

**TAMIL NADU AGRICULTURAL UNIVERSITY**

**PROCEEDINGS**

**8<sup>th</sup> AGRICULTURAL ENGINEERING SCIENTISTS' MEET 2020**  
**(1<sup>st</sup> June 2020)**

**Lead Centre**

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

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

## **PROCEEDINGS**

### **8<sup>th</sup> Agricultural Engineering Scientists' Meet, 2020 (June 1, 2020)**

The 8<sup>th</sup> Agricultural Engineering Scientists Meet was conducted on 1.6.2020 in Anna Auditorium involving 50 scientists off-line and more than 240 scientists on-line covering all college campuses, research stations and KVKs. **Dr. N. Kumar**, Vice Chancellor, TNAU, has inaugurated the event and offered his opening remarks. He suggested the importance of farm mechanization in view of acute labour shortage and narrow window for sowing and other agricultural operations. Importance is given to solar pumps and thorough study required to assess the energy saving and environmental safety. Agricultural processing should be done integrated way so as to reduce the drudgery to farmers at the post-harvest stage. Neera processing set up has be optimized and ready to use by July 2020. Polyhouse technology needs further optimization to address issues raised by farmers and Department officials. The machineries assembled in AEC & RI, Kumulur may be given away to all research stations and colleges by adopting the university procedure.

**Dr. K.S. Subramanian**, Director of Research flagged off issues such as data collection required to scientifically prove the importance of complete mechanization in sugarcane and other crops, combined harvesting machineries to be fine tuned to suit sugarcane, groundnut and maize, TNAU protray pneumatic seed picker & sowing machine, automatic tissue culture banana planter, a dedicated team to develop strategies to combat birds damage and human-animal conflict, scientific validation of solar pumps and solar dryers, demo of integrated turmeric processing, irrigation automation using artificial intelligence and robotics in agriculture. These strategies are required to achieve precision or digital farming.

**Dr. B. Sridhar**, Dean, AEC & RI, Coimbatore, presented the overall achievements and action plan for the year 2020-2021. Heads of Departments in Farm Machinery, Renewable Energy Engineering, Food Process Engineering, Post-Harvest Technology Center, Soil & Water Conservation Engineering and Physical Sciences & IT, presented the research highlights with respect to their department concerned. The Vice Chancellor offered concluding remarks and the Director of Research summarized the event. **Dr. V. Thirupathi**, Dean, AEC & RI, Kumulur, proposed a formal vote of thanks. Overall, the Agricultural Engineering activities and achievements were overwhelmingly appreciated.

The proceeding of the meet is furnished below:

**I. Farm Machinery**

1. Technologies for adoption
2. Remarks on the ongoing projects
3. General remarks
4. Action Plan 2020-2022

**II. Renewable Energy Engineering**

1. Technologies for adoption
2. Remarks on the ongoing projects
3. General remarks
4. Action Plan 2020-2022

**III. Food Process Engineering**

1. Technologies for adoption and OFT
2. Remarks on the ongoing projects
3. General remarks
4. Action Plan 2020-2022

**IV. Centre for Post Harvest Technology**

1. Technologies for adoption
2. Remarks on the ongoing projects
3. Action Plan 2020-2022

**V. Soil and Water Conservation Engineering**

1. Technologies for adoption
2. Remarks on the ongoing projects
3. General remarks
4. Action Plan 2020-2022

**VI. Physical Sciences and Information Technology**

1. Remarks on the ongoing projects
2. Action Plan 2020-2022

**VII. Recommendation of the 8<sup>th</sup> Agricultural Engineering Scientists Meet**

VIII. Closing remarks / Way forward (Vice-Chancellor) and Director of Research

IX. Contact details of the scientists participated in the 8<sup>th</sup> Agricultural Engineering Scientists' Meet 2019

## I. FARM MACHINERY

### 1. Technologies for adoption

- (i) Two row tissue culture banana planter.
- (ii) High clearance weeder

### 2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Name of the PI & Co-PI	Remarks
<b>Core Projects</b>			
1	<b>AECRI / KUM / FMPE / 2018 / CP037</b>  Design and development of power operated cono-weeder	Dr. P. Dhananchezhiyan Assistant Professor (FM) Dr. D. Asokan Professor and Head, FM&PE, AEC&RI, Coimbatore	Intensive field trails may be carried out in different locations after weight reduction and provision for turning at Head land.
2	<b>AECRI / KUM / FMB / 2018 / CP098</b>  Development of Wireless Turning Indicator for Agricultural Tractor - Trailer System to Ensure Safety	Dr. A.P.Mohan Kumar Assistant Professor (FM)	Synchronization of developed model with different tractors may be carried out. Flashing as per ISI standards, battery operated. Commercialization of the developed indicator may be taken up through ABD.
<b>AICRP on Farm Implements and Machinery</b>			
1.	<b>AICRP / AGE / CBE / FMR / 002-17 / 001</b>  Design and development of a system for sowing pelletized rice seeds	Dr. D. ManoharJesudas, Professor and Head (up to 30.09.2019) Dr. B. Shridar , Professor (up to 21-09-2019) Dr.D.Asokan, Professor and Head (from 1.10.2019)	Proposal may be prepared to have collaborative research with Anna University, Chennai to develop a commercial prototype.
2.	<b>AICRP / AGE / CBE / FMR / 002 / 17 / 002</b>  Design and Development of a corn cob harvester	Dr. B. Shridar, Professor (up to 21-1-2019) Dr.D.Manohar Jesudas, P&H (up to 30-9-2019) Dr.D.Asokan, Professor and Head (from 1.10.2019)	Corn cob harvester may be taken under large scale trials may be taken to release the unit.

