

TAMIL NADU AGRICULTURAL UNIVERSITY

PROCEEDINGS

10th Agricultural Engineering Scientists' Meet (25th July 2022)

Lead Centre

Agricultural Engineering College and Research Institute
Coimbatore – 641 003

Directorate of Research

Tamil Nadu Agricultural University
Coimbatore – 641 003

2022

PROCEEDINGS

The 10th Agricultural Engineering Scientists' Meet 2022 was held at Video Conferencing Hall, Tamil Nadu Agricultural University, Coimbatore on July 25th, 2022 between 9:30 am and 12.30 pm. The session was chaired by the Respected Vice-Chancellor, **Dr. V. Geethalakshmi** in the presence of Dr. M. Raveendran, Director of Research and Dr. A. Raviraj, Dean (AEC&RI), Coimbatore.

Mentioning the low adoption rate (40%) of mechanization in India as compared to USA (>90 %), the Vice Chancellor emphasized the urgent need of mechanization suitable for small and marginal farmers. The Vice Chancellor also insisted on developing complete mechanization package for specific crops as that of paddy and sugarcane. Madam suggested organizing large scale demonstration (5 acre) on sesamum mechanization at RRS, Vridhachalam involving Dept. officials.

Dr. M. Raveendran, Director of Research, TNAU, Coimbatore welcomed the gathering. He had suggested popularizing the TNAU released farm machineries and implements to reach to the small and marginal farmers through custom hiring.

Dr. A. Raviraj, Dean (AEC&RI), Coimbatore presented the action taken on the recommendations of the 9th Agricultural Engineering Scientists Meet 2021 held on 4th May 2021. **Dr. A. Surendrakumar**, Professor and Head, FMPE, **Dr. P. Subramanian**, Professor and Head, REE, **Dr. M. Balakrishnan**, Professor and Head, FPE and **Dr. K. Nagarajan**, Professor and Head, SWCE presented Research highlights of 2021-22 and Action plan for 2022-23 pertaining to their disciplines. They also presented the Theme-wise action taken during the year 2021-22 and action plan for the year 2022-24.

The Heads of various Departments and Staff members of AEC&RI, Coimbatore and SWCE scientists of WTC participated in person. **Dr. P. Rajkumar**, Dean (AEC&RI), Kumulur, Scientists of AEC&RI, Kumulur and Agricultural Engineering and crop scientists from various Research stations of TNAU also participated through on line mode.

Finally, the meeting was concluded with the remarks of the Respected Vice Chancellor and followed by the Director of Research. The formal vote of thanks was proposed by **Dr. P. Rajkumar**, Dean, AEC&RI, Kumulur.

The proceedings of the meet is furnished below:

I. FARM MACHINERY

1. Technologies for OFT
2. Remarks on the ongoing research projects
3. Action Plan for the year 2022-24

II. RENEWABLE ENERGY ENGINEERING

1. Technologies for OFT
2. Technologies for Adoption
3. Remarks on the ongoing research projects
4. Action Plan for the year 2022-24

III. FOOD PROCESS ENGINEERING

1. Technologies for OFT
2. Remarks on the ongoing research projects
3. Action Plan for the year 2022-24

IV. SOIL AND WATER CONSERVATION ENGINEERING

1. Remarks on the ongoing research projects
2. Action Plan for the year 2022-24

V. REMARKS

VI. LIST OF PARTICIPANTS

I. FARM MACHINERY

1. TECHNOLOGIES FOR ON FARM TRIALS:

a. Design and Development of self-propelled maize harvester

A maize harvester was developed as self propelled unit with 11 hp prime mover. The harvester consists of two essential components viz., snapping rollers for snapping of cobs from the stalk and harvesting of corn stalks. The snapping rollers grab maize stalks and pull them between the snapping bars, meanwhile maize cob cannot pass through the spacing between the snapping bars. Spiral-lugged rolls made of cast iron with spiral ribs on their surfaces was adopted for shearing of cobs from the plants. The snapping rollers spin opposite to each other to grab the stalk just below the cob and guide them into the rolls, and the rotary cutting blade provided at the bottom cuts the maize stalk at ground level. The snapping rollers were fixed at different levels to collect the harvested cobs in the box provided by the side of the rollers.



The snapping rollers spin opposite to each other to grab the stalk just below the cob and guide them into the rolls, and the rotary cutting blade provided at the bottom cuts the maize stalk at ground level. The snapping rollers were fixed at different levels to collect the harvested cobs in the box provided by the side of the rollers.

Salient features:

- The self propelled maize harvester snaps the cobs and harvest the maize stalks simultaneously.
- Field capacity : 0.19 ha h⁻¹
- Labour requirement : 5.5 man hour ha⁻¹
- Saving in cost of operation : 25 per cent
- Saving in Time : 96 per cent
- Saving in Labour : 91 per cent

Location: Maize Research Station, TNAU, Vagarai.

b. Ergonomic studies in Vegetable transplanter

A comfortable sitting position was created with height adjustable seat, a foot rest to ensure a rigid sitting position. The location of seedling tray is important to provide comfortable sitting position to the operator. Hence, the seedling tray stand with rotating arrangement was made such that height of the seedling tray can be adjusted according to the requirement of the operator. The tray stand can be pulled towards the operator, so that tray will be in the primary work zone of the operator. The tray will



be resting at an angle of 75° so that entire tray height will be within the reach envelope zone. Both the hands can be used to pick the seedlings from the tray and placing it in the seedling conveyor

Salient features:

- The modified semi-automatic vegetable transplanter was found to be more comfortable though the field coverage was less striking an optimum between human comfort and transplanting of seedlings.
- The mean values of heart rate, energy cost, oxygen consumption rate in terms of VO_2 max and work pulse for the operation of modified vegetable transplanter were $112 \text{ beats min}^{-1}$, $2.95 \text{ kcal min}^{-1}$, 29 per cent of VO_2 max and $13 \text{ beats min}^{-1}$ respectively.
- The discomfort score was 11, grading the work as light.
- The picking and placement of seedlings could be achieved without any missing when both tractor speed and the conveyor speed were minimum.

Location: Farmers field, Thondamuthur, Coimbatore.

c. Studies on interventions in self-propelled auger digger suitable to women farmers

After assessing the hand arm vibration, the modifications such as a frame and handle were made taking in to consideration of the female anthropometric data. As the flexion of trunk plays an important role in the operation of auger digger, attempts were made to keep the flexion angle within 30° . But as the unit has to be operated close to the body, the length of the handle was kept as 400 mm. The accelerator component of the engine was relocated to the handle of the frame, so that the acceleration may be given to the auger bit simultaneously when the Auger unit is pressed down to form pits. The total weight of the unit was 44.5 kg.



Salient features:

- Density and cone penetration index of the soil were 1.3 kg cm^{-3} and 48 kg cm^{-2} , respectively.
- The Auger digger was used dig pits and separately and the same digger was fitted in a frame and used to dig pits.
- The entire unit could be moved from one place to another place, where the force require to pull the unit was only 60.8 N which was within the force exerted by normal female worker.
- The unit can also be pushed with a force of 55 N.
- Easy transport and handling, with lesser energy expenditure, the auger digger may be used.
- Saving in time and cost of 31.8 % and 40% respectively.

Location: Farmers field, Kinathukadavu, Coimbatore.

