables optimization and development of electrochemical reactor	
3.	Bac-Algae consortia for fuel production and resource recovery from wastewater		Further confirmatory field trials for nitrogen recovery	
4.	Up-flow Anaerobic Sludge Blanket reactor for tannery wastes		Installation and performance evaluation of UASB reactor	UASB reactor for tannery wastes

SI. No.	Activity	Name of the Scientists	2021-22	Deliverables/ expected outcome
Action Plan 2: Thermochemical Conversion Technology				
1.	Development of prototype continuous biochar unit	Dr.P.Subramanian Dr.S.Sriramajayam Dr.P.Vijayakumary Dr.R.Mythili	Energy recovery from pyrogas	Continuous biochar unit (prototype)
2.	Combustible cookstove industrial process heating application		OFT for low thermal applications	Efficient cook stove for industrial heating applications

3.	Biofuel production from biomass using FT process		Optimization of process parameters for liquid biofuel production	Catalyst for liquid fuel production
4.	Carbon molecular sieves production from coconut wastes		Process optimization for molecular sieve production and its adsorption studies	Carbon molecular sieve production technology
5.	Bamboo based energy production		Pretreatment and blending for better energy recovery	Technology for blending/pre-treatment of bamboo for higher energy recovery

SI. No.	Activity	Name of the Scientists	2021-22	Deliverables/ expected outcome
Action Plan 3: Liquid Biofuel Technology				
1.	Production and upgradation of bio-oil from agro-residues	Dr.P.Subramanian Dr.S.Sriramajayam Dr.S.Chandrakumar	Kinetic studies of bio-oil feedstocks Process optimization for higher bio-oil yield	Technology for liquid biofuel from agro-residues/plastic wastes
2.	Co-pyrolysis of plastic waste and lignocellulosic biomass		Optimization of reaction conditions for fuel oil yield	biomass mixture
3.	Removal of furfural for maximizing the yield of biofuel production		Pretreatment of biomass by acid and steam explosion technique,	Furfural removal technique better pretreatment
4.	Downstreaming of bio-oil through hydrodeoxygenation		Development of hydrodeoxygenation system for bio-oil downstreaming	Technology for quality bio-oil derivation
5.	Green Processing of Lignocellulosic Biomass in Deep		Recovery of Lignin and Sugars From	Low cost and ecofriendly pre-

	Eutectic Solvents		Biomass	treatment of biomass using DES
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SI. No.	Activity	Name of the Scientists	2021-22	Deliverables/ expected outcome
Action Plan 4. Exploring Solar Energy for Agriculture, Agro-based and allied industries				
1.	Solar parabolic trough concentrator for paddy straw pasteurization	Dr.J.John Gunasekar Dr.S.Joshua Davidson Dr.D.Ramesh Dr.A.Ramjani Dr.R.Mahendiran	Integration and optimization of solar PTC based steam generation for pasteurization	Technology for paddy straw pasteurization using solar concentrator
2.	Development of photovoltaic-thermal (PVT) hybrid collector		Development and testing of PVT hybrid collector	Photovoltaic thermal hybrid collector for heat and electricity generation
3.	Development of walk-behind solar powered rotary weeder		Fabrication and evaluation of solar powered rotary weeder	Walk-behind solar powered rotary weeder
4.	Design and development of portable forced convective solar dryer		Fabrication and performance evaluation of forced convective solar dryer	Portable forced convective solar dryer
5.	Development of solar operated bird scarer cum insect trap system		Fabrication and testing of solar operated bird scarer cum insect trap	Solar operated bird scarer cum insect trap

III. FOOD PROCESS ENGINEERING

1. Technology for On Farm Trials:

a. Size grader for spherical fruits

The size based grader consists of a feed hopper, conveying belt, grading assemble and five outlets. The belt width of 100 mm with the length of 4620 mm and thickness 3 mm was used to convey each fruit into the grading aperture. The belt was mounted on a tapered stainless steel plate fixed on the main frame. The belt was made up of PVC material. The inclination of the tapered belt conveyor can be adjustable from 0° to 25°. This inclination changes can be measured using protractor which was fixed to it. Fruits and vegetables to be graded are brought into contact with belt and a grading board through gravitational and tangential force. The graded fruits / vegetables are collected through five different outlets. This size based grading helps the traders/processors to get more income through grading alone.



Salient features:

- The spherical fruits can be graded into five different sizes on both sides of the grader.
- The gap between conveyor belt and grading roller assembly can be adjusted based on the required size of the spherical fruits including coconuts.
- Cost of grading unit is Rs. 50000/-.
- Operational cost is Rs. 1/ kg

Location: Coconut trading/ processing units at Coimbatore / Pollachi

b. Hermetic storage bin for dehulled millets

A preliminary study on hermetic storage was carried out with a bin capacity of 200 kg in that bin the dehulled little millet was stored for 4 months without any quality or nutritional loss. Based on these studies, a hermetic storage bin for a capacity of 1000 kg was designed. The bin is made up of food grade stainless steel SS. It is designed in such a way that the components can be dismantled and assembled for ease of transport and cleaning before loading fresh produce. Provisions were made to monitor temperature and relative humidity at definite points in the bin and also to analyse the changes in the gas concentration over a period of storage.



Salient features:

- De-hulled millet can be stored in the hermetic storage for a storage period of 4 months with negligible changes in nutritional quality.
- Mortality rate of insects is 95% which is an alternative to chemical methods to control insects.
- Hermetic storage system could be scaled up which might effectively store de-hulled millets without addition of any chemicals.
- Cost of the unit : Rs. 2.50 lakhs

Location: RRS, Paiyur and COE for millets at Athyanthal**c. Aggregatum onion peeler**

The onion peeling machine consists of main frame, feed hopper, Conveyor assembly, peeling assembly and blower. The peeling assembly consists of Mild steel pipe of 4inch diameter, inside this pipe a shaft with screw assembly was made with the help of SS pipe and round nylon rope wire, Polyethylene and Silicone rope of 3.5 mm thickness, for the purpose of peeling. A blower assembly is also attached at the outlet point of the peeler to suck the skin of the aggregatum onion.

**Salient features:**

- Round nylon rope wire of 3.5 mm thickness is effective for peeling onion
- A shaft speed of 1450 rpm recorded maximum peeling efficiency with minimum damage.
- Cost of the aggregatum onion peeler is Rs. 20,000/-.
- Operational cost is Rs. 1.10/ kg.