3.	<b>AICRP / AGE / CBE / FMR / 002 / 17 / 003</b> Design and development of picker combine for field harvested groundnut	Dr.R.Kavitha, Professor Dr.B.Suthakar, Asst. Prof. Dr.D.Manohar Jesudas, P&H (up to 30-9-2019)	Required modifications may be carried out. Laboratory trials may be completed before the season. Field trials may be conducted during the ensuing groundnut harvesting season.
4.	<b>AICRP / AGE / CBE / FMR / 002 / 18 / 001</b> Development of a tractor operated high clearance weeder	Dr. V.M. Duraisamy, Professor Dr. D. ManoharJesudas, Prof. & Head (Upto 30.09.2019) Dr. D. Asokan, Professor and Head (From 1.10.2019)	<ul style="list-style-type: none"> <li>Field trials may be conducted in cotton/maize crop.</li> <li>Weeder may be taken under On Farm Trial and necessary action may be taken to release the unit.</li> </ul>
5.	<b>AICRP / AGE / CBE / FMR / 002 / 18 / 02</b> Development of a tractor operated planter for tissue culture banana	Dr.B.Suthakar, Asst. Prof. Dr.D.Manohar Jesudas, P&H (up to 30-9-2019)	<ul style="list-style-type: none"> <li>Two row planter may be developed and evaluated in the field.</li> <li>Action may be taken to release the two row planter.</li> </ul>

#### **AICRP on Ergonomics and Safety in Agriculture**

1.	<b>AICRP / AGE / CBE / AMC / 003 / 17 / 001</b> Vibration studies of Mini tractor with attachments	Dr.A.Surendrakumar, Professor Dr.R.Thiyagarajan, Assistant Professor	Action may be taken towards the purchase of Vibration analyzer with latest configuration.
2.	<b>AICRP / AGE / CBE / AMC / 003 / 17 / 002</b> Studies on ergonomic interventions in semi-automatic vegetable transplanters	Dr.A.Surendrakumar, Professor Dr.R.Thiyagarajan, Assistant Professor	The fabrication work may be completed early. The machine may be released after conducting field trials.
3.	<b>AICRP / AGE / CBE / AMC / 003 / 19 / 001</b> Studies on ergonomic interventions in portable type auger digger to make it women friendly	Dr.R.Thiyagarajan, Asst. Professor Dr.A.Surendrakumar, Professor	The fabrication work may be completed early incorporating the refinements/ modifications. The machine may be released in the ensuing year.

### **3. General remarks:**

- Documentation may be done on establishment of complete mechanization trials conducted at Coimbatore and Bhavanisagar. (**Action:** P&H, FM&PE, Coimbatore)
- Small farm mechanization may be prioritized. (**Action:** P&H, FM&PE, Coimbatore)

3. Research on protray seeder for vegetable crops may be focused, which plays a vital role in horticulture. (**Action:** P&H, FM&PE, Coimbatore)
4. Bird scaring machines may be developed. (**Action:** P&H, FM&PE, Coimbatore)
5. Research may be focussed towards Digital agriculture, Artificial Intelligence and Robotics in Agriculture in collaboration with other Institutes like Anna University. (**Action:** P&H, FM&PE, Coimbatore)

#### **4. Action Plan (2020-22)**

##### **Theme I: Small Farm Mechanization**

<b>Action Plan 1: Design and Development of small groundnut combine harvester</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/expected out come</b>
Design and development of small groundnut combine harvester	Dr. B. Suthakar Dr. R.Kavitha	Selection of design parameters	Assembly of components	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.
Performance evaluation of the small groundnut combine harvester		Design of components and preparation of drawings	Field tests with the prototype groundnut combine harvester	
Design refinement and field trials		Fabrication of digging, conveying and stripping mechanisms	Calculation of saving in cost and BC ratio	

<b>Action Plan 2: Design and Development of mini corn cob harvester</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/expected out come</b>
Design and development of self propelled corn cob harvester.	Dr. R.Kavitha Dr. B.Suthakar	Selection of design parameters	Assembly of components	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.
Performance evaluation of		Design of components and preparation of drawings	Field tests with the prototype self propelled corn cob	

self propelled corn cob harvester		Fabrication of corn cob snapping, maize stalk harvesting and cob collection mechanisms	harvester  Calculation of saving in cost and BC ratio	
Design refinement and field trials				

### Action Plan 3 : Development of Bird scarer

Activity	Name of the scientists	2020-21	Deliverables/ expected outcome
To study the different models of bird scarer and to select the suitable mechanism	Dr. A. Surendrakumar Dr. R.Thiyagarajan	Study of different models of available bird scarers and their working principles	Bird scarer
To develop a prototype bird scarer		Fabrication of prototype bird scarer	
To evaluate the performance of prototype in the field		Field evaluation	

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

Activity	Name of the scientists	2020-21	2021-22	Deliverables/ expected outcome
To optimize base and intercrop geometry.	Dr. S.S.Sivakumar Professor and Head Dept. of FM&PE, AEC&RI, Kumulur, Trichy	Study of crop and field parameters and optimize the crop geometry	Development of prototype Groundnut cum Blackgram Seeder	Tractor operated Groundnut cum blackgram seeder
To evaluate suitable metering mechanisms for groundnut and blackgram.		Development of suitable metering mechanisms for groundnut and blackgram (selection of	Performance evaluation of developed prototype seeder in lab and actual field conditions viz.,	
To develop a prototype of groundnut cum blackgram seeder.				

To evaluate the performance of prototype in laboratory and actual field conditions.		suitable sensor devices)  Fabrication of components seed planter	Data of yield and crop parameters field efficiency	
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**Theme II:** Mechanization of Horticulture crops

**Action Plan 5: Automation of sowing of vegetable seeds in protray**

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

**Action Plan 6: Ergonomic studies in Vegetable transplanter**

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



<b>Action Plan 7 : Studies on interventions in self-propelled auger digger suitable to women farmers</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected out come</b>
Design modification of self-propelled auger digger to suitable for women farmers  Ergonomic evaluation	Dr.R.Thiyagarajan 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.
<b>Action Plan 8: Feasibility testing of commercially available coconut /arecanut climber</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected out come</b>
Study of commercially available coconut/arecanut tree climbers  Selection and Procurement  Feasibility testing in coconut / arecanut farms	Dr.R.Kavitha Dr.B.Suthakar	Collection of information on available tree climbers  Selection and procurement process  Feasibility study of the climber and refined if needed		Engine operated coconut/arecanut tree climbers
<b>Action Plan 9: Development of Mini-Tractor operated onion (<i>Allium cepa</i> var.cepa) harvester with detopping unit</b>				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected out come</b>
To investigate the crop parameters and suitable mechanism for harvesting the onions.  To develop a prototype onion harvester with detopping	Dr. P.K.Padmanathan Assistant Professor(FM) Department of Farm Machinery and Power Engineering AEC&RI, Kumulur, Trichy	Study of crop and field parameters  Selection suitable mechanism for detopping and digging of onion	Assembling of components and development of prototype unit  Performance evaluation of developed	Mini tractor operated harvester cum detopper for onion

unit on the basis of optimized parameters To evaluate the performance of the prototype unit under the actual field conditions.		Fabrication of components viz., detopper, harvester mechanisms, power transmission systems for mini tractor	prototype onion harvester cum detopper	
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**Theme III:** Unmanned Aerial Vehicle (UAV) in Agriculture