COMMERCIALIZATION:

a. Development of multi row rotary weeder attachment to Ride on rice transplanter

A multi row rotary weeder was developed as an attachment to the riding type rice transplanter to increase the field capacity, reduce the labour requirement and drudgery in weeding operation. The weeder consists of main frame, gear box, main shaft, rotary weeding units, two floats and a tyne. In the weeder, six rotary weeding units are mounted on the shaft whereas one more weeding unit is mounted behind the gear box. Totally 7 rows can be covered in a single pass of operation. The width of the rotary unit is 150 mm. The entire unit can be easily mounted and dismantled from the transplanter. Drive for the weeding unit is taken from the Power Take Off (PTO) of the transplanter. The gear box, rotary weeding drums and floats are mounted on a frame.



Salient features:

- The multi row weeder is an attachment to the riding type transplanter.
- Weeding in 7 rows in a single pass.
- Field capacity: 2.5 - 3.0 ha day⁻¹.
- Saving in Time: 90 and 70 per cent when compared to manual weeding and weeding with power weeder, respectively.
- Saving in cost of operation: 77 and 68 per cent when compared to manual weeding and weeding with power weeder, respectively.

Machinery manufacturing companies involved in the manufacturing of paddy power weeders were contacted for commercialization.

2. REMARKS ON THE ONGOING PROJECTS:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
Core Research Projects				
1	AECRI/CBE/FMP/2021/001 Development of Improved Portable Power Operated Cono-Weeder	December 2020 to December 2021	Dr.P.Dhananchezhiyan , AP(Farm Machinery) Dr.R.Kavitha, Professor Dr. A. Surendrakumar, P&H (FMPE)	Project is extended for making the modifications and conduct field trials.

2	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. Asst. Prof. (FM) Dr. A. Surendrakumar, P&H (FMPE)	Confirmative field trials may be conducted at Coimbatore.
3.	Development of Tractor Drawn Groundnut cum Blackgram Seeder	2021-2022	Dr.S.S.Sivakumar Professor (Farm Machinery) and Dr.V.Alex Albert Asst. Prof.(SST)	Confirmative field trials may be conducted at farmers field.
4.	Development of Mini-Tractor operated onion harvester with detopping unit	2021-2022	Dr.P.K.Padmanathan, Asst. Prof. (FM) and Dr.V.Alex Albert, Asst. Prof.(SST)	Confirmative field trials may be conducted at farmers field.

AICRP on Farm Implements and Machinery

1.	AICRP/AGE/CBE/FMR/002/20/001 Evaluation of autonomous drone spraying system for field /horticultural Crops	01.04.2020 to 31.03.2023	Dr.R.Kavitha, Professor Dr.A.P.Mohan kumar, Assistant Professor Dr.B.Suthakar, Assistant Professor	Electrostatic principle may be incorporated to increase the target deposition of the spray liquid.
2.	AICRP/AGE/CBE/FMR/002/20/002 Design and Development of small groundnut combine harvester	01.04.2020 to 31.03.2022	Dr. B.Suthakar, Asst. Prof. Dr. R.Kavitha, Professor Dr.R.Thiyagarajan, Asst. Professor	Field trials may be conducted. The commercialization of the unit may be initiated involving the manufacturer who had already submitted the willingness for commercialization.
3.	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	Field trials has to be conducted in the farmers' field involving

			Dr.P.Dhananchezhiyan, Asst. Professor	the sister departments.
4.	AICRP/AGE/CBE/FMR/002/20/004 Automation of sowing vegetable seeds in protray	01.01.2020 to 31.03.2022	Dr.R.Thiyagarajan, Assistant Professor Dr.B.Suthakar, Assistant Professor Dr.R.Kavitha, Professor	The unit may be tested for poly coated vegetable seeds. Incorporation of media filling unit and compactor unit has to be carried out.
5.	AICRP/AGE/CBE/FMR/002/21/004 Automatic transplanter for protray grown vegetable seedlings	01.10.2021 to 31.03.2023	Dr. R.Kavitha, Professor Dr.B. Suthakar, Assistant Professor Dr.P.Dhananchezhiyan, Assistant Professor	Suggestions of the XXXVI Annual Workshop of AICRP on FIM held between 22 nd to 24 th , February has to be carried out by involving the other centres.
6.	AICRP/AGE/CBE/FMR/002/21/005 Development of multi row rotary weeder attachment to Ride on rice transplanter	01.10.2021 to 31.03.2023	Dr. R.Kavitha, Professor Dr.B. Suthakar, Assistant Professor Dr.A.P.Mohankumar Assistant Professor	Commercialization has to be accelerated at the earliest through Directorate of Agribusiness Development, TNAU, Coimbatore.
7.	AICRP/AGE/CBE/FMR/002/21/006 Frontline demonstration of Pneumatic precision planter (Commercial), IISR Sugarcane deep furrow planter, Mini tractor operated weeder cum earthing up for sugarcane, banana and papaya (Commercial), Tractor	April 2021 to March 2022	Dr.P. Dhananchezhiyan, Asst. Professor Dr.R. Kavitha, Professor Dr.R. Thiyagarajan, Asst. Professor	Completed

	operated turmeric planter (TNAU) and Tractor operated semi-automatic vegetable transplanter (MPKV)			
8.	AICRP/AGE/CBE/FMR/002/21/007 Prototype feasibility testing of i. Tractor operated Phule hydro mechanically based inter row cum intra row weeder for Orchard (MPKV, Rahuri) ii. Mini tractor operated vertical sprayer (Commercial) iii. Motorized coconut tree climbing machine (Commercial) iv. Tractor operated Paddy straw rake (Commercial) v. Tractor front mounted reaper binder (Commercial) vi. Tractor operated cotton picker (Commercial)	01.04.2021 to 31.03.2022	Dr.A.P.Mohan Kumar, Asst. Professor Dr.R.Kavitha, Professor & PI (FIM) Dr.B.Suthakar, Asst. Professor	Completed
AICRP on Ergonomics and Safety in Agriculture				
1.	AICRP/AGE/CBE/AMC/003/2017/02 Studies on ergonomic interventions in semi-automatic vegetable transplanters	December 2017 to March 2022	Dr.A.Surendrakumar, Professor and Head	On Farm Trial: Field trials may be conducted in the farmers field.
2.	AICRP/AGE/CBE/AMC/003/2019/01 Studies on ergonomic interventions in Engine operated auger digger to make it women friendly	April 2019 to March 2022	Dr.A.Surendrakumar, Professor and Head	On Farm Trial: The manoeuvrability of the digger may be test verified with the farm women labours for planting tree

				saplings.
EXTERNALLY FUNDED PROJECT				
1.	CIL/AEC&RI/CBE/FMPE/2021/R001 Design and development of machinery for harvesting and collection of neem fruit	01.07.2021 to 31.06.2024	Dr. A.Surendrakumar, Prof. & Head Dr. B.Suthakar, Asst. Prof.	Shoulder mounted neem collector may be developed.

3. ACTION PLAN FOR THE YEAR 2022-24

Theme I: Small Farm Mechanization

Ongoing projects

Action Plan 1: Design and Development of small groundnut combine harvester			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Performance evaluation of the small groundnut combine harvester Design refinement and field trials	Dr. B. Suthakar Dr. R.Kavitha Dr. R.Thiyagarajan	Assembly of components Field tests with the prototype groundnut combine harvester Calculation of saving in cost and BC ratio	Prototype mini combine harvester suitable for small farms will be developed.