Location: Farmers field at Perambalur and Trichy districts**d. Palmyrah Fiber Extraction Machine**

The Palmyrah fiber extraction machine consists of Combing roller plate, Combing teeth attached with MS shaft, Fibre crushing roller, Conveyor roller, Fibre holding clips and Combing roller with 12 pattern. The Chain conveyor of chain sprocket with holding clamps which is used to hold the leaf base tight. The leaf base first enters in between two adjustable crushing



rollers of 152 mm diameter where the excess moisture content of the leaf base is removed and the fibrous and the non-fibrous substances are loosened to facilitate de-fibering. The clamp holding the leaf base moves to the combing section. There are two combing drums with 12 flat shaft each on which 17 needles of 4 mm diameter. These drums rotate in both clockwise and anti-clockwise direction and they are connected with hydraulic drum to facilitate up and down movement. The combing teeth remove off the non-fibrous pith from the leaf base. The extracted palmyrah fiber is obtained at the end by loosening the holding clamp.

Salient features:

- The machine can help the unemployed youths to improve the standard of living.
- Extraction of fiber from palmyrah leaf base can be made easy.
- Fiber can be used as a raw material for development of eco friendly packaging material.
- Cost of the unit is Rs. 3,00,000/-

Location: AC&RI, Kilikulam

e. Annatto seed decorticator cum cleaner

The food colour annatto is obtained from the outer layer of the seeds of the tropical tree *Bixaorellana*L. The principle pigment in annatto, bixin, is a carotenoid, which is contained in high concentration in the annatto seed aril. The pod covered with fleshy spines is usually divided into two valves containing between ten to fifty small seeds inside. The traditional method of obtaining the seed is to beat the dried pods with a stick on the ground or in a bag. Extraneous matter is removed by sieving and winnowing but leads to abrasion and loss of the valuable seed coat which contains the pigment. The power operated seed decorticator cum cleaner was developed for separation of annatto (*Bixaorellana* L.) seeds from freshly harvested pods to reduce the human drudgery and to reduce the loss of seed coat. There are three shafts - one for the beater (for beating the pods), one for blower (for blowing the outer shell of the pods) and for cleaner (sieving mechanism for cleaning the seeds), run by a single three phase motor by means of coupled pulleys and V belt drives.



Salient features:

- Total time for separation of seed is 3 min / kg.
- Separation efficiency of seed from pod is 96 %.
- Seed cleaning efficiency is 84 %.

- The biocolour (Bixin) extracted from the anatto seeds can be used as a natural colorant.
- Cost of the unit is Rs. 60,000/-

Location: FC&RI, Mettupalayam

2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
University Research projects				
1.	AECRI/CBE/FAP/FRU/2020/001 Design and Development of Colour sorter cum grader for spherical fruits	September 2020 to August 2022	Dr. P. Rajkumar, Professor and Head (FPE) Dr.I.Geethalakshmi, Asst. Professor (Horti)	Further on-farm trials may be conducted.
2.	AEC&RI/CBE/FAP/2020/001- Development of Annatto seed separator cum cleaner machine.	September 2020 - August 2022	Dr. P. Sudha Assistant Professor (Food Process Engg.) Dr. K. Kumaran Professor (Forestry)	Since the prototype of the thresher has been completed and recommended for trials at FC & RI, Mettupalayam.
3.	AEC&RI/CBE/FAP/VVEG/2020/001- Development of techniques for extending Shelf life of Moringa flower	September 2020 to August 2022	Dr.G.Amuthaselvi Assistant Professor (Food Process Engineering) Dr.D.Amirtham Assistant Professor (Bio Chemistry) Dr.I.Geethalakshmi Assistant Professor (Horticulture)	As per the objectives expedite the work
4.	AEC&RI/CBE/FAP/2021/001: Development of a prototype radiofrequency dryer for non-chemical disinfestation of dried turmeric rhizomes	January 2021 to December 2022	Dr. R. Arulmari Asst. Prof (FPE) Dr. A. Arulprakash Asst Prof. (Ent.)	Instrumentation part has to be strengthened at Department level
5.	AECRI/CBE/FAP/2021/002 - Controlling aflatoxin in groundnut through cold plasma	January 2021 to December 2022	Dr. S. Ganapathy, Professor	Expedite the work as per the objectives
6.	AECRI/KUM/FAP/VEG/2020/001- Studies on	August 2020 -	Dr. T. Pandiarajan Professor and Head	Thermocouple may be installed

	drying of Ivy gourd (<i>Coccinia grandis</i>) under Hot air assisted Infrared drying condition	May 2022	Department of P&FE, Kumulur.	to monitor the temperature. The drying unit may be fabricated using transparent material
7.	AECRI/KUM/FAP/VEG/2020/002- Design and Development of an Aggregatum Onion Peeler	July 2020 to June 2022	Dr. S. Parveen Assistant Professor	Effective peeling of aggregatum onion without any pretreatment should be done in the mechanical peeler
Externally Funded Projects				
1.	GoI/MHRD/SPARC-Project/2019- Development of novel methods for aflatoxin mitigation and management practices for value addition in chilies in India.	2019-2022	Dr. S. Ganapathy Professor (FPE) Dr. Kumar Mallikarjunan Professor and International PI Food Science and Nutrition Dept., University of Minnesota, USA	Efforts may be initiated to explore the possibilities of utilizing the cold plasma technology available at CPHT.
2.	TARE/AEC/CBE/FAP/2019/R004 - Development of an ergonomically designed Palmyrah (<i>Borassus flabellifer</i>) fiber extraction machine and characterization of palmyrah palm fiber reinforced epoxy biocomposites product	December 2018 to December 2021	Dr.I.P. Sudagar, Asst. Professor	The machine has to be tested intensively
AICRP on Postharvest Engineering and Technology				
1.	AICRP/PH / CO/2019/001- Ultrasound assisted enzymatic aqueous extract of turmeric leaf essential oil	April 2019 to March 2022	Dr. K. Gurusamy (From 02.11.2020) Assistant Professor (Biochemistry) Dr. R. Arulmari Assistant Professor (FPE) Dr. D. Amirtham (Up to 31.10.2020) Asst. Prof.	The technology may be standardized as per the objectives.