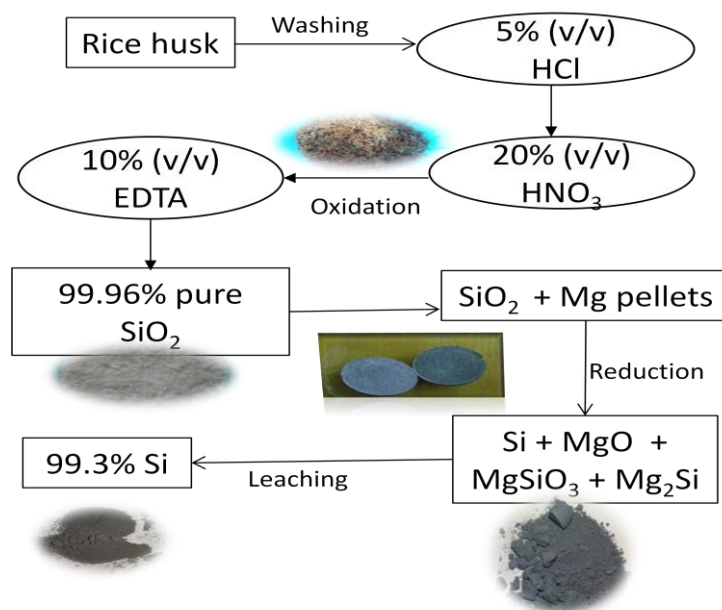
<b>Action Plan 10 : Evaluation of spraying characteristics in horticultural crops</b>				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
Study the machine components of autonomous drone sprayer Evaluation in laboratory condition Performance evaluation in selected field crops Performance evaluation in selected horticultural crops.	Dr. R.Kavitha Dr. B. Suthakar	Establishment of laboratory for testing of spraying characteristics  Evaluation of drone sprayer in lab condition viz. droplet size, spray width, spraying pattern, VMD, NMD etc.,  Evaluation of drone sprayer in selected field crops (paddy, groundnut)	Evaluation of drone sprayer in selected horticultural tree crops (mango, sapota)  Standardization 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.

## II. RENEWABLE ENERGY ENGINEERING

### Technologies for adoption:

#### **Silica production from biomass for PV cell production**

- Rice husk was used to produce Silica with purity level of 99.96%.
- The production processes used are washing of rice husk, oxidation, reduction ( $\text{SiO}_2$  and Mg (1:2)) and leaching (Hydrochloric acid and Acetic acid (1:4)).
- Silicon retrieved after leaching had purity level of 99.3%.



Production of high purity solar grade silicon from rice husk through magnesio thermic reduction process

### **2. Remarks on the ongoing research projects**

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
<b>University Research Projects</b>				
1.	<b>AEC&amp;RI/CBE/BOE/2017/001-</b> Development of a frugal engineering thermal reactor for generating energy efficient Refuse and Biomass Derived Fuels	August 2017 to March 2020	Dr.P.Subramanian (PI)	Performance evaluation of the reactor has to be carried out, after confirmatory trials with cost economics and energy calculation.

2.	<b>AECRI/TRY/BIO/2019/001</b> 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.)	Work may be carried out as per objectives
<b>Core Research Project</b>				
3.	<b>AEC&amp;RI/CBE/BOE/2018/CP089-</b> Comparative study of solar tunnel dryer with different cover materials for drying agricultural produce	November 2018 to October 2020	Dr. P. Vijayakumary (PI) Dr. S.Pugalendhi (Co-PI)	Quality analysis of the product is to be added
4.	<b>AECRI/CBE/BOE/2018/CP148-</b> Evolution of higher energy producing techniques for fuel and chemical generation from cashew nut by-products	January 2019 to December 2020	Dr. P. Subramanian, Professor	Work may be carried out as per the objectives
5.	<b>AECRI/KUM/BIE/2018/CP035:</b> Development of Fluidized Bed Gasifier for Leafy Biomass	August 2017 to March 2020	Dr. S.A. Ramjani, Assistant Professor (BE), AEC & RI, Kumulur  Dr. J.John Gunasekar, Professor (BE) & Head, AEC & RI, Kumulur  Dr.P.Vijayakumary, Asst. Professor (BE) Dept. of REE, AEC & RI, Coimbatore	Economical assessment for different biomasses may be made and work may be carried out as per objectives.
<b>Externally Funded Projects</b>				
1.	<b>NASF/AEC/CBE/BEN/2019/R004-</b> Studies on Thermal	April 2019 to March 2022	Dr. P. Subramanian, Professor	Project may be carried out as per the objective

	Degradation of Crop residues for Kinetics, Bio-polymeric transitions and Value added products			
2.	ICAR-NASF scheme on Eliciting soil microbiome responses of rice for enhanced water and nutrient use efficiency under anticipated climate change	July 2015 To June 2019	Dr. S. Karthikeyan, Professor (Microbiology) Dr D Balachander, Professor (Microbiology)	Specific recommendation out of the study conducted may be arrived
3.	Enhanced biomass productivity and biofuel production potential of algae cultivated in raceway ponds using agro-industrial wastewater	April 2017 To March 2020	Dr. S. Karthikeyan, Professor (Microbiology) S Sriramajeyam, Asst. Professor (Bioenergy)	Specific recommendation may be arrived based on the study conducted.
4.	NICRA scheme on Strategies for management of rice straw and microbial carbon use efficiency under changing climate	September 2018 To March 2020	Dr. S. Karthikeyan, Professor (Microbiology), Dr. S. Pugalendhi, Prof.& Head (REE) Dr. P. Subramanian, Prof. (Ag. Engg.) S Marimuthu, Asst.Prof.(Agron.)	Specific recommendation may be arrived
<b>AICRP Projects</b>				
1.	<b>AICRP/AGE/CBE/BEN/001/DRET-SET/2018/1</b> Development and performance evaluation of compound parabolic collector (CPC) based solar air heater for drying of high value agro-products	April 2018 to March 2020	Dr.R.Mahendiran (PI)	Cost economics of the system may be worked out
2.	<b>AICRP/AGE/CBE/BEN/001/DRET-TCT/2017/1 ICAR-AICRP-LBT-</b> Development of hydrothermal carbonization (HTC) reactor for hydrochar and chemicals production from selected lignocellulosic feed stocks.	April 2017 to March 2020	Dr. S. Pugalendhi (PI)	Cost economics to be included.