Action Plan 2: Design and Development of mini corn cob harvester			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Performance evaluation of self propelled corn cob harvester Design	Dr. R.Kavitha Dr.B.Suthakar Dr.P.Dhanan chezhiyan	Field tests with the prototype self propelled corn cob harvester Calculation of	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.

refinement and field trials		saving in cost and BC ratio	
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Action Plan 3 :Development of Bird scarer			
Activity	Name of the scientists	2022-23	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>Study of different models of available bird scarers and their working principles</p> <p>Fabrication of prototype bird scarer</p> <p>Field evaluation</p>	<p>Remote controlled Bird scarer.</p>

Action Plan 4 : Development of Tractor Drawn Groundnut cum Blackgram Seeder			
Activity	Name of the scientists	2022-23	Deliverables/ expected out come
<p>To evaluate the performance of prototype in laboratory and actual field conditions.</p>	<p>Dr. S.S.Sivakumar Professor (Farm machinery)</p>	<p>Performance evaluation of developed prototype seeder in lab and actual field conditions viz., Data of yield and crop parameters field efficiency</p>	<p>Tractor operated Groundnut cum blackgram seeder</p>

Action Plan 5 : Development of Package of machinery for Sesame			
Activity	Name of the scientist	2022-23	Deliverables/ expected out come

Formulation of protocol for mechanization of Sesame	Dr. A.P.Mohan kumar Dr. A.Surendra kumar Dr. P.Dhanan chezhiyan	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
Adoption of machinery for sowing and harvesting sesame			

Action Plan 6 : Development of Improved Portable Power Operated Cono-Weeder			
Activity	Name of the scientist	2022-23	Deliverables/ expected outcome
Performance evaluation and modification of improved portable power operated cono weeder	Dr.P.Dhanan chezhiyan Dr. A.Surendra kumar	Performance evaluation of improved portable power operated cono weeder	Improved portable power operated cono weeder

New proposal

Action Plan 7: Design and development of mini tractor operated adjustable sugarcane detrasher				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected outcome
To design and develop a conceptual drawing for tractor operated sugarcane detrasher with adjustable rollers To develop a tractor operated adjustable sugarcane detrasher To evaluate the performance of	Dr.A.P.Mohan kumar Dr. R.Kavitha Dr.R.Thiyagar ajan	Selection of design parameters Design of components and preparation of drawings Fabrication of rollers, main frame, hydraulic circuit	Assembly of components Field tests with the prototype adjustable sugarcane detrasher Calculation of saving in cost and BC ratio	Mini tractor operated adjustable sugarcane detrasher for sugarcane mechanization will be developed.

developed detrasher				
To workout the cost economics of the developed detrasher				

Action Plan 8: Development of power tiller operated groundnut vine cutting Machine				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected out come
<p>To identify the suitability of commercially available reaper for cutting groundnut vine</p> <p>To develop a prototype power tiller operated groundnut vine cutting machine</p> <p>To evaluate the performance of the prototype power tiller operated groundnut vine cutting machine</p> <p>To work out the cost economics of the prototype power tiller operated groundnut vine cutting machine.</p>	Dr. M. Saravanakumar	<p>Study of existing reaper for cutting groundnut vine.</p> <p>Develop a prototype power tiller operated groundnut vine cutting machine.</p>	<p>Evaluation of the prototype. Work out the cost economics of the prototype power tiller operated groundnut vine cutting machine.</p>	Prototype power tiller operated groundnut vine cutting machine.

Theme II: Mechanization of Horticulture crops

Action Plan 8: Automation of sowing of vegetable seeds in protray			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Performance evaluation of automatic needle	Dr.R.Thiyagarajan Dr. B.	Laboratory tests for sowing of different	Automatic precision seeder for sowing vegetable seeds in protrays will be

seeder for sowing of vegetable seeds Design refinement	Suthakar Dr. R.Kavitha	vegetable seeds. Calculation of saving in cost and BC ratio	developed.
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Action Plan 9: Ergonomic studies in Vegetable transplanter			
Activity	Name of the scientists	2022-23	Deliverables/ expected out come
Ergonomic evaluation	Dr.A.Surendrakumar Dr.P.Dhananchezhiyan	Field trials Ergonomical evaluation	Ergonomically refined transplanter for transplanting protray grown vegetable seedlings.

Action Plan 10 : Studies on interventions in self-propelled auger digger suitable to women farmers			
Activity	Name of the scientists	2022-23	Deliverables/ expected out come
Ergonomic evaluation	Dr.A.Surendrakumar Dr.P.Dhananchezhiyan	Field trials	Ergonomically refined self-propelled auger digger suitable for women farmers.

Action Plan 11 : Development of Mini-Tractor operated onion harvester with detopping unit			
Activity	Name of the scientist	2022-23	Deliverables/ expected out come
To evaluate the performance of the prototype unit under the actual field conditions.	Dr. P.K.Padmanathan Assistant Professor(FM)	Performance evaluation of developed prototype onion harvester cum detopper	Mini tractor operated harvester cum detopper for onion

Action Plan 12 : Development of package machinery for mechanization of Turmeric cultivation				
Activity	Name of the scientist	2022-23	2023-24	Deliverables/ expected out come
Development and adoption of tractor operated planter for	Dr. R.Kavitha Dr. A.Surendrakumar Dr.A.P.Mohan	Adoption and Modification of tractor operated	Modification of root crop harvester for de-	Development of protocol for mechanization of turmeric

sowing turmeric rhizomes & Protray seedlings	kumar	planter for turmeric rhizomes Adoption of Vegetable transplanter for protray turmeric seedlings Adoption of weeder cum earthing up	topping of plants, digging and collection of turmeric rhizomes	cultivation
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New proposal

Theme: II

Action Plan 13: Design and development of tractor operated turmeric combine harvester				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected outcome
<p>To study the cultivation practices and physical properties of turmeric plant and rhizomes</p> <p>To design and develop the components of turmeric combine harvester viz, de-topper, digger, collection unit</p> <p>To develop the tractor operated turmeric combine harvester</p> <p>To evaluate the performance & to work out the cost economics of developed tractor operated turmeric combine</p>	<p>Dr.P. Dhananchezhian</p> <p>Dr.R. Kavitha</p> <p>Dr.R. Thiyagarajan</p>	<p>Selection of design variables based on physical properties, plant, machine parameters</p> <p>Design of components and preparation of drawings</p> <p>Fabrication of de-topper, digger, collection unit</p>	<p>Assembly of components</p> <p>Field tests with the prototype</p> <p>Calculation of saving in cost and BC ratio</p>	<p>Tractor operated turmeric combine harvester will be developed.</p>

harvester				
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Theme III : UAV in Agriculture

Action Plan 14 : Evaluation of spraying characteristics in field crops and horticultural crops			
Activity	Name of the scientist	2022-23	Deliverables/ expected out come
Performance evaluation in selected field crops Performance evaluation in selected horticultural crops	Dr. R.Kavitha Dr. B. Suthakar Dr.A.P.Mohankumar	Evaluation of drone sprayer in selected horticultural tree crops (mango, sapota) Standardisation of operational parameters viz., height of spray, speed of operation etc., based on crops and diseases.	Autonomous drone spraying will be standardized and spraying characteristics will be studied for different crops.

New proposal

Action Plan 15: Design and development of Radio Frequency (RF) controlled pesticide applicator				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected out come
To design a Radio Frequency (RF) controlled platform for mounting the pesticide applicator To design a battery operated boom sprayer To develop a Radio Frequency (RF) controlled pesticide applicator for field / vegetable	Dr.B. Suthakar Dr. R.Kavitha Dr. A.P.Mohankumar	Selection of variables and preparation circuit diagram Fabrication of platform, boom sprayer and selection of RF controller, battery	Assembly of components Field tests with the prototype Calculation of saving in cost and BC ratio	Radio Frequency (RF) controlled pesticide applicator will be developed.