			(Biochem)	
2.	AICRP/PH/CO/2020/00 1- Enzyme assisted extraction and characterisation of dietary fiber from coconut residue meal.	April 2019 to March 2022	Dr.K. Gurusamy (From 02.11.2020) Assistant Professor (Biochemistry) Dr.I. Geethalakshmi, Assistant Professor (Horticulture) Dr. D. Amirtham (Upto 30.10.2020) Asst. Prof. (Biochem)	Expedite the work as per the objectives
3.	AICRP/PH/CO/2020/00 2 - Development of On-farm Hermetic Storage System for Dehulled Millets	March 2020 to December 2022	Dr.M.Balakrishnan, Asso. Prof. Dr.S.Ganapathy, Professor Dr.K.Gurusamy, Asst. Prof. (Biochemistry)	On-farm trials on storage of dehulled millets may be conducted
4.	AICRP/PH/CO/2020/03 - Effect of radio frequency assisted drying on qualities of high valued medicinal and aromatic plants	April 2020- March 2022	Dr.I.Geethalakshmi Assistant Professor (Hort.) Dr.R.Arulmari Assistant Professor (FPE)	Expedite the technical work as per the objectives. Instrumentation part has to be strengthened.
5.	AICRP/PH/CO/2020/04 - Characterization sugarcane fibres reinforced epoxy bio composite product for rigid packaging	April 2020 to March 2022	Dr. I. P. Sudagar Asst. Professor Dr. S. Ganapathy, Professor	Confirmation trials may be conducted with respect to rigid packaging.
6.	AICRP/PH/CO/2020/Activity 01 - Design and development of a dehumidified dryer for drying sticky tamarind fruits	April 2020 to March 2022	Dr.P.Rajkumar, Research Engineer Dr.S.Ganapathy, Asst. Research Engineer Dr.I.Geethalakshmi, Asst. Horticulturist	Trials have to be carried out with the developed dehumidified dryer as per the design

3. ACTION PLAN 2021–2022

Theme I: Improved Post Harvest Handling of Fruits and Vegetables

Action Plan 1: Development and Evaluation of a sensor based size and colour grading sorting unit for spherical fruits

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected out
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				come
Engineering and physiological properties of selected spherical fruits, vegetables and coconut.	Dr.P.Rajkumar Dr.I.Geethalakshmi Dr.J.Deepa	Selection of size grading parameters	Sensor based colour sorting unit	A prototype size based grader has been developed for grading spherical fruits. Development of Sensor based colour sorting unit is in progress.
Development of colour sensor for sorting fruits, vegetables and coconut		Preparing of drawing for the design of size grader	Assembly of sensor based on size based unit as a single unit	
Performance evaluation of the developed colour sorter cum grader unit.		Development of a size based grading mechanism for grading based on sphericity	Experimental operation and evaluation of the unit for its cost effectiveness	

Action Plan 2: Design and development of a dehumidified dryer for drying sticky tamarind fruits				
Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
Study the physical properties of tamarind fruits	Dr.P.Rajkumar Dr.S.Ganapathy Dr.I.Geethalakshmi	Optimizing the parameters for the design of dehumidified dryer	Development of the dehumidified dryer	A dehumidified dryer is being developed for drying tamarind to increase its brittleness for effective deseeding. Also, the dehumidified dryer reduces the stickiness of tamarind.
Development of a dehumidified dryer for drying sticky tamarind fruits		Design of components and preparation of drawing for the development of dryer	Experimental trial for the optimum drying condition for deseeding	
Evaluation of the dryer		Development of the dryer		

for its suitability for deseeding of the dried tamarind fruits		components		
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Action Plan 3: Design and Development of an Aggregatum Onion Peeler

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected out come
Study the Engineering properties of aggregatum onion	Dr. S. Parveen Assistant Professor (F&APE)	Optimizing the parameters for the design of aggregatum onion peeler	Experimental trial for the optimum condition for peeling	An aggregatum onion peeler is being developed. Performance evaluation of developed aggregatum onion peeler is in progress.
Design and Development of an aggregatum onion peeler		Design of components and preparation of drawing for development of onion peeler	Performance evaluation of developed aggregatum onion peeler	
Performance evaluation of developed aggregatum onion peeler		Development of the aggregatum onion peeler	Cost economics of developed aggregatum onion peeler	

Action Plan 4: Development of techniques for extending Shelf life of Moringa flower

Activity	Name of the scientists	2021-22	2022-2023	Deliverables/ expected out come
Study the respiration rate of moringa flower at different storage	Dr.G.Amuthaselvi Assistant Professor (FPE) Dr.I.Geethalakshmi Assistant Professor (Horticulture)	Respiration Studies of Moringa flower were completed.	Performance evaluation of developed modified atmospheric storage system for	Technology for preservation of fresh and dried moringa flowers using MAP system and drying

temperature			moringa flower	technique will be developed.
Development of modified atmospheric storage system for moringa flower		Experimental trials for development of modified atmospheric storage system for moringa flower	Performance evaluation of optimized drying condition for moringa flowers	
Drying studies for moringa flowers using sun, solar and Fluidized bed drier		Drying studies of Moringa flower by sun, solar and fluidized bed drier.	Cost economics of developed modified atmospheric storage system and drying method	

Theme II: Novel Processing Technologies

Action Plan 5: Development of novel methods for aflatoxin mitigation and management practices for value addition in chillies

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
Develop methods of rapid detection and measurement of aflatoxins in red chili	Dr. S. Ganapathy Professor (FPE) Dr. Kumar Mallikarjunan Professor and International PI Food Science and Nutrition Department University of Minnesota, USA	Development of rapid detection and measurement of aflatoxins in red chili	Rapid FT-NIR method was developed for aflatoxin quantification in red chili.	Technology for mitigation of aflatoxin in red chilli and management practices for value addition in chillies are being developed.
Explore the use of atmospheric cold plasma technology for the detoxification of chili.		Effect of dielectric barrier discharge (DBD) cold plasma on chilli powder was studied.	Cold plasma treatment with argon gas had a significant effect on the aflatoxin content and the quality parameters of chilli powder.	
Assess the current prevalence of aflatoxin in local markets.		Quantification of aflatoxins using the ELISA test.	Chilli samples were collected at different stages of the value chain and	

			quantified using the ELISA test.	
Train stakeholders on GAP and GMP practices related to the postharvest technologies of chili value chain.		Development of GAP and GMP practices related to the postharvest technologies of chili value chain.	GAP and GMP practices related to the postharvest technologies of chili value chain was developed.	