3.	<b>AICRP/AGE/CBE/BEN/001/DRET-TCT/2018/1</b>  Design And Development Of Activated Carbon Reactor For Gas Adsorption And Separation	April 2018 to March 2020	Dr. S.Pugalendhi (PI)	Cost economics to be included.
4.	<b>AICRP/AGE/CBE/BEN/001/DRET-BCT/2017/1</b>  Performance evaluation of high rate reactor with various packing media for treating community wastewater	April 2017 to March 2020	Dr. P. Subramanian (PI) Dr. S Karthikeyan (Co-PI)	Cost economics may be incorporated in the completion report.
5.	<b>AICRP/AGE/CBE/BEN/001/DRET-BCT/2019/1</b>  Development of Biomethanation system for food processing industry	April 2019 to March 2021	Dr. P. Subramanian (PI) Dr. S Karthikeyan (Co-PI)	As per the objectives work may be expedited.
6.	<b>AICRP/AGE/CBE/BEN/001/DRET-BCT/2019/2</b>  Bioaugmentation in an anaerobic reactor for treating community wastewater	April 2019 to March 2021	Dr. S Karthikeyan (PI) Dr. P. Subramanian (Co-PI) Dr.K.Chandra Kumar (Co-PI)	Work may be carried out as per the objectives.
7.	<b>AICRP/AGE/CBE/BEN/001/BCCT-01/2019</b>  Exploration and optimization of pretreatment processes for efficient biomethanation of lignocellulosic biomass	December 2019 to March 2022	Dr. P. Subramanian (PI) Dr. S Karthikeyan (Co-PI)	As per the objectives work may be carried out.
8.	<b>AICRP/AGE/CBE/BEN/001/DRET-LBT/2019/1</b>  Process development for catalytic upgradation of bio-oil from agro residues	April 2019 to March 2021	Dr. S.Sriramajayam (PI) Dr.K.Chandra Kumar (Co-PI) Dr. S. Karthikeyan (Co-PI)	Studies may be carried out with the identified catalyst.
9.	<b>AICRP/AGE/CBE/BEN/001/DRET-LBT/2019/2</b>  <i>Yarrowialipolytica</i> as a tool for production of biofuel	April 2019 to March 2021	Dr. K. Chandra Kumar (PI) Dr S Karthikeyan (Co-PI) Dr. S.	Work may be carried out as per the objective.

	and utilization of glycerol in circular economy		Sriramajayam (Co-PI)	
10.	<b>AICRP/AGE/CBE/BEN/001/EMA/2017/1</b> Energy auditing in sugarcane cropping system	April 2017 to March 2020	Dr. R.Mahendiran, Associate Professor (Bioenergy) Dr.P.Subramanian, Professor	Work may be expedited. Suitable software may be used for analysing the data
11.	<b>AICRP/AGE/CBE/BEN/001/DRES/2019/1</b> Installation and evaluation of biogas plant at selected users' site in Tamil Nadu	April 2019 to March 2021	Dr. P. Vijayakumary (PI)	As per the standard design, construction has to be done for its best functioning.
12.	<b>AICRP / AGE / CBE / BEN / 001/ DRES / 2019 / 2</b> Multi location trials of 8kW biomass combustor developed by CIAE.	April 2019 to March 2021	Dr. P. Vijayakumary (PI), Assistant Professor	Trials may be conducted in identified locations.
<b>Other Projects</b>				
1.	GOI-MNRE-BDTC-1011E28AA Biogas Development and training centre	April 2019 to March 2020	Dr. S.Pugalendhi Dr.R.Mahendiran	As per the objectives work may be carried out
2.	Venture Capital Scheme (V60HK) "Enhancing Biogas Promotion and Consultancy of Renewable Energy Gadgets and Systems"	April 2019 to March 2020	Dr. S.Pugalendhi Dr. S. Karthikeyan Dr. R. Mahendiran	Efforts may be given for maximum revenue.
3.	MPNG / AEC / CBE / BEN / 2019 / T002 Energy Conservation Programs (Agricultural Workshops, KisanMelas and Seminars) to Agricultural officials, Students & farmers.	April 2019 to March 2022	Dr. S. Pugalendhi (PI) Dr. P. Subramanian (Co-PI) Dr. R. Mythili (Co-PI)	Works may be expedited as per objectives.

### **3. General Remarks:**

1. Solar pump installed at ARS, Chettinad was well appreciated. A PG scholar may be allotted to evaluate the performance of the pump. (**Action:** P&H, REE, Coimbatore)

#### **4. Action Plan (2020-22)**

<b>Theme 1: Biochemical conversion Technology</b>					
<b>Sl. No</b>	<b>Activity</b>	<b>Name of the Scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
1	Pretreatment of promising biomass of biomethanation	Dr.P.Subramanian Professor Dr. S.Karthikeyan, Professor	Thermal treatment of biomass for enhanced biogas production	Effective biomethanation electrical based pretreatment of biomass	Identification of promising biowaste for biomethanation. Increased biogas yield using microbial consortia and newer pretreatment technologies
2	Assessment of food industry waste for biogas production		Development of reactor for biomethanation of selected food waste	Process optimization for better biomethanation of food industry waste	
3	Development of microbial consortia for enhanced biomethanation		Isolation and screening of methanogenic isolates	Process variables optimization with methanogenic consortia	

<b>Theme 2: Thermo-chemical Conversion Technology</b>					
1	Biofuel Production using FT process from biomass	Dr.S.Pugalendhi Prof. and Head Dr.P.Subramanian Professor Dr.S.Sriramajayam Assistant Professor	Process optimization for biofuel production	Design of reactor for producing biofuel through FT process	Identifying promising waste for producing high quality biofuel for operating engines
2	Molecular sieve production using coconut wastes	Dr.K.Chandrakumar Assistant Professor	Design of reactor for activated carbon production from coconut	Process optimization for molecular sieve production	Development of Indigenous molecular sieve production technology



			wastes		
3	Biooil Production through fast pyrolysis process		Development of reactor for fast pyrolysis		
4	Assessment of energy and product generation from industrial waste		Process optimization for higher energy recovery from cashew nut industry wastes	Upstream processing and kinetic studies in biooil production	Technology development and process optimization for the generation of products and fuels from biomaterials
5.	Development of Fluidized Bed Gasifier for Leafy Biomass	1. Dr. S.A. Ramjani, Assistant Professor (BE), 2. Dr. J. John Gunasekar, Professor (BE) & Head, AEC & RI, Kumulur 3. Dr. P. Vijayakumary, Asst. Professor (BE) Dept. of REE, AEC & RI, Coimbatore	Optimization of operating parameters of FBG	--	Fluidized Bed Gasifier for Leafy Biomass