<p>crops. To evaluate the performance of the RF controlled boom sprayer To calculate the cost economics of the developed RF controlled pesticide applicator</p>				
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Action Plan 16: Development of remote controlled drum seeder				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected out come
<p>To study the operational parameters and the drudgery involved in drum seeder. To Explore the possibilities of Automating the drum seeding operation. To develop a remote controlled direct seeding system. Evaluation of the remote controlled direct seeding unit</p>	<p>Dr.A.Surendrakumar, Dr.P.Dhananchezhian</p>	<p>Study the operational parameters. Development of Automating the drum seeding operation.</p>	<p>Develop a remote controlled direct seeding system. Performance evaluation of the unit.</p>	<p>Use friendly remote controlled drum seeder for paddy.</p>

Externally funded scheme

Action Plan 17: Design and development of machinery for harvesting and collection of neem fruit				
Activity	Name of the scientists	2022-23	2023-24	Deliverables/expected out come
<p>To study and</p>	<p>Dr.A.Surendraku</p>	<p>To study</p>	<p>To conduct</p>	<p>Neem fruit harvesting</p>

<p>identify the pertinent parameters for harvesting Neem fruit</p> <p>To design and develop the Neem fruit collection system</p> <p>To conduct performance evaluation of the prototype machinery for collection and harvesting of Neem in the field condition.</p> <p>To work out cost economic of the developed prototype.</p>	<p>mar Dr. B.Suthakar</p>	<p>and identify the pertinent parameters for harvesting Neem fruit</p> <p>To design and develop the Neem fruit collection system</p>	<p>performance evaluation of the prototype machinery for collection and harvesting of Neem in the field condition.</p> <p>To work out cost economic of the developed prototype</p>	<p>and collection machinery.</p>
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Action Plan 19: Innovative Research and Development Components in palmyrah for the upliftment of Marginal farmers in Tamil Nadu

Activity	Name of the scientists	2022-23	Deliverables/expected out come
Design and development of Palmyrah climber Fabrication user friendly machine Conducting field trials Refinement if any	Dr.A.Surendrakumar Dr. R.Thiyagarajan	To design and development Performance evaluation	User friendly palmyrah climber

II. RENEWABLE ENERGY ENGINEERING

1. TECHNOLOGIES FOR ON FARM TRIALS:

a. Continuous Biochar unit

Different biomass (*Casuarina* wood, Cotton stalk, Coconut shell and Groundnut shell) were selected and physical, chemical and thermal properties were characterized for biochar production. The electric pyrolytic reactor of 10 kg/h capacity has been designed and developed for continuous biochar production.



Salient features:

- Optimum process temperature for biochar production : 400°C for coconut shell, 300°C for groundnut shell, and 350°C for casuarina and cotton stalk
- Energy available in syngas (78.23 MJ/h) was utilized for reheating of biochar resulted into a saving of electrical heating by 8 kW.
- The cost of biochar produced using continuous biochar unit is Rs. 42/kg.
- Energy closure of the developed continuous biochar reactor was 76.1 %.

Location : Agro-processing industries based biomass as raw materials

b. Triple walled thermally insulated metal Chulha

The Metallic Chula consists of a combustion chamber surrounded by insulation chamber and hot air chamber, grate, provisions for accommodating various size of vessels. The diameter and height of the combustion chamber are 15 cm 25 cm, respectively. The bottom portion of the metal chula is kept at a height of 5 cm above the ground level. The top cover plate is made of 14 G thick M.S. sheet.

Combustion chamber is insulated by constructing an annular space of 3.75 cm thick and filled with fire clay. The insulation chamber wall and combustion chamber walls are connected by 12 mm dia M.S. pipes with a triangular pitch of 6.5 cm.

Rectangular opening of 10 × 5 cm is provided in the chula outer wall for the entry of secondary air. The temperature of air inside the air heating space is always 4 to 5 °C higher than the ambient air. The overall dimensions of metal Chula is 31 cm X 29 cm.



Salient features:

- Combustion chamber surrounded by insulation chamber and hot air chamber (three walls)
- Grate with provisions for accommodating various size of vessels.
- Thermal Efficiency : 22-28%

Location: Pallapuram, Pachaimalai, Thankuruchi

c. Walk-behind solar powered rotary weeder

Simple, light weight with rigidity, ergonomically designed, green energy based weeder was designed and developed. The developed system consists of solar array, Lithium-ion battery with BMS, DC motor with gear box, charge controller, rotor blades, traction wheels, speed adjustment handle and frame. The developed solar weeder was tested for charging and discharging conditions under lab conditions. Later, field trail was conducted to access the drawbacks and convenience.



Salient features:

- Expected field capacity : 0.3 ha/day
- Weeding efficiency : 89 %
- Optional to attach the sowing tool for better utility
- Suitable for small farm holdings

Location: Thondamuthur

2. TECHNOLOGIES FOR ADOPTION:

a. Solar parabolic trough concentrator (PTC) for paddy-straw pasteurization

Solar parabolic trough concentrator (PTC) (4 kg/h capacity) connected with a pasteurization vessel (50 kg/batch) was installed. Glass reflectors of area 12 m² and CR 50 was used. Single axis tracking device is fitted for tracking the concentrator. No-load and load trials were carried out for steam pasteurization of paddy straw (size 3-5 cm) for 45 - 55 minutes. The process temperature and pressure were 67-72 °C and 1 kg/cm², respectively. Substrate (2-5 cm size) of 120 kg/day (dry weight) with hot water pasteurization at temperature range of 70-80°C was observed.



Salient features:

- Paddy straw 50 kg/batch(3-5 cm, soaked) pasteurization 45 - 55 min
- Optimized the process temp. 67-72°C, steam pressure 1-1.5 kg/cm²
- Reduction of processing time for pasteurization 26 % (double jacketed vessel)
- Thermal Efficiency η : 57.3 %
- Payback period: 4.8 years

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 / KUM / BOE / 2020 /001 (Sanctioned on 24.11.2020) Design and Development of Portable Forced Convective Solar Dryer	April 2020 to March 2022	S. Joshua Davidson Professor & Head, Department of Basic Engineering and Applied Sciences, AEC&RI, Kumulur.	Expedite the work as per the objectives.
2.	Promotion of Sustainable Agriculture for Economic Empowerment of Malayali tribes of Pachamalai	April 2021 to Nov March 2022	Dr. S. A. Ramjani, Associate Professor (BE), Dr.S.S.Sivakumar, Prof. & Head, Dept. of FMPE, AEC & RI, Kumulur Dr. J.John Gunasekar, Professor (BE), AC & RI, Thanjavur Dr. V. Alex Albert, Asst. Prof. (SST), KVK, Sirugamani, Trichy Dr.P.Dhandapani Asst. Prof. (PBG), TRRI, Aduthurai.	Expedite the work as per the objectives.
3.	Development of triple walled thermally insulated metallic chulah	April 2021 to March 2022	Dr. S.A. Ramjani, Assistant Professor (BE), AEC&RI, Kumulur Dr. J.John Gunasekar, Professor (BE), AC&RI, Thanjavur	Extension for one year to conduct long term performance evaluation.
AICRP Projects:				
1.	AICRP/AGE/CBE/BEN/001/ DRET-TCT/2020/1 Design and development	April 2020 to March	Dr.P.Subramanian, Professor and Head Dr.S.Pugalendhi,	Recommended for OFT