Action Plan 6: Controlling aflatoxin in groundnut through cold plasma				
Activity	Name of the scientists	2021-22	2022-23	Deliverables/ expected outcome
Controlling the incidence of aflatoxin in groundnut during postharvest handling by means of imposing cold plasma treatment.	Dr. S. Ganapathy Professor (FPE)	A cold plasma set up working based on dielectric breakdown was examined	Optimization of effect of cold plasma set up working based on dielectric breakdown on the aflatoxin content.	Technology for mitigation of aflatoxin in groundnut will be developed.
Evaluate the effect of cold plasma on the level of occurrence of aflatoxins in groundnut		Preliminary observations of cold plasma generation was done.	Performance evaluation of effect of cold plasma set up working based on dielectric breakdown on the aflatoxin content.	
Suggest improved management practice for postharvest handling of groundnut.		Development of improved management practice for postharvest handling of groundnut.	Recommend the improved management practice for postharvest handling of groundnut.	

Action Plan 7: Development of hermetic storage system for dehulled millets

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected out come
Design and development of hermetic storage system for dehulled millets	Dr.M.Balakrishnan	Selection of design parameters	Performance evaluation of the storage system	A hermetic storage with a capacity of 1000 kg has been developed with SS material. The storage trial need to be carried out for optimizing the conditions
Optimization of grain parameters and storage conditions		Preparation of drawings	Optimization of gas concentration	
Evaluation of storage system and standardization of optimal atmosphere		Fabrication of hermetic storage bin	Study the mortality rate of insects (<i>Tribolium castaneum</i>) during storage	
Study the nutritional and bio chemical quality changes during the storage of dehulled millets		Analyse the nutritional and bio chemical quality changes during storage		

Action Plan 8: Studies on drying of Ivy gourd (*Coccinia grandis*) under Hot air assisted Infrared drying condition

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected out come
Design and development of a hot air assisted infrared dryer	Dr. T. Pandiarajan Prof. and Head Dr. S. Geetha Asst. Prof. (FSN)	Selection of design parameters of a hot air assisted infrared dryer	Development of hot air assisted infrared dryer	A hot air assisted infrared dryer has been developed. The drying trials need to be carried out

				for optimizing the conditions.
Optimization of processing parameters like IR Power level, air flow and temperature on drying characteristics of Ivy gourd		Optimization of processing parameters like IR Power level, air flow and temperature on drying characteristics of Ivy gourd	Performance evaluation of the developed hot air assisted infrared dryer	
Compare the quality of dried product of combination drying and those carried out individually.		Fabrication of hot air assisted infrared dryer	Analyse the nutritional and biochemical quality changes during drying	

Action Plan 9: Effect of radio frequency assisted drying on qualities of high valued medicinal and aromatic plants

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
Optimization of the radio frequency drying conditions for high valued commercial medicinal and aromatic herbs.	Dr.I.Geethalakshmi Assistant Professor (Hort.) Dr.R.Arulmari Assistant Professor (FPE)	Optimization of the radio frequency drying conditions for high valued commercial medicinal plants	Analysis of the quality parameters of the dried medicinal plants.	Technology for preservation of high valued commercial medicinal and aromatic herbs using RF drying technique are being developed.
Analysis of the quality parameters of the dried herbs.		Optimization of the radio frequency drying conditions for high valued commercial aromatic herbs.	Analysis of the quality parameters of the dried aromatic herbs.	

Action Plan 10: Development of a prototype radiofrequency dryer for non-chemical disinfestation of dried turmeric rhizomes

Activity	Name of the scientists	2021-22	2022-23	Deliverables /expected out come
Study of thermotolerance and dielectric properties of selected insects and turmeric rhizomes.	Dr. R. Arulmari Asst. Prof. (FPE) Dr. A. Arulprakash Asst. Prof. (Agrl. Ent.)	Study of thermotolerance of selected insects.	Development of radiofrequency applicator for uniform disinfestation of the dried turmeric rhizomes.	Technology for non-chemical disinfestation of dried turmeric rhizomes will be developed.
Design and development of prototype radiofrequency applicator for uniform disinfestation of the dried turmeric rhizomes.		Study of dielectric properties of selected insects and turmeric rhizomes.	Evaluation of impact of non-chemical Radio Frequency treatment on disinfestations of the insects.	
Evaluation of impact of non-chemical Radio Frequency treatment on disinfestations of the insects.		Optimization of radiofrequency disinfestation of the dried turmeric rhizomes.	Analysis of quality characteristics of non-chemical Frequency treated turmeric rhizomes during storage.	
Analysis of quality characteristics of non-chemical Radio Frequency treated turmeric rhizomes during storage.		Evaluation of impact of non-chemical Radio Frequency treatment on disinfestations of the insects.		

Theme III: Bioprospecting and Waste Utilization

Action Plan 11 : Ultrasound assisted enzymatic aqueous extraction of turmeric leaf essential oil

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
To optimize the process parameters of ultrasound assisted enzymatic aqueous extraction of essential oil from turmeric leaves.	Dr. K. Gurusamy, Assistant Professor (Biochemistry) Dr. R. Arulmari, Assistant Professor (FPE) Dr. D. Amirtham, Assistant Professor (Biochemistry)	Extraction of Enzyme assisted turmeric leaf essential oil	Extraction of turmeric leaf essential oil using ultrasound assisted enzymatic aqueous system	An optimized ultrasound assisted enzymatic aqueous technology for extraction of essential oil from turmeric leaves (1 %) are being developed.
To workout the cost economics of the technology		Preliminary trials for optimization of ultrasound treatment conditions	Quality analysis of Enzyme assisted and ultrasound assisted turmeric leaf essential oil	

Action Plan 12 : Enzyme assisted extraction and characterisation of dietary fiber from coconut residue meal

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
To optimize the process parameters of enzyme assisted extraction of crude polysaccharides from coconut residue meal.	Dr. K. Gurusamy, Assistant Professor (Biochemistry) Dr. I. Geethalakshmi, Assistant Professor (Horticulture) Dr. D. Amirtham, Assistant Professor (Biochemistry)	Experiments on alkali extraction of crude polysaccharides from coconut residue meal.	Characterisation of chemical assisted extracted coconut meal residue dietary fiber	An optimized enzyme assisted extracted coconut meal residue dietary fiber technology are being developed
To characterize the coconut meal residue dietary fiber (CRDF)		Experiments on acid extraction of crude polysaccharides from coconut residue meal.	Characterisation of enzyme assisted extracted coconut meal residue dietary fiber	