<b>Theme 3: Liquid Biofuel Technology</b>					
1.	Biodiesel feedstock studies and assessment	Dr. P. Subramanian Professor Dr. S. Karthikeyan Professor Dr. S. Sriramajayam Assistant, Prof. Dr. K. Chandrakumar Assistant, Prof.	Feedstock availability, procurement and proximal studies	Process optimization.	Technology development and process optimization for the generation of products and fuels from biomaterials
2.	Process optimization for FAME production / transesterification		Process optimization on catalyst concentration,	Performance evaluation	Biodiesel to substitute the conventional diesel.
3.	Biodiesel Production process from Castor: Life cycle analysis		methanol : oil molar ratio,	Process optimization for biodiesel production	Biodiesel to substitute the conventional diesel.

			reaction temperature and time	from castor Feasibility and LCA	
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#### Theme 4: Exploring Solar Energy for Agro-based and allied industries

<b>Action Plan 1: Integration and optimization of solar parabolic trough concentrator for paddy-straw pasteurization</b>				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
<ul style="list-style-type: none"> <li>• Integration of solar parabolic trough concentrator for mushroom substrate preparation</li> <li>• Optimizaton of the process parameters for paddy-straw pasteurization</li> <li>• Determine cost economics of the system</li> </ul>	Dr. R.Mahendiran Dr.S.Sriramajeyam	<p>To evaluate the solar parabolic trough concentrator for paddy straw substrate preparation process (solar intensity, tracking device, process temperature, process time)</p> <p>To optimize the process parameters such as</p> <ul style="list-style-type: none"> <li>• Substrate feed rate per batch</li> <li>• Steam temperature</li> <li>• Steam pressure</li> </ul> <p>Study the comparative study of parabolic trough system and conventional boiler system with cost economics</p>	Performance evaluation	Solar steam based paddy straw pausterization process will be evolved.

<b>Action Plan 2: Prototype Solar distillation and Up-flow Anaerobic Sludge Blanket (UASB) reactor for achieving zero liquid discharge (ZLD) of tannery effluent reject (TER)</b>				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
• To develop industrial-scale solar	Dr. R.Mahendiran Dr.S.Karthikeyan Dr.P.Subramanian	• Design and fabrication of industrial scale	• Field integration with	Industrial scale solar distillation process for

<p>distillation process for TER</p> <ul style="list-style-type: none"> <li>• To evaluate and optimize the field performance of the integrated solar distillation with UASB reactor for distillate recovery at user industry</li> <li>• To conduct mass and energy balance of TER process and determine the cost economics of the system</li> </ul>	<p>Dr.S.Vijayakumary</p>	<p>non-imaging solar distillation system.</p> <ul style="list-style-type: none"> <li>• Installation of Upflow Anaerobic Sludge Blanket reactor available in institution</li> </ul> <p>Optimization of</p> <ul style="list-style-type: none"> <li>- Distillation TER flow rate</li> <li>- distillation collector temperature</li> <li>- RH</li> <li>- UASB reactor flow rate</li> <li>- HRT</li> <li>- Distillate collection</li> <li>- Distillate recovery</li> </ul>	<p>instrumentation and evaluation at user industry</p> <ul style="list-style-type: none"> <li>• Determine Mass balance between TER influent and distillate in Solar and UASB systems</li> <li>• Energy balance in Solar desalination system and UASB reactor</li> </ul>	<p>tannery effluent reject</p> <p>Integration of cost effective green technology with bimethanation using tannery waste</p> <p>ZLD achieved by using green energy thereby meeting pollution standards and mass balance of distillate and sludge</p>
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<b>Action Plan 3: Design and Development of Portable Forced Convective Solar Dryer</b>				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
<p>Study the existing methods of drying agricultural produces in small scale/domestic level and its portability</p> <p>Development a small scale foldable/portable forced convective solar dryer with automatic control systems</p>	<p>Dr. S.Joshua Davidson</p>	<p>To study the existing methods of drying agricultural produces in small scale / domestic level and its portability.</p> <p>To design a small scale portable forced convection solar drier with automatic control systems.</p>	<p>To fabricate a portable forced convection solar drier as per the design.</p> <p>To evaluate the drying performance of forced convective solar drier</p> <p>Volume reduction ratio (Portability)</p> <p>Solar irradiation, Ambient &amp; drying</p>	<p>Small scale portable forced convective solar dryer will be developed.</p>

Evaluate drying performance of the fabricated forced convective dryer			temperature, Relative Humidity (%) Weight of the drying product w.r.to drying time (kg)	
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<b>Action Plan 4:</b> Development of solar operated bird scarer cum insect trap system				
<b>Activity</b>	<b>Name of the scientist</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/expected outcome</b>
<ul style="list-style-type: none"> <li>To develop a solar operated bird scarer cum insect trap</li> <li>To test the performance of the developed solar gadget</li> </ul>	Dr.D.Ramesh, Dr.M.Chandrasekaran,	<ul style="list-style-type: none"> <li>To develop a solar operated bird scarer cum insect trap</li> </ul>	<ul style="list-style-type: none"> <li>To testing the performance of the developed solar gadget</li> </ul>	Solar operated bird scarer cum insect trap will be developed.

### III. FOOD PROCESS ENGINEERING

#### 1. Technology for Adoption:

##### Grader for dehusked coconut



##### Salient Features:

- Efficiency of the grader was 85% with 5000 nuts/ hour of grading
- Size grading cost per hour was Rs. 64.73
- Maximum efficiency of coconut size grader was found to be 85% at the speed of 1.7 m/s and 15° inclination for fully dehusked coconut.

#### 2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
<b>Core Research projects</b>				
1.	<b>AECRI / CBE / FPE / VEG /2018 / CB088</b>  RF drying of carrot	April 2016 – September 2020	Dr. T.Pandiarajan, Professor (Till March 2019) Dr. P.Rajkumar, Professor	• Standardization of radio frequency drying of carrot slices and steps may be taken to transfer the technology to the farmers.
2.	<b>AEC&amp;RI/TRY/APE/2018/CP153</b>  Controlled atmosphere storage of paddy using Acetylene as alternate gas.	January 2019 to March 2021	Dr.R.Visvanathan, Professor (Agrl. Processing) Dr. P. Yasodha, Asst. Professor (Agrl. Entomology) ADAC&RI, Thiruchirappalli.	• Work may be carried out as per objectives.
3.	<b>AECRI/KUM/FPE/2018/CPO33 -</b>  Design and	Sep 2018- sep 2020	(Dr. P. Rajkumar, Professor) changed as Dr.T.Pandiarajan	• Data on tamarind dryer testing may be provided and expedite the work.