	of prototype reactor for the continuous production of biochar	2022	Retd. Professor, (Bioenergy)	
2.	AICRP/AGE/CBE/BEN/001/DRET-TCT/2021/2 Hydochar synthesis through microwave assisted artificial coalification	April 2021 to March 2023	Dr.P.Subramanian, Professor and Head (REE)	Work may be expedited as per the objectives.
3.	CMB/EAAI/DRET-BCT/2019/3 Exploration and optimization of pretreatment processes for efficient biomethanation of lignocellulosic biomass.	December 2019 to March 2023	Dr.D.Ramesh, Professor (Bioenergy) Dr.S.Karthikeyan, Professor (Microbiology)	Work may be expedited as per the objectives.
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.D.Ramesh, Professor (Bioenergy)	Work may be expedited as per the objectives.
5.	CMB/EAAI/DRET-BCT/2021/1 Valorization of bakery wastes for biogas production	April 2021 to March 2023	Dr.D.Ramesh, Professor (Bioenergy) Dr.S.Karthikeyan, Professor (Microbiology)	Work may be expedited as per the objectives.
6.	CMB/EAAI/DRET-LBT/2020/1 Co-pyrolysis of plastic waste and lignocellulosic biomass for high recovery fuel oil	April 2020 to March 2022	Dr.S.Sriramajayam, Assoc. Professor (Bioenergy) Dr.K.Chandrakumar, Asst. Professor (Biochem.)	Explore the possibility of industrial collaboration since the results are encouraging.
7.	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. Professor (Biochem.) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Intensive trials may be carried out to get fruitful results.
8.	CMB/EAAI/DRET-LBT/2021/1 Development of	July 2021 to March 2023	Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Work may be expedited as per the objectives.

	continuous reactor for pretreatment of lignocellulosic biomass for bioethanol production		Dr.K.Chandrakumar , Asst. Professor, (Biochem.)	
9.	CMB/EAAI/DRET-LBT/2021/2 Metabolic intervention for enhancing methanol production from methane	July 2021 to March 2023	Dr.K.Chandrakumar , Asst. Professor, (Biochem.) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Intensive trials may be carried out to get fruitful results.
10.	CMB/EAAI/DRET-SET/2020/1 Integration and optimization of solar parabolic trough concentrator for paddy-straw pasteurization	April 2020 to March 2022	Dr.R.Mahendiran, Assoc. Professor (Bioenergy) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Recommended for adoption
11.	CMB/EAAI/DRET-SET/2020/2 Development and evaluation of solar PV-T (Photovoltaic-Thermal) hybrid collector	April 2020 to March 2022	Dr.R.Mahendiran, Assoc. Professor (Bioenergy) Dr.P.Vijayakumary, Asst.Professor (Bioenergy)	Work may be expedited as per the objectives.
12.	CMB/EAAI/DRET-SET/2020/3 Development of walk-behind type solar powered rotary weeder	September 2020 to March 2023	Dr.R.Mahendiran, Assoc.Professor (Bioenergy)	Recommended for OFT
13.	CMB/EAAI/EMA/2017/1 Energy auditing in sugarcane cropping system	April 2017 to March 2022	Dr.R.Mahendiran, Assoc. Professor (Bioenergy) Dr.P.Subramanian, Professor and Head (REE)	Results may be published
14.	CMB/EAAI/DRES/2021/1 Demonstration of TNAU developed biochar production system in selected districts of Tamil Nadu	July 2021 to June 2022	Dr. P. Vijayakumary, Asst.Professor (Bioenergy)	More demonstrations may be conducted
15.	CMB/EAAI/DRES/2021/2 Demonstration of TNAU developed Forced combustible cook stove in	July 2021 to June 2022	Dr. P. Vijayakumary, Asst. Professor (Bioenergy)	Work may be expedited as per the objectives.

	selected villages of Coimbatore District			
16.	TNAU/CRP-EA/2020/04 Synthesis of carbon nanotubes from biomass through pyrolysis and carbon vapor deposition	April 2021 to March 2023	Dr.P.Subramanian, Professor and Head (REE) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Work may be expedited as per the objectives.
17.	TNAU/CRP-EA/2022/New Project Biopolymer production from lignocellulosic biomass through physical and chemical techniques	April 2021 to March 2023	Dr.P.Subramanian, Professor and Head (REE) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Work may be expedited as per the objectives.
18.	ICAR-CRP-EA/2020/1 Bac-Algae consortia for Fuel production and Resource recovery from Wastewater	April 2020 to March 2022	Dr.S.Karthikeyan, Professor (Microbiology) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy)	Work may be expedited as per the objectives.
19.	NASF/AEC/CBE/BEN/2019/R004 Studies on Thermal Degradation of Crop residues for Kinetics, Biopolymeric transitions and Value added products	April 2019 to March 2022	Dr.P.Subramanian, Professor and Head (REE) Dr.K.Chandrakumar, Asst Professor (Biochem.)	Work may be expedited as per the objectives.
20.	CDB/AEC/CBE/REE/2020/005 Production of carbon molecular sieves from coconut residues/wastes	April 2020 to March 2022	Dr.P.Subramanian, Professor and Head (REE) Dr.S.Sriramajayam, Assoc. Professor (Bioenergy) Dr.R.Mythili, Asst. Professor (Bioenergy)	Work may be expedited as per the objectives.

3. ACTION PLAN FOR THE YEAR 2022-24

Sl.No	Broad Area	Activity 2022-23	Deliverables/ Expected Outcome	Name of the Scientists
Action Plan 1: Thermochemical Conversion Technology				

1.	Synthesis of lignocellulosic based value added products through thermochemical conversion methods	Production of graphite derivatives from agricultural biomass	Graphite based materials generation and application in super capacitors	Dr. P. Subramanian Dr. D. Ramesh Dr. S. Sriramajayam Dr. P. Vijayakumary
2.	Sustainable Waste Management in Tea Industry (DBT)	Production of carbon rich products from tea wastes	Transformation of Tea Industry Waste into Carbon Neutral and Zero Waste	
Action Plan 2: Biochemical Conversion Technology				
1.	Bioconversion of promising Biomaterials for fuel and chemical production	Pretreatment processes for enhanced biomethanation of Cumbu-Napier grass	Optimized pretreatment parameters for Cumbu-Napier grass	Dr. D. Ramesh Dr. S. Karthikeyan
2.		Ethanol production from matured coconut wastewater	Process for ethanol production from matured coconut wastewater	
Action Plan 3: Liquid Biofuel Technology				
1.	Production of biofuels and solvents from renewable feedstock	Technology for liquid biofuel from agro-residues	Characterization and optimization of process parameters for green diesel production	Dr. S. Sriramajayam Dr. K. Chandrakumar
2.		Green processing of lignocellulosic biomass using deep eutectic solvents	Ecofriendly pretreatment process for the production of ethanol and biochemicals	
Action Plan 4: Exploring Solar Energy for Agriculture, Agro-based and allied industries				
1.	Solar powered gadgets/equipment for low draft power applications	Development of solar powered prime mover with multi-tool attachments for	Solar powered prime mover for low draft power operations	Dr. R. Mahendiran Dr. P. Vijayakumary

		small holder agriculture		
2.		Testing and evaluation of Solar based Universal Solar Pumping Controller (USPC) for agrarian applications	Efficient utilization of solar power for related agricultural applications during non-pumping hours	

III. FOOD PROCESS ENGINEERING

1. FOR ADOPTION

- Development of On-farm Hermetic Storage System for dehulled millets

2. FOR INFORMATION

- Development of seed decorticator for Vahl fruit (*Sapindus emarginatus*)
- Development of annatto pod decorticator

3. REMARKS ON THE ONGOING UNIVERSITY RESEARCH

Sl. No.	Project Number and Title	Name and Designation of the Project leader	Duration	Remarks
AICRP – PHET Scheme projects				
1	PH/CO/2020/001 Testing, Modification and Commercialization of a Color Sorter Cum Grader for Spherical Fruits developed at TNAU centre	Dr. P. Rajkumar, Dean (Engg.), AEC & RI, Kumalur	April 2020 to December 2022	Project may be closed, since the technology has been released
2	PH/CO/2020/002 Design and development of a dehumidified dryer for drying sticky tamarind fruits	Dr. P. Rajkumar, Dean (Engg.), AEC & RI, Kumalur.	April 2020 to December 2022	Project may be completed.