To work out the cost economics of the technology		Optimization of enzyme assisted extraction of crude polysaccharides from coconut residue meal.	Cost economics for the developed technology	
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Action Plan 13 : Development of Annatto seed separator cum cleaner machine

Activity	Name of the scientists	2020-21	2021-22	2022-23	Deliverables/ expected out come
To analyze the engineering properties of pods and seeds of annatto (<i>Bixa orellana</i> L.)	Dr. P. Sudha, Assistant Professor (FPE) Dr. K. Kumaran, Professor (Forestry)	Analysis of the engineering properties of pods and seeds of annatto.	Performance evaluation of Developed annatto seed separator cum cleaner machine	Optimisation of extraction parameters for colourant obtained from annatto seeds	An Annatto seed separator cum cleaner machine has been developed. Technology for the extraction and preservation of the colourant will be established.
To develop annatto seed separator cum cleaner machine					
To evaluate the separation efficiency and cleaning efficiency of the developed machine		Development of annatto seed separator cum cleaner machine	Preliminary trials for extraction of colourant from annatto seeds	Storage studies to determine the quality characteristics and shelf life of the extracted colorant	
To evaluate the quality of the colourant extracted from annatto seeds and to conduct storage studies					

Action Plan 14 : Development of an ergonomically designed Palmyrah (Borassus flabellifer) fiber extraction machine and characterization of palmyrah palm fiber reinforced epoxy biocomposites product

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
To study the physical, chemical, thermal and mechanical properties of Palmyrah leaf base fiber in relation to biocomposite making.	Dr.I.P.Sudagar Assistant Professor (FPE)	Determination of engineering properties of Palmyrah leaf base fibre	Development of a palmyrah fibre with reinforced epoxy biocomposite product.	A palmyrah fibre extractor has been developed.
To develop ergonomic machine for fiber extraction.		Development of an ergonomic fiber extraction machine		
To develop palmyrah palm fibre with reinforced epoxy biocomposites product.		Performance evaluation with the developed ergonomic fiber extraction machine	Characterization of the biocomposites product in terms of physical, mechanical, electrical, optical, thermal and degradation properties	
To characterize the biocomposites product in terms of physical, mechanical, electrical, optical, thermal and degradation properties				

Action Plan 15: Characterization of sugarcane bagasse fibers reinforced epoxy bio composite product for rigid packaging

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
To develop sugarcane fibres with reinforced epoxy biocomposites product	Dr.I.P.Sudagar Assistant Professor (FPE)	Characterization of bio composite product in terms of physical and mechanical properties	Characterization of bio composite product in terms of thermal properties	Rigid packaging using sugarcane bagasse biocomposites has been developed.
To characterize the biocomposites product in terms of physical, mechanical, electrical, optical, thermal and degradation properties		Development of a sugarcane fiber with reinforced epoxy biocomposites product		

IV. CENTRE FOR POST HARVEST TECHNOLOGY CENTRE

1. Technology for Adoption:

- Enhancing the shelf life of Neera.

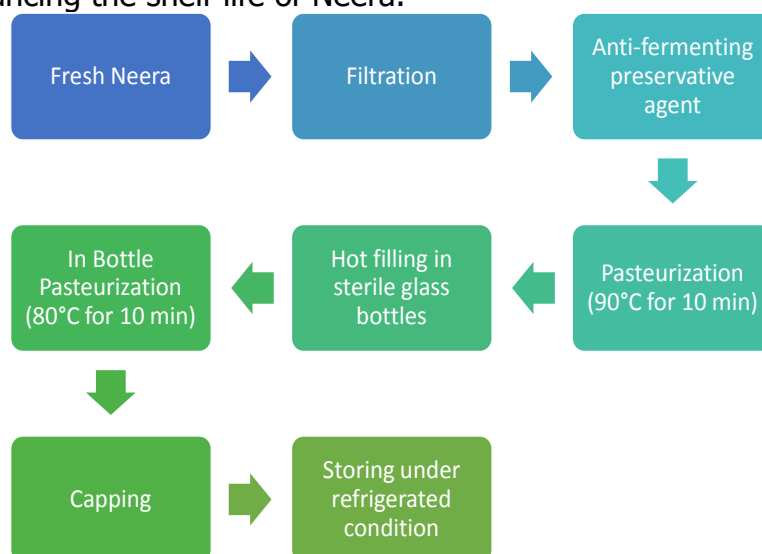


Fig 1. Thermal Processing of Neera

2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
University Research Projects				
1.	AECRI/CBE/FAP/PUL/2020/001 Development of Hybrid System for Pulse Fractionation for High value Pulse Based Functional Foods	August 2020 to July 2022	Dr.M.Balakrishnan, Associate Professor (FPE) Dr.G.Gurumeenakshi, Associate Professor (FSN) Dr.Z.Johnkennedy, Professor and Head, CPHT	The Chemical composition of the Pulse fractionates may be analysed and may be incorporated in various foods for new product development.
2.	TNAU-ERDF/ AEC/CBE/ CPHT/ 2019/R-006 Enhancing the shelf life of Neera by thermal Processing.	1-10-2019 to 30-09-2020	Dr. Z. John Kennedy Professor and Head	Completion report may be prepared with limited data as patent has been filed.
Core Research Projects				
1.	AECRI / CBE/ PHT/ 2018 / CPO26 Development of Hermetic Storage	March 2018 to April 2020	Dr. M. Balakrishnan, Associate Professor,	Intensive trials may be conducted with the project proposed under

	System to Enhance the Shelf Life of De-hulled Millets.		Dept. of Food Process Engineering, AEC&RI, TNAU, Coimbatore	AICRP on PHET.
2.	AECRI / CBE/ PHT/ 2018 / CP090 Design and Development of Pulsed Light (UV- C) Continuous Treatment System for Liquid Foods.	March 2018 to Sept. 2020	Dr. M. Balakrishnan, Associate Professor, Co-PI : Dr. Z. John Kennedy, Professor and Head, Centre for Post Harvest Technology, AEC & RI, TNAU, Coimbatore	Trials may be conducted with the other fruit juices to standardize the technology. Completion report may be submitted.