	Development of a continuous tamarind processing Machinery		Professor and Head, Dept. of P&FE	
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4.	CPMB/CBE/BIC/2018/CP 007 Developing a non thermal ultrasonic process technology for enhancing the shelf life of coconut milk.	December 2017- November 2019	Dr.D.Amirtham, Asst. Professor (Biochem), Dept. of FPE, AEC&RI, TNAU, CBE.	<ul style="list-style-type: none"> <li>The completion report may be prepared and submitted for the completed core project and steps may be initiated to transfer the technology for the benefit of farmers.</li> </ul>
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### Externally Funded Projects

1.	Development of novel methods for aflatoxin mitigation and management practices for value addition in chillies in India (MHRD sponsored SPARC Project)	March 2019 - March 2021	Dr. S. Ganapathy, Professor and Head Dr. M. Parameswarakumar, Professor, University of Minnesota, USA	<ul style="list-style-type: none"> <li>Efforts may be initiated to explore the possibilities of utilizing the cold plasma technology available at PHTC and REE department.</li> </ul>
2.	TARE/AEC/CBE/FAP/2019/R 2004 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 - December 2021	Dr.I.P.Sudagar, Asst. Professor, Dept. of Food Process Engineering, AEC&RI, TNAU, CBE.	<ul style="list-style-type: none"> <li>The progress of the palmyrah project may be expedited as per the objectives.</li> </ul>

### AICRP on Postharvest Engineering and Technology

1.	PH/CO/2016/1 Controlled atmosphere storage of selected pulses	April 2016 to December 2019	Dr. P.Rajkumar, Professor	<ul style="list-style-type: none"> <li>Cost economics of the CA storage may be worked out.</li> <li>Completion report may be prepared and submitted at the earliest.</li> <li>Steps may be taken to transfer the technology for the farming community</li> </ul>
2.	AICRP/PH/CO/2017/01 Design and development	April 2017 - December	Dr. S. Ganapathy, Professor & Head	<ul style="list-style-type: none"> <li>The research outcome can be</li> </ul>

	of turmeric processor using super heated steam for simultaneous boiling, drying, and polishing	2019		utilized to continue further work on vacuum assisted superheated steam drying.
3.	<b>PH/CO/2017/2</b>  Development of a portable nondestructive device to grade banana based on dielectric properties	April 2017-December 2019	Dr. I. P. Sudagar, Assistant Professor	<ul style="list-style-type: none"> <li>The handheld meter may be specifically tried for other economic fruits other than banana.</li> <li>Externally funded project may be obtained to continue further work</li> </ul>
4.	<b>AICRP/PH/CO/2017 /3</b>  Design of on farm ventilated storage system for potato	April 2017 – December 2019	Dr. S. Ganapathy, Professor and Head, Dept. of FPE.	<ul style="list-style-type: none"> <li>The cost economics of the system may be worked out and steps may be taken to commercialize the technology of farm ventilated storage of potato.</li> </ul>
5.	<b>AICRP/PH/CO/2017 / 04</b>  Pulsed Electric field Processing of Orange Juice	April 2017 – March 2020	Dr. S. Ganapathy, Professor & Head	<ul style="list-style-type: none"> <li>The completion report may be prepared and submitted.</li> </ul>
6.	<b>AICRP/PH/CO/2017 /05</b>  Development of electrostatic spray coating machine for edible coating of fruits using the natural plant extracts	April 2017 – March 2020	Dr.M.Balakrishna n, Assoc. Professor Dr. K.Thangavel, Professor(Till May 2019) Dr. S.Ganapathy, Prof. and Head Dr.D.Amirtham, Asst. Professor	<ul style="list-style-type: none"> <li>Cost economics of the developed machine may be worked out</li> </ul>
7.	<b>AICRP / PH / CO / 2018 / 01</b>  Identification and standardization of microbial management techniques to reduce post-harvest losses in carrots.	April 2018 to March 2020	Dr.P.Raja, Asst. Prof (Ag. Micro)  Dr. S. Ganapathy, Professor and Head	<ul style="list-style-type: none"> <li>The lab trial of the study may be taken to the field trial. Quality parameters, shelf life, varietal specifications, cost economics; physical dimensions (Length, Diameter, Volume, and Weight) and quality loss before and after treatments</li> </ul>

				<p>may be studied.</p> <ul style="list-style-type: none"> <li>• The technology may be standardized and up scaled for the benefit of farmers.</li> </ul>
8.	<p><b>AICRP/PH/CO/2019/01</b></p> <p>Ultrasound assisted enzymatic aqueous extraction of turmeric leaf essential oil.</p>	April 2019 – December 2021	Dr.D.Amirtham, Asst.Professor(Bio chemistry)	<ul style="list-style-type: none"> <li>• The technology may be standardized as per the objectives.</li> </ul>
9.	<p><b>PH/CO/2015/1</b></p> <p>Development of efficient supply chain for aggregatum onion</p>	October 2019 - December 2019	Dr. S. Ganapathy, Professor & Head,	<ul style="list-style-type: none"> <li>• Cost economics of the storage structure in comparison with conventional storage system may be worked out. Completion report may be submitted:</li> </ul>
10.	<p><b>CPMB/CBE/BIC/2018/CP007</b></p> <p>Developing a non thermal ultrasonic process technology for enhancing the shelf life of coconut milk</p>	December - 2017- November – 2019	Dr.D.Amirtham, Asst.Professor(Bio chemistry)	<ul style="list-style-type: none"> <li>• The completion report may be prepared and submitted for the completed core project and steps may be initiated to transfer the technology for the benefit of farmers</li> </ul>

### **3. General Remarks:**

1. Turmeric value chain machinery may be installed in a single point in concurrence with SHG or Turmeric Growers Association for large scale adoption. (**Action:** P&H, FPE, Coimbatore)
2. Food processing machineries purchased at Centre of Excellence, Athiyanthal under TANII scheme viz., millet processing, grader, dehuller, pulverizer etc., may be exposed to the students. (**Action:** P&H, FPE, Coimbatore)



#### **4. Action Plan (2020-22)**

<b>Theme I: Improved Post Harvest Handling of Fruits and Vegetables</b>				
<b>Action Plan 1: Design and development of a dehumidified dryer for drying sticky tamarind fruits</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/expected out come</b>
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 will be developed for drying tamarind to increase its brittleness for effective deseeding. This unit will be highly useful for continuous deseeding purposes.
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 tamarind deseeding	
Evaluation of the dryer for its suitability for deseeding of the dried tamarind fruits		Development of the dryer components		