3	PH/CO/2020/001 Enzyme assisted extraction and characterization of dietary fiber from coconut residue meal	Dr. K. Gurusamy, Asst. Professor (Bio chem.)	April 2020 to December 2022	Project may be continued.
4	PH/CO/2020/002 Development of On-farm Hermetic Storage System for Dehulled Millets	Dr. M. Balakrishnan Professor & Head (FPE)	April 2020 to December 2022	Project may be completed. Recommended for adoption. Low cost material may be attempted.
5	PH/CO/2020/03 Effect of radio frequency assisted drying on qualities of high valued medicinal and aromatic plants	Dr. M. Anand, Asst. Professor (Hort.)	April 2020 - December 2022	Project may be continued.
6	PH/CO/2020/04 Characterization of sugarcane bagasse fibers reinforced epoxy bio composite product for rigid packaging	Dr. T.Pandiarajan Prof. (FPE)	April 2019 - December 2022	Project may be continued.
7	PH/CO/2021/001 Development of annatto pod decorticator	Dr. P. Sudha Asst. Professor (FPE)	April 2021 to March 2023	Project may be continued
8	PH/CO/2021/002 Development of seed decorticator for Vahl fruit (<i>Sapindus emarginatus</i>)	Dr. S. Parveen Asst. Professor (FPE)	April 2021 to March 2023	Project may be continued
9	PH/CO/2021/003 Postharvest Management Practices for Mitigating Aflatoxin Incidence in Groundnut	Dr. G. Amuthaselvi Asst. Professor (FPE)	April 2021 to March 2023	Project may be continued
10	PH/CO/2021/004 Improved postharvest handling of fruits and vegetables from production centre to urban markets in Coimbatore district	Dr. G. Amuthaselvi Asst. Professor (FPE)	April 2021 to March 2023	Project may be continued

11	PH/CO/2021/005 Development of process protocol for non – thermal processing of coconut neera for enhancement of shelf life and to achieve food safety	Dr. M. Balakrishnan Professor & Head (FPE)	April 2021 to March 2023	Project may be continued
University Research Projects				
1	AEC&RI/CBE/FAP/VVEG/2020/001 Development of techniques for extending shelflife of Moringa flower	Dr. G. Amuthaselvi Asst. Professor (FPE)	September 2020 to August 2022	Project may be continued
2	AEC&RI/CBE/FAP/2020/001 Development of Annatto seed separator cum cleaner machine	Dr. P. Sudha Asst. Professor (FPE)	September 2020 to August 2022	Project may be closed
3	AECRI/KUM/FAP/VEG/2020/001 Studies on drying of Ivy gourd (<i>Coccinia grandis</i>) under Hot air assisted Infrared drying condition	Dr. T. Pandiarajan, Professor (FPE)	August 2020 to May 2022	Project completed. Completion report may be sent for approval.
4	AECRI/KUM/FAP/VEG/2020/002 Design and Development of an Aggregatum Onion Peeler	Dr. S. Parveen Assistant Professor (FPE)	July 2020 to June 2021	Project completed. Completion report may be sent for approval. Recommended for OFT
5	AECRI/KUM/FAP/VEG/2020/003 Design and development of Moringa deseeder.	Dr. R. Arulmari Assistant Professor (FAPE)	January 2022 to September 2024	Project may be continued
6	AECRI/CBE/FAP/FRU/2020/001 Design and development of colour sorter cum grader for Spherical fruits.	Dr. P. Rajkumar, Dean, AEC & RI, Kumalur	January 2019 to December 2021	Technology may be commercialized through DABD

7	AECRI/CBE/FAP/PUL/2020/001 Development of hybrid system for pulse fractionation for high value pulse based functional foods	Dr. M. Balakrishnan Professor & Head (FPE)	August 2020 to July 2022	Project may be completed
8	AECRI/CBE/FAP/2021/001 Development of a prototype of radio frequency drier for non chemical disinfestation of dried turmeric rhizomes	Dr. R. Arulmari Assistant Professor (FPE)	January 2021 to December 2023	Project kept in abeyance
Externally funded projects				
1	TNFD/AECRI/CBE/FPE/2021/001 Development of pgpr microbial consortium for healthy seedling production in <i>Melia dubia</i> .	Dr. G. Thangamani Asst. Professor (AGM)	Jan 2021 to Dec 2022.	Project may be continued.
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"	Dr. I. P. Sudhagar Asso. Prof. (FPE)	April 2019 to June 2022	Project may be completed.
3	DST-SERB/AECRI/CBE/FPE/2022/R001 Design and Development of a decorticator for Annatto and development of prototype extraction unit with advanced techniques for bixin for sustainable use in food industry	Dr. P. Sudha Asst. Professor (FPE)	December 2020 to November 2024	Project may be continued
4	CIL/ AEC & RI/ FPE/ 2021/R001 Design and Development of Neem (<i>Azadirachta indica</i>) fruit depulper	Dr. P. Sudha Asst. Professor (FPE)	June 2021 to May 2023	Project may be continued

4. ACTION PLAN (2022 - 2023)

Action Plan 1: Development of On-farm Continuous Grader for Fruits			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Development of On-farm continuous weight based grader for fruits	Dr.T.Pandiarajan Dr.M.Balakrishnan Dr.S.Parveen Dr.M.Anand	<ul style="list-style-type: none"> Fabrication of a continuous weight based grader Performance evaluation of the grader for optimization of machine parameters 	The developed equipment will be useful for farmers, traders, FPO's, to grade the fruits based on weight for price fixation and better remuneration for their produce.
Action Plan 2: Process Techniques for Extending Shelf Life of Moringa Flower			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Development of modified atmospheric storage system for moringa flower	Dr. G. Amuthaselvi Dr. P. Sudha Dr. M. Anand	Optimization of process conditions for modified atmospheric storage system for moringa flower	Moringa flowers with extended storage life using MAP
Action Plan 3: Improved Processing and Value Addition of Turmeric			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Development of turmeric slicer and low temperature grinding system for turmeric	Dr.M.Balakrishnan Dr.V.Thirupathi Dr.T.Pandiarajan Dr.S.Parveen Dr.M.Anand Dr.K.Gurusamy	Fabrication of turmeric slicer and optimization of process conditions for slicing of turmeric Quality assessment of sliced turmeric for value addition	Development of value added products from turmeric, which will be an ingredient to develop functional foods To boost exports for earning foreign exchange
Action Plan 4: Cold Plasma Treatment to Mitigate the Aflatoxin in Groundnut			
Activity	Name of the scientists	2022-23	Deliverables/expected out come
Controlling the incidence of aflatoxin in groundnut during	Dr. G. Amuthaselvi Dr. S. Ganapathy Dr. G. Thangamani	Optimization of energy level and treatment time for groundnut	Technology for mitigation of aflatoxin in groundnut

postharvest handling by cold plasma treatment.		kernel	
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Action Plan 5: Process Development for the Extraction of Bixin from Annatto