3. Action plan 2021 – 2022

Theme: Value addition

Activity	Name of the scientists	Deliverables/expected outcome
Optimization of process for osmotic dehydration of fig fruit Standardization of Packaging and storage condition of processed Fig	Dr.P.Vennila, Ph.D., Professor(FSN), CPHT Dr.P.Geetha , Ph.D., Assoc.Professor(FSN), CPHT	Value added products from Fig fruit (<i>Ficus carica L.</i>) (Suggested during Horticultural review)

Activity	Name of the scientist	
Optimization of process for osmotic dehydration of bread fruit chunks	Dr.P.Vennila, Ph.D., Professor(FSN), CPHT Dr.P.Geetha , Ph.D., Assoc.Professor(FSN), CPHT Dr. Z. John Kennedy, Ph.D. Professor and Head, CPHT	Value added products from bread fruit (Suggested during Vice chancellor Review)

Action Plan 3 : Development of hybrid system for pulse fractionation for high value pulse based functional foods

Activity	Name of the scientist	2021-22	Deliverables/expected outcome
Design and development of pulse fractionation unit	Dr.M.Balakrishnan, Assoc. Prof., Dept. of FPE	Performance evaluation of the unit	Pulse fractionation system will be developed which leads to the value addition of pulse fractionates for the development of high value pulse based functional foods
Optimization of grain parameters and machine parameters to produce pulse fractionates		Refinements of the system, if any	
Evaluation of the machine for the effective separation of the pulse fractions		Study the nutritional quality of various pulse fractions	
Analysis of the nutritional value of the various fractions for the development of pulse based functional foods.			

V. SOIL AND WATER CONSERVATION ENGINEERING

1. Remarks on the ongoing projects:

Sl. No	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
University Research Projects				
1.	AECRI/KUM/WC/2018/001 Estimation of crop coefficient and Water requirement of Chilli and Cucumber under polyhouse and open field condition.	April 2018 to March 2021	Dr. K. Arunadevi, Asst. Prof (SWCE) Dept. of soil and water cons. Engg. AEC &RI, Kumulur Dr. A.D. Ashok, Ap (Hort.), IOA, Kumulur	Completion report may be submitted.

2.	AECRI/CBE/SWC/2020/001 Effect of drip fertigation and different colour mulches for vegetable crops under controlled condition (cucumber -Cucumis Sativus.L).	Sept. 2020- Aug. 2022	Dr. K. Nagarajan Prof. & Head, Department of Soil and Water Conservation Engineering AEC &RI, Coimbatore. Dr. I. Geetha Lakshmi Assistant Professor(Hort.) Dept. of FPE, AEC&RI, Coimbatore	Expedite the work as per the objectives.
3.	AECRI/KUM/SWC/2020/001 Irrigation Scheduling by Soil Water Tension Measurements for Drip Irrigated Onion	June 2020 to May 2022	Dr. M. Manikandan Asst. Prof.(SWC) 2. Dr. A. Raviraj Prof and Head (IDE)	Conduct the trials as per the objectives since first crop was failure due to rain.
4.	ICAR/AEC/CBE/SWC/2018/R001 Development and Testing of Low cost filters” in the Network project on “Engineering Interventions in Micro Irrigation Systems (MIS) for improving water productivity” under Consortia Research Platform on Farm Mechanization and Precision Farming	1.4.2020 - 30.6.2021	Dr. K.Nagarajan, Prof.& Head, Dept. Of SWCE, AEC & RI, TNAU, Coimbatore.	Confirmation trials may be conducted before finalizing the design of the filter.
5.	AECRI / CBE / SWC / 2021 / 001 Estimation of daily actual evapotranspiration using remote sensing	Feb. 2021 to March 2022	Dr. Balaji Kannan Associate Professor (SWCE)	Expedite the work as per the objectives
6.	AECRI/KUM/SWC/2020/002 Effect of Dry land Technologies on water use and yield of millet crops	July 2020 to June 2022	Dr. M. NAGARAJAN, Assistant Professor (SWCE)	Trials may be conducted in the ensuing season to get the confirmed result.

7.	Impact of Low Tunnel drip irrigation strategies on microclimate modification in horticulture crops	November 2020 to May 2022	Dr.S.Selvakumar Assistant Professor (SWCE) Dr.I.Geethalakshmi Assistant Professor (Horticulture)	Make use of the materials already available in the workshop of Department of SWCE. For purchase of other materials required, fund available at Department of SWCE may be used.
8.	Subsurface drainage for waterlogged and salt affected lands in farmers field.	2019-2021	Dr. M. Manikandan Assistant Professor (SWCE)	Completion report may be submitted
Core Research Projects				
1.	AECRI / KUM / SWC / 2018CP155 Evaluation of water conservation and management techniques for field crops.	Jan,2019 – Sept. 2020	Dr. V. Ravikumar Professor (SWC) and Head Department of Irrigation and Drainage Engineering Dr.S.Vallalkannan Asst. Prof. (Agro) Department of I&DE	Results presented already and completion report submitted.
Externally Funded Project				
1.	ICAR/AEC/KUM/SWC/2018/R009 ICAR-NICRA scheme on "Temperature Gradient Modelling in a Greenhouse equipped with Evaporative Cooling Pad System in a Semi-arid Region"	Sept. 2018 to March 2021	Dr. R. Lalitha Professor and Head (SWCE) Department of SWCE, AEC & RI, Kumulur Dr. S. Vallal Kannan,	Completion report may be submitted along with research paper published

			Assistant Professor (Agronomy), Department of IDE, AEC & RI, Kumulur,	
ICAR & AICRP Projects				
1.	AICRP/WTC/CBE/IWM/001/P2 Locating Rainwater Harvesting Structures Using Remote Sensing and GIS	3 years (2020-2023)	Dr. V. Ravikumar Professor (SWC) Water Technology Centre Dr.G.Thiyagarajan Assistant Professor Water Technology Centre	Expedite the work as per the objectives
2.	AICRP/WTC/CBE/ IWM/001 Estimation of crop coefficient for Banana for drip irrigation in Western Zone of Tamil Nadu	October 2020 to Sept. 2023	Dr.A.Valliammai, Assistant Professor(SWCE), ARS, Bhavanisagar.	Pertinent data may be recorded as per the objectives.
3.	AICRP/WTC/CBE/ IWM/001- Application of Soil and Water Assessment Tool (SWAT) model for estimation of surface water resources and temporal water demand for sustainable water management in LBP basin.	Sept. 2018 to August 2022	Dr.A.Valliammai, Assistant Professor(SWCE), ARS, Bhavanisagar.	Prediction may be confirmed before passing the results to AED.
4.	AICRP/DCM/KPT/AGR/1971 /004 Effect of supplemental irrigation and intercropping on yield and water use efficiency of groundnut	2020-21 (New)	Dr. N. Anandaraj Associate Professor (SWC), Agricultural Research Station, Kovilpatti	Trials may be repeated as per the objective in the ensuing season
5.	AICRP/DCM/KPT/AGR/1971 /004 Catchment - storage - command area relationship for enhancing water productivity in a micro – watershed.	2006 - LT	Dr. N. Anandaraj Associate Professor (SWC), Agricultural Research Station, Kovilpatti	Works may be carried out as per the objective of the project. Interim report may be submitted.
6.	AICRP/DCM/KPT/AGR/1971 /004	2014 – 2021	Dr. N. Anandaraj Associate	Completion report may