<b>Action Plan 2: Development and evaluation of a sensor based size and colour grading sorting unit for spherical fruits</b>				
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/expected out come</b>
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 sensor based sorting and size based grading unit for all spherical fruits and vegetables including coconut will be developed.
Development of colour sensor for sorting fruits, vegetables and coconut		Preparing of drawing for the design of size grader	Assembly of developed sensor and size grader as a single unit	
Performance evaluation of the developed colour sorter cum grader		Development of a size grading mechanism	Experimental operation and evaluation of the unit for	

unit.		for grading based on sphericity	its cost effectiveness	
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## Theme II: Novel Processing Technologies

### Action Plan 3: 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 Dr. S. Ganapathy Dr. D. Amirtham	Selection of design parameters	Performance evaluation of the storage system	<ul style="list-style-type: none"> <li>• A suitable storage system for the dulated millets will be developed.</li> <li>• Proper storage of dehulled millets will pave the way for fetching better price to the millet growers</li> <li>• Long term storage will favour better value addition of millet based foods</li> </ul>
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 4: Development of hybrid system for pulse fractionation for high value pulse based functional foods

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected out come
Design and development of pulse fractionation unit	Dr.M.Balakrishnan Dr.G.Gurumeenakshi Dr.Z.John Kennedy	Selection of design parameters	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		Preparation of drawings	Refinements of the system, if any	

machine parameters to produce pulse fractionates				
Evaluation of the machine for the effective separation of the pulse fractions		Fabrication of pulse fractionation unit	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			Analyse the suitability for the development of functional foods	

### Theme III: Bioprospecting and Waste Utilization

#### Action Plan 5: Characterization of bio fiber (sugarcane bagasse) reinforced epoxy biocomposites product for rigid packaging

Activity	Name of the scientists	2020-21	2021-22	Deliverables/expected outcome
To develop bio-fiber with reinforced epoxy bio composite fiber product from sugarcane bagasse	Dr.I.P.Sudagar	To characterize the bio composite product in terms of physical & mechanical properties	To characterize the bio composite product in terms of thermal properties	Characterize the sugarcane bagasse bio composite product with suitable physical, mechanical and thermal properties will be made for rigid packaging.
To characterize the bio composite product in terms of physical, mechanical and thermal properties				

**Action Plan 6: Extraction ,development and characterization of combined carotene based food biocolorants**

<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected out come</b>
Extraction of carotene from tomato, pumpkin, carrot	Dr.D.Amirtham Dr.T.Saraswathi Dr.S.Ganapathy	<ul style="list-style-type: none"> <li>• Design of experiments and Standardization of extraction protocol</li> <li>• Studying the nutritional and anti nutritional status of the extracted carotene</li> </ul>	Standardizing the encapsulation protocol with suitable wall material for increasing the stability	Development of stable natural highly intensified natural food biocolorant
Development of combined carotene biocolorants		<ul style="list-style-type: none"> <li>• Identification of suitable combinations for producing stable combined carotene biocolorant</li> <li>• Assessing the biochemical and antioxidant status of the combined carotene biocolorant</li> </ul>	Characterization of the encapsulated combined carotene biocolorant	

#### IV. CENTRE FOR POST HARVEST TECHNOLOGY CENTRE

##### 1. Technology for Adoption:

Enhancing the shelf life of Neera.

##### 2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
<b>University Research Projects</b>				
1.	<b>AECRI/CBE/ PHT/ 2018</b>  Development of Hybrid system for milling of pulse in fractionates products and Development and commercialization of pulse based high value functional foods.	2018- 2020	Dr.M.Balakrishnan, Assoc. Prof. (FAPE). Dr. Z. John Kennedy, Professor and Head Dr. G. Gurumeenakshi, Assoc. Prof. (FSN)	Fabrication may be expedited and laboratory trials may be conducted.
2.	<b>TNAU-ERDF/AEC/CBE/CPH T/2019/R006</b>  Optimization of process for enhancing the shelf life of Neera	2020-2021	Dr. Z. John Kennedy, Professor and Head	Commercialization of the technology may be done through ABD
<b>Core Research Projects</b>				
3.	<b>AECRI / CBE/ PHT/ 2018 / CPO26</b>  Development of Hermetic Storage System to Enhance the Shelf Life of De-hulled Millets	April 2018 to September 2020	Dr.M. Balakrishnan, Assoc.Prof.(FPE) Dr. N. Varadharaju, Former Dean (Agrl. Engg.)	As per the objectives expedite the work.
4.	<b>AECRI/CBE/PHT/FP E/2018/CP090</b>  Design and Development of Pulsed Light (UV- C)	01.11.2018 to 31.10.2020	Dr.M. Balakrishnan, Assoc.Prof.(FPE) Dr. Z. John Kennedy, Professor (Microbiology)	Intensive trials may be carried out with economics.

	Continuous Treatment System for Liquid Foods			
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### 3. Action Plan (2019-20):

**Theme: Value addition**

<b>Action Plan 1: Enhancing the shelf life of Neera</b>			
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>Deliverables/expected outcome</b>
Studies on storage methods for enhancing the shelf life	Dr. Z. John Kennedy	Studies on storage methods for enhancing the shelf life Commercialization	Processing of Neera at 90°C for 10 min with chemical preservatives @150-300 ppm shows maximum storage period of 90 days under refrigerated condition and 30 days under ambient conditions.

<b>Action Plan 2: Design and Development of Pulsed Light (UV- C) Continuous Treatment System for Liquid Foods</b>			
<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>Deliverables/expected outcome</b>
<ul style="list-style-type: none"> <li>Optimization of the process parameters to achieve maximum microbial reduction</li> <li>Analysing the effect of pulsed light treatment on the microbial, physico-chemical and organoleptic qualities of the liquid foods during storage.</li> </ul>	Dr. M. Balakrishnan  Dr. Z. John Kennedy	Studies on the storage and shelf life of pulsed light treated fruit juices.  Study the nutritional & biochemical changes during storage	Pulsed light treatment system developed to inactivate both spoilage and pathogenic microorganisms in foods without significant loss in nutrients and functionality of the liquid foods, as no heat is involved.

## V. SOIL AND WATER CONSERVATION ENGINEERING

### 1. Technology for Adoption:

Closure dripper spacing of 0.3 m is recommended for field crops in medium textured soil for optimum water and fertilizer use. The trails may be conducted with AED.