Activity	Name of the scientists	2022-2023	Deliverables/expected out come
Extraction of bixin from Annatto	Dr. P. Sudha Dr. G. Amuthaselvi Dr. K. Gurusamy	Optimization of method of extraction and process parameters for the extraction of bixin	Bixin is a natural colorant, which can replace synthetic colorant

Action Plan 6: Improved Processing Technology for Production of Quality Jaggery

Activity	Name of the scientists	2022-23	Deliverables/expected out come
Development of improved production process for jaggery	Dr.M.Balakrishnan Dr.T.Pandiarajan Dr.K.Gurusamy Dr.G.Thangamani	Fabrication of cooling pan and the granulator to prevent lump formation	Production of uniform granular size, free flowing powdered jaggery with enhanced shelf life, which will address the problems faced by the jaggery processors

Action Plan 7 : 3D Food Printing Technology for Bakery Products

Activity	Name of the scientists	2022-23	Deliverables/expected out come
Development of customized shapes of bakery products with improved nutritional qualities using 3D printing technology	Dr. S. Parveen Dr. M. Balakrishnan Dr.G.Gurumeenakshi Dr. K. Gurusamy	<ul style="list-style-type: none"> Optimization of rheological properties of the bakery product mix and optimization of printing parameters 	Customized shapes with improved nutritional quality and minimum product quantity

Action Plan 8 : Encapsulation of monolaurin from coconut oil for enhancing its bioavailability

Activity	Name of the	2022-23	Deliverables/expected
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	scientists		out come
Extraction of monolaurin from coconut oil and encapsulation by spray drying technique	Dr. M. Balakrishnan Dr. S. Marimuthu Dr. S. Karthikeyan	<ul style="list-style-type: none"> • Optimize the process parameters for the extraction of monolaurin • Evaluating the carrier material for encapsulation of monolaurin • Evaluating the antimicrobial property of monolaurin 	Encapsulated monolaurin can be used as an emulsifier in baked foods, dairy products and beverages, which could improve the functional and therapeutic value

IV. 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/CBE/SWC/2020/001 Effect of drip Irrigation and different colour mulches for vegetable crops under controlled condition (Cucumber - Cucumis sativus and Tomato – Solonum lycopersicum)	September 2020- August 2022	Dr. K. Nagarajan Professor & Head, Department of Soil and Water Conservation Engineering, AEC &RI, Coimbatore. Dr. I. Geetha Lakshmi Assistant Professor (Hort.) Department of FPE, AEC&RI, Coimbatore	Completion report may be submitted.
2.	AECRI/CBE/SWC/2020/002	November 2020 to March 2022	Dr.S.Selvakumar, Asst. Prof. (SWCE) Dr.I.Geethalakshi Asst. Prof. (Hort.)	Extension proposal may be submitted
3.	AECRI / CBE / SWC / 2020 / 003 Prediction of groundwater level in Noyyal river basin of	Sept. 2020 – August 2022	G. Thiyagarajan, Assistant Professor (SWCE), WTC, TNAU,	Project to be continued

	Tamil Nadu using Artificial Neural Network (ANN)		Coimbatore	
4.	Design of sediment filtration for Groundwater Recharge through Bore wells	Sept. 2021- August 2024	Dr. V.Ravikumar Professor (SWCE), WTC	Project to be continued
5.	AECRI / CBE / SWC / 2021 / 001 Estimation of daily actual evapotranspiration using remote sensing	February 2021 to March 2022	Dr. Balaji Kannan Professor(SWCE), AEC&RI, TNAU, CBE	Continuation proposal may be sent and the tool may be developed

Externally Funded Project:

1.	ICAR/AEC/CBE/SWC/2018/R 001 "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.	August 2018- March 2022	Dr. K. Nagarajan Professor & Head, Department of Soil and Water Conservation Engineering, AEC &RI, Coimbatore.	The developed filter may be evaluated as per the objectives of CRP
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2.	AECRI/KUM/SWC/2020/001 Irrigation Scheduling by Soil Water Tension Measurements for Drip Irrigated Onion	June 2020 to May 2022	Dr. M. Manikandan, Assistant Professor (SWC) Dr. A. Raviraj Professor and Head (IDE)	The results of the projects may be given for information
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ICAR & AICRP Projects:

1.	AICRP/WTC/CBE/ IWM/001 Estimation of crop coefficient for Banana for drip irrigation in Western Zone of Tamil Nadu.	2020 - 2023	Dr. M. Nagarajan, Asst. Prof. (SWCE), ARS, Bhavanisagar.	Repetitive trails may be conducted as per the objectives
2.	AICRP/WTC/CBE/IWM/001/ P2 Automatic drip irrigation scheduling for Maize	April 2021 – March 2023	G. Thiyagarajan, Assistant Professor (SWCE), WTC, TNAU, Coimbatore	Project to be continued
3.	AICRP/DCM/KPT/AGR/1971 /004	2006 to Long	Dr. M. Manikandan Assistant Professor	Annual data should be

	Catchment - storage - command area relationship for enhancing water productivity in a micro - watershed (Vertisols)	Term	(SWC)	recorded and visualized accordingly
4.	AICRP/DCM/KPT/AGR/1971 /004 Effect of supplemental irrigation and intercropping on yield and water use efficiency of groundnut	2020 - 2023	Dr. M. Manikandan, Assistant Professor (SWC)	To be continued

2. ACTION PLAN FOR THE YEAR 2022-24:

Theme- Irrigation and Drainage Engineering

Scientist Involved	Project	Deliverables
Dr. K. Nagarajan, Professor and Head (SWCE)	Development and Testing of Low cost Filters	<ul style="list-style-type: none"> Develop low-cost filters with optimal selection of off-the- shelf components as well filtering media
Dr. K. Nagarajan, Professor and Head (SWCE) Dr. I. Geethalakshmi, Asst. Prof. (Horticulture)	Effect of Drip Irrigation and Different Colour Mulches for Vegetable Crop under Controlled Condition (CUCUMBER - <i>Cucumis sativus</i> and TOMATO - <i>Solanum lycopersicum</i>)	<ul style="list-style-type: none"> Assess soil temperature variation for different colour mulches for vegetable crop under polyhouse condition and evaluate the soil moisture distribution and yield parameters under different coloured mulches.
Dr. Balaji Kannan, Professor (SWCE)	Estimation of daily actual evapotranspiration using remote sensing	<ul style="list-style-type: none"> Remote sensing based daily actual evapotranspiration using surface energy balance methods and vegetation indices method Develop a tool for estimation of daily actual evapotranspiration
Dr. G. THIYAGARAJAN, Assistant Professor (SWCE), Water Technology Centre	Automatic drip irrigation scheduling for Maize	<ul style="list-style-type: none"> Assess water productivity, crop productivity & energy saving for different types automated drip irrigation system in Maize

Dr. M. Nagarajan, Assistant Professor (SWCE), ARS, Bhavanisagar	Estimation of crop coefficient for Banana for drip irrigation in Western Zone of Tamil Nadu	<ul style="list-style-type: none"> Estimate the crop coefficient for Banana for different stages under drip irrigation and develop an optimal irrigation schedule for Banana based on the estimated crop coefficient for higher productivity for western zone of Tamil Nadu
Dr. M. Manikandan, Assistant Professor (SWCE), ARS, Kovilpatti	Effect of supplemental irrigation and intercropping on yield and water use efficiency of groundnut	<ul style="list-style-type: none"> Study the effect of supplemental irrigation on yield and evaluate the performance of intercrop under rainfed condition
Dr. S. Selvakumar, Assistant Professor (SWCE) Dr. I. Geethalakshmi, Assistant Professor (Horticulture)	Impact of Low Tunnel drip irrigation strategies on microclimate modification in horticulture crops	<ul style="list-style-type: none"> Investigate and validate new low tunnel technologies for water melon and musk melon cultivation