	Evaluation of tillage methods for improving water use efficiency in rainfed cotton - Pulses crop rotation.		Professor (SWC), Agricultural Research Station, Kovilpatti	be submitted
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2. Action Plan 2021-2022:

Theme-I: Irrigation Engineering

Activity/Title	Name of the scientists	2020-21	2021-22	Deliverables/expected outcome
Development and Testing of Low cost filters	Dr. K.Nagarajan, Prof.& Head, Dept. Of SWCE, AEC & RI, TNAU, Coimbatore.	Fabrication of low cost filter was done	Testing of fabricated low cost filter with different media will be carried.	Best filter media for low cost filter is found to be silex, sand and pebbles rather than the coconut fiber
Effect of drip fertigation and different colour mulches for vegetable crops under controlled condition (cucumber - Cucumis Sativus.L).	Dr. K.Nagarajan, Prof.& Head, Dept. Of SWCE, AEC & RI, TNAU, Coimbatore.	First field trail was conducted	Second and third field trail (tomato, cucumber) will be conducted	Continuous observation during germination stage, First flowering, Soil moisture at 15 cm depth, Soil temperature at 15 cm depth, Yield parameters will be done
Estimation of daily actual evapotranspiration using remote sensing	Dr. Balaji Kannan Associate Professor (SWCE) Water Technology Centre	Satellite data viz.,Landsat 8 data and Sentinel-2 from Copernicus hub and earth explorer website respectively has been downloaded for period from 2017 to	To prepare time series maps of daily actual evapotranspiration from 2017-2020 for Lower Bhavani river basin .	A tool for estimation of daily actual evapotranspiration will be developed using remote sensing.

		2020		
Impact of Low Tunnel drip irrigation strategies on microclimate modification in horticulture crops	Dr.S.Selvakumar Assistant Professor (SWCE) Dr.I.Geethalakshmi Assistant Professor (Horticulture)	Project formulated and got University approval.	Design and construction of new low tunnel technologies for water melon and musk melon cultivation.	Suitability of low tunnel structure for water melon and musk melon cultivation
Estimation of crop coefficient for Banana for drip irrigation in Western Zone of Tamil Nadu	Dr.A.Valliammai, Assistant Professor(SWCE), Agricultural Research Station, Bhavanisagar	1. Planting of Banana (Kadali and Red Banana) was taken up on 10.11.2020 2.Quantity of irrigation amounts may be decided based on the daily pan evaporation. 3.Soil moisture content is being observed daily in the field.	1.To estimate the crop coefficient for Banana for different stages under drip irrigation.	An optimal irrigation schedule for Banana based on the estimated crop coefficient for higher productivity for western zone of Tamil Nadu will be developed.
Irrigation Scheduling by Soil Water Tension Measurement	Dr. M. Manikandan Assistant Professor (SWC) Dr. A. Raviraj Professor and	First field trial was conducted and necessary	Second field trial will be initiated.	During first trial Remarkable Onion Yield was not recorded among the

s for Drip Irrigated Onion	Head (IDE)	observations were done		treatments due to continuous rain during Nov and Dec 2020.
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Theme-II: Surface water and Groundwater Engineering

Prediction of groundwater level in Noyyal river basin of Tamil Nadu using Artificial Neural Network (ANN)	Dr. G. Thiyagarajan, Asst. Prof. (SWCE) Dr. V. Ravikumar, Prof. (SWCE) Dr. Balaji Kannan. Asso. Prof.(SWCE)	-	Training of the neural networks and selection of appropriate algorithm. Selection of activation function. Testing of the selected ANN algorithm. Validation of the selected ANN algorithm. Suggesting suitable water management scenarios and cropping pattern	Predicted groundwater levels of the study area can be used for preparing suitable water management scenarios and cropping pattern.
Locating Rainwater Harvesting Structures Using Remote Sensing and GIS	Dr. V. Ravikumar Professor (SWC) Water Technology Centre Dr.G.Thiyagarajan Assistant Professor Water Technology Centre	1. Four tiles of Cartosat digital elevation model were downloaded which corresponded to the Noyyal river basin. 2. From the digital elevation data, elevation map was	The suitable sites for locating rain water harvesting structures such as farm pond, check dams, subsurface dykes, percolation pond and gully plugs are to be proposed through GIS analysis.	1. The potential groundwater recharge zones in various river basins of Tamil Nadu will be mapped. 2. Suitable artificial recharge structures for sustainable management of groundwater will be suggested.

		produced 3.A Steam network map was derived from the digital elevation data.		3. Water quality index of the various river basins will be determined.
Application of Soil and Water Assessment Tool (SWAT) model for estimation of surface water resources and temporal water demand for sustainable water management in LBP basin	Dr.A.Valliammai, Assistant Professor(SWCE), Agricultural Research Station, Bhavanisagar	The following thematic maps were prepared for the LBP basin. Boundary map, DEM map, Slope map, Soil map and Land use map. 2.Distributary wise irrigation water demand of LBP basin is being estimated based on water release from the dam and crop water requirement based on the existing crops.	The annual water balance of the basin will be simulated.	1.To simulate the surface water and ground water availability using SWAT model 2. To suggest suitable options to minimize the gap between supply and demand.