Theme: Surface and Ground Water

Scientist Involved	Project	Activity
Dr. V. Ravikumar, Professor (SWCE), Water Technology Centre.	Sediment filtration Design for Ground water Recharge through Bore wells	<ul style="list-style-type: none"> Design and evaluation of a suitable sediment filtration system for groundwater recharge through bore wells
Dr. V. Ravikumar, Professor (SWCE), Water Technology Centre.	Identification of Potential Ground water Recharge Zones in various River basins of Tamil Nadu	<ul style="list-style-type: none"> Suggest suitable artificial recharge structures for sustainable management of groundwater
Dr. G. THIYAGARAJAN, Assistant Professor (SWCE), Water Technology Centre	Prediction of ground water level in Noyyal river basin of Tamil Nadu using Artificial Neural Network	<ul style="list-style-type: none"> Predict the groundwater levels in the hard rock region using ANN and to test verify the predicted and observed groundwater levels
Dr.A.Valliammai , Associate Professor(SWCE)	Impact of recharge cum pumping well to	<ul style="list-style-type: none"> To identify the existing recharge cum pumping well in the study area Study on impact of recharge cum

Dr. G. Thiyagarajan, Assistant Professor (SWCE), Water Technology Centre	augment the groundwater recharge rate in hard rock aquifer	pumping well in increasing the recharge rate in hard rock aquifer
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Theme: Soil and Water Conservation

Scientist Involved	Project	Activity
Dr. M. Nagarajan, Assistant Professor (SWCE), ARS, Bhavanisagar	Application of Soil and Water Assessment Tool (SWAT) model for estimation of surface water resources and temporal water demand for sustainable water management in a selected watershed of Bhavani river basin	<ul style="list-style-type: none"> Temporal water demand in Bhavani river basin
Dr. M. Manikandan, Assistant Professor (SWCE), ARS, Kovilpatti	Catchment - storage - command area relationship for enhancing water productivity in a micro – watershed (Vertisols)	<ul style="list-style-type: none"> Study the feasibility of using the farm pond water for giving supplemental irrigation to rabi crops and water balance components of stored water in farm ponds
Dr. M. Manikandan, Assistant Professor (SWCE), ARS, Kovilpatti	Effect of mechanization on yield and economics of rainfed cotton production	<ul style="list-style-type: none"> Compare the cost of cotton cultivation by mechanized, partially mechanized and traditional practices. Analyse the energy input and output for cotton production
Dr. N. Anandaraj, Associate Professor and Head, Dept. of Agrl. Engg., Madurai Dr. J. Ramachandran, Teaching Assistant	Rainfall-Runoff Modelling of Small Watersheds Using Satellite Data and GIS	<ul style="list-style-type: none"> To delineate and study the Geomorphologic characteristics of the watershed To prepare different thematic maps and estimate the surface runoff using SCS-CN method
Dr.A.Valliammai , Associate Professor(SWCE) Dr.Balaji Kannan, Professor(SWCE)	Prioritization of Watersheds in Noyyal river basin for implementing the soil and water conservation practices by using Remote	<ul style="list-style-type: none"> Preparation of hydrological thematic maps of the study area Viz. land use/cover, land forms, geology, Geomorphology and soil in

	sensing and GIS techniques	<p>the GIS domain</p> <ul style="list-style-type: none"> • Estimation of morphological parameters of the watershed • Integration of morphological parameters with hydrological information to prioritize the watersheds for implementing the soil and water conservation practices and technology transfer
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V. Remarks

a. General recommendations

1. PG and Ph.D. students strength may be increased in all the departments of Agricultural Engineering (Action: All the Departments)
2. TNAU released technologies and farm machineries may be popularized and promoted(Action: All the Departments)
3. Possibilities of obtaining funding from RKVY scheme may be explored (Action: All the Departments)
4. Projects may be formulated based on interdisciplinary research (Action: All Departments of AEC & RI, CBE & Kumulur)
5. Scientists may be encouraged to publish research articles in high impact factor and NAAS rated (>6.0) journals (Action : All the Departments)

b. Farm Machinery

1. Action may be taken to exhibit the machinery / implements developed by AEC&RI in a single location. Farmer's opinion may be invited towards the improvement of the machinery(Action: FM&PE, CBE)
2. Development of machinery for small and marginal farmers may be initiated(Action: FM&PE, CBE)
3. Establishment of model farms on farm mechanization may be planned(Action: FM&PE, CBE)
4. Sesame mechanization trial may be carried out at RRS, Vridhachalam. Trials may also be carried out in collaboration with the Department of Agriculture and Farmers Welfare (Action: FM&PE, CBE)
5. Research on development of maize cob harvester may be initiated(Action: FM&PE, CBE)
6. Demonstration of power operated cono weeder may be arranged (Action: FM&PE, CBE)

7. Mechanization activities may be carried out in collaboration with the Agronomy scientists(Action: FM&PE, CBE)
8. Brain storming session may be organized to assess the modifications to be carried out in the existing machineries(Action: FM&PE, CBE)
9. Prototype/commercially available farm machineries may be refined based on the farmers' feedback and Governments priority (Action: FM&PE, CBE & Kumulur).

c. Renewable Energy Engineering

1. Three walled Chulha fabricated at AEC&RI, Kumulur may be commercialized (Action: DREE, Kumulur)
2. Research on newer renewable energy technologies *viz.*, concentrated solar power, microbial fuel cell technology and green hydrogen production may be focussed(Action: DREE, Coimbatore and Kumulur)
3. Delineation of areas for implementation of different renewable energy systems based on the potential of renewable energy resources (Solar, wind and hydro) in Tamil Nadu (Action : DREE, Coimbatore)

d. Food Process Engineering

1. Commercialization of technologies developed by Dept. of FPE may be intensified through DABD (Action: FPE, CBE)
2. Research work on Cold Plasma Technique may be intensified (Action: FPE, CBE)
3. Development of storage system for dehulled millets may be carried out using low cost materials with durability and safety (Action: FPE, CBE)
4. The hermetic storage bins for the dehulled millets need to be fabricated with low-cost materials(Action: FPE, CBE)
5. Table top aggregatum onion peeler for house hold purpose may be developed (Action: FPE, CBE)
6. Bixin degradation studies and the stability to be evaluated(Action: FPE, CBE)
7. Utilization of neem fruit pulp may be explored(Action: FPE, CBE)
8. More focus has to be given for waste utilization of food industry(Action: FPE, CBE)
9. Research work has to be carried out in advanced techniques like 3 D food printing(Action: FPE, CBE)

e. Soil Water Conservation Engineering

1. Mechanism for treating hard water at source itself may be developed(Action: SWCE, CBE)

2. SRTM DEM Map for basin level possibility may be studied(Action: SWCE, CBE & RS&GIS, CBE)
3. Documentation of number of bore wells and groundwater level (basin / sub-basin) may be done and sent to AED for adoption (Action: Director, WTC & SWCE, CBE)
4. Research projects may be proposed on Soil conservation activities (Action: SWCE, CBE & SWCE, Kumulur).
5. Brainstorming session may be arranged with Head of Departments of AEC & RI, Coimbatore and Kumulur for identifying research gaps based on the farmers need and government priorities (Dean, AEC&RI CBE & Kumulur).

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