Theme-III: Soil and water Conservation Engineering

Effect of Dry land Technologies on water use and yield of millet crops	Dr. M.NAGARAJAN, Assistant Professor (SWCE) Dept. of Swce, AEC & RI, Kumulur	First year field trail was conducted by Ragi crop at AEC & RI, Kumulur during Sept. 2020 to Jan. 2021. The soil physical properties viz., soil moisture, infiltration rate were studied before and after the treatment implemented. Yield and water productivity calculated.	Second year field trail will be conducted	Suitable dry land technology to sustain crop and to improve the water productivity will be identified.
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VI. Recommendation on the 9th Agricultural Engineering Scientists' Meet

The Vice-Chancellor well appreciated the overall outcome of Agricultural Engineering and conveyed appreciation for the presentation made by the Dean (Engg), AEC&RI, TNAU, Coimbatore. The remarks are as follows.

- Projects may also be formulated based on the regional level issues in addition to the approved AICRP projects. **(Action: FM&PE, CBE)**
- As the University had already signed MoU with the leading tractor manufacturers like TAFE, Mahindra & Mahindra and John Deere, action may be initiated to have collaborative research work towards complete mechanization for selected crops. **(Action: FM&PE, CBE)**
- Performance of the machinery may be evaluated in terms of labour, time and cost savings in all the mechanization programmes of various crops. **(Action: FM&PE, CBE)**
- Bulletin on mechanization of crops carried out at the TNAU research farms may be prepared and released during the TNAU Golden Jubilee celebrations. **(Action: FM&PE, CBE)**
- A team of scientists from the Department of FM&PE, SWCE, REE and FPE may have a visit to the Centre of Excellence, Reddiyarchathiram to have an exposure on automated machinery. **(Action: Dean, AEC&RI CBE)**

- Sensor and artificial intelligence may be incorporated in the areas like weeding, plant health monitoring system etc. **(Action: FM&PE, CBE)**
- Engineering scientists working on Drone spraying may be involved with the trials being conducted by the scientists of the Department of Nano Science & Technology to evaluate the performance of nano liquid fertilizers under IFFCO sponsored scheme at ARS, Bhavanisagar. **(Action: FM&PE, CBE)**
- Incorporating the already available electronic sound modules to the unmanned aerial bird scarer being under development. **(Action: FM&PE, CBE)**
- Research articles may be published on spraying characteristics of drone. **(Action: FM&PE, CBE)**
- Action may be taken to patent the machinery developed under research. **(Action: FM&PE, CBE)**
- Concept on the development of solar powered mini tractor / tractor may be evolved. **(Action: FM&PE, CBE/ REE, CBE)**
- Technology bulletin may be prepared with standard operational protocol for drying various farm produces in solar dryer. **(Action: REE, AEC&RI, CBE)**
- Smaller capacity domestic solar dryers may be developed and promoted under Venture Capital Scheme for household utilization. **(Action: REE, AEC&RI, CBE / REE, AEC&RI, Kumulur)**
- Ongoing project on development of bird scarer may be collaborated with Department of Farm Machinery and Power Engineering and Forest College & Research Institute, Mettupalayam. **(Action: REE, AEC&RI, CBE)**
- Location for installation of Solar PV pump may be identified in discussion with the Professor and Head, Department of Floriculture and Landscape Architecture, HC & RI, Coimbatore. **(Action: REE, AEC&RI, CBE)**
- Mega project on multi usage of solar energy systems (covering all solar energy gadgets) may be proposed for possible funding from Government Agencies. **(Action: REE, AEC&RI, CBE)**
- Retrofitting solar based steam generation for essential oil extraction from eucalyptus at Horticultural Research Station, Ooty. **(Action: REE, AEC&RI, CBE)**
- Studies may be conducted for better biomethanation of water hyacinth. **(Action: REE, AEC&RI, CBE)**
- The optimum stage for extraction of oil from turmeric leaves has to be standardized. **(Action: P&H, FPE)**
- Processing machineries available at AC&RI, Trichy, DARS, Chettinad, AC&RI, Madurai and AC&RI, Killikulam may be properly utilized for processing agricultural produces and the products may be sold under VCS to generate income to the University. UG / PG students may be engaged in this regard and the same may be implemented by Dean (Engg.), Coimbatore after discussing with the Dean (CSC &RI), Madurai. **(Action: P&H, FPE)**
- Waste available/generated at FC&RI, Mettupalayam may be incorporated in the pilot paper plant to generate wealth from waste. **(Action: P&H, FPE)**
- A proposal has to be placed for the purchase of Cold Plasma equipment to carry out the drying studies of fruits, vegetables and Oil seeds through Director of Research. **(Action: P&H, FPE)**

- A project has to be proposed on “Drying of high value medicinal plants with radio frequency drier” in consulting with the Professor and Head, Department of Medicinal and Aromatic Plants. **(Action: P&H, FPE)**
- Through Coconut Research Station, Aliyar, coconut traders may be identified to conduct on farm trail for better utilization of the coconut grader. **(Action: P&H, FPE)**
- Analysis of the organic acids present in the turmeric leaves. **(Action: P&H, CPHT)**
- Neera technology released by the Centre for Post Harvest Technology has to be commercialized at the earliest and standardization of technology for palmyrah Neera is to be done in collaboration with AC&RI, Killikulam. **(Action: P&H, CPHT)**
- Automation of Irrigation system is the priority area and the scientists of Dept. of Soil and Water conservation Engineering and Water Technology Centre should join hands in solving the issues and problems relating to the automated irrigation system laid out in the main campus. **(Action: Dean, AEC&RI, CBE / Director, WTC).**
- Automated irrigation system is planned to be introduced for Cashew plantation in NPRC, Vamban and necessary modalities and planning has to be done by SWCE scientists of AEC&RI, Kumulur. **(Action: AEC&RI, Kumulur)**
- A teaching assistant with M.E. (Controls and Instrumentation Engg. / Power Electronics and Drives/ Applied Electronics) may be recruited on contract basis to look after the needs and issues related to automated irrigation systems in the main campus in addition to other automated works of the University. **(Action: Dean, AEC&RI, Coimbatore)**
- Standardization of low cost polyhouse construction must be done for plains, medium and high elevation areas. **(Action: SWCE, AEC&RI, CBE).**
- Vertical mulching may be adopted for Coconut wherever possible and yield data has to be recorded continuously. **(Action: SWCE, AEC&RI, CBE / Spices and Plantation Crops, HC&RI, CBE)**
- Rain hose has been successfully installed in many lawns and fields of TNAU. The data on the water saving through rain hose has to be studied in depth. **(Action: SWCE, AEC&RI, CBE)**

VII. Contact details of scientists participated in the 9th Agricultural Engineering Scientists' Meet, 2021.

Farm Machinery and Power Engineering

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