### 2. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
<b>University Research Projects</b>				
1.	<b>AECRI/KUM/SWC/2018/001</b>  Estimation of crop coefficient and Water requirement of Chilli and Cucumber under polyhouse and open field condition	April 2018 to October 2020	1. Dr. K. Arunadevi, Assistant professor (SWCE) Dept. of Soil and Water Conservation Engineering AEC & RI, Kumulur 2. Dr. A.D. Ashok, Ap (Hort.) Instt. of Agriculture, Kumulur	Validation of crop coefficient value for chilli may be carried out.
2.	<b>WTC/CBE/SWC/2017/002</b>  Standardizing Irrigation scheduling based on different types of automated drip Irrigation System	September 2017 - August 2019	Dr. K. Nagarajan, Prof. (SWCE), WTC	The sensors response may be done for accurate results.
3.	<b>AECRI/CBE/SWC/2016/002</b>  To study the effectiveness of artificial recharge techniques in increasing the recharge rate and to improve the ground water quality.	November 2016 - October 2019	Dr. G. Thiyagarajani, Asst. Prof. (SWCE) Dr. A. Raviraj, Prof. (SWCE), WTC	Results may be reported to AED
4.	<b>AECRI/CBE/SWC/2016/001</b>  Hydrological evaluation of watershed by Morphometric	November 2016 - October 2019	Dr. G. Thiyagarajan, Asst. Prof. (SWCE) Dr. A. Raviraj, Prof. (SWCE) Dr. Balaji Kannan,	Results may be communicated to AED

	Analysis		Assoc. Prof. (SWCE)	
<b>Core Research Projects</b>				
1.	<b>AECRI/KUM/SWC/2018/CP034</b>  Estimation of crop coefficient and Water requirement of Capsicum under poly house and open field condition	December 2018 to March 2021	Dr. K. Arunadevi, Assistant professor (SWCE) Dept. of SWCE AEC &RI, Kumulur Dr. A.D. Ashok, Ap (Hort.) Instt. of Agriculture, Kumulur	Work may be expedited.
2.	<b>AECRI/KUM/SWC/2018/CP036</b>  Crop water requirement for drip irrigated crops	April 2018 to December 2019	Dr. M. Manikandan Asst Professor (SWCE) Dept. of Irrigation and Drainage Engineering, AEC &RI, Kumulur Dr. V. Ravikumar Professor (SWC) and Head, Dept. of Irrigation and Drainage Engineering, AEC &RI, Kumulur	Completion report may be prepared
3.	<b>AECRI/KUM/SWC/2018CP155</b>  Evaluation of water conservation and management techniques for field crops	2019 – 2020	Dr. V. Ravikumar Professor (SWC) and Head Department of Irrigation and Drainage Engineering Dr.S.Vallalkannan Assistant Professor (Agronomy) Department of Irrigation and Drainage Engineering	Completion report may be prepared.
<b>Externally Funded Project</b>				
1.	NICRA scheme on "Temperature Gradient Modelling in a Greenhouse equipped with Evaporative Cooling Pad System in a Semi-arid Region"	September 2018 to March 2020	Dr. R. Lalitha Professor and Head, Department of SWCE, AEC &RI, Kumulur Dr. S. Vallal Kannan, Assistant Professor (Agronomy), Department of Irrigation and Drainage Engineering, AEC &	Green house design at different elevation may be standardized. Meetings may be arranged in collaboration with Horticultural scientists for standardizing the



			RI, Kumulur	green house design.
<b>ICAR &amp; AICRP Projects</b>				
1.	ICAR/AEC/CBE/SWC/2018/R001 Development and Testing of Low-cost filters Under the Network project on "Engineering Interventions in Micro Irrigation Systems (MIS) for improving water productivity" under CRP on Farm Mechanization and Precision Farming	August 2018 to March 2020	Dr. Balaji Kannan Associate Professor (SWCE) and Head i/c, Dept. of SWCE, AEC&RI, Coimbatore	Field trials may be carried out and cost economics for the filter may be worked out.
2.	ICAR/WTC/CBE/AEC/2015/R008 National Initiative on Climate Resilient Agriculture-Evaluation of Groundwater Recharge Structures and Model Study under varied Climate Scenario(ICAR).	April 2014-March 2020	Dr A.Raviraj, Professor(SWCE) -60 % Dr G.Thiyagarajan, Asst. Prof.(SWCE) – 40%	As per the objective works may be carried out.
3.	AICRP/WTC/CBE/IWM/001/C2 Conjunctive Use of Surface and Groundwater in the Lower Bhavani Project	April 2014-March 2020	Dr A.Raviraj, Professor(SWCE) -60 % Dr G.Thiyagarajan, Asst. Prof.(SWCE) – 40%	Results may be reported to AED.
4.	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 a selected watershed of Bhavani river basin	Sep 2018 - Aug 2020	Dr.A.Valliammai, Asst. Prof. (SWCE), ARS, Bhavanisagar.	Results may be communicated to AED.
5.	AICRP/WTC/CBE/IWM-001 Optimization of depth of placement of lateral using HYDRUS for different soil types.	Sep 2016 to August 2019	Dr.A.Valliammai, Asst. Prof. (SWCE), ARS, Bhavanisagar	Completion report may be submitted
6.	AICRP/DCM/KPT/AGR/1971/004 Catchment - storage - command area relationship for enhancing water productivity in a micro –	2006 - LT	Dr. N. Anandaraj Associate Professor (SWC), Agricultural Research Station, Kovilpatti.	As per the objective works may be carried out.

watershed.			
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### **3. General Remarks:**

1. Research may be concentrated towards Sensor based irrigation systems for effective utilization of water. Soil moisture may be monitored through Nano sensors. (**Action:** Prof. & Head, SWCE / I&DE, Kumulur / Assoc. P&H, SWCE, CBE)
2. The Director of Research appreciated the copy right obtained for KUMET software developed for calculating the evapotranspiration of crops.

### **4. Action Plan (2020-22):**

#### **Theme I: Irrigation and Drainage Engineering**

<b>Activity</b>	<b>Name of the scientists</b>	<b>2020-21</b>	<b>2021-22</b>	<b>Deliverables/ expected outcome</b>
Effect of evapotranspiration on sugar content in sugarcane crop	Dr. S. Vallal Kannan, Asst. Prof. (Agronomy)  Dr. V. Ravikumar, Prof. and Head, IDE	<ul style="list-style-type: none"> <li>• To study the crop evapotranspiration using soil water balance method.</li> <li>• To study the crop behavior and sugar content with respect to crop evapotranspiration.</li> </ul>	<ul style="list-style-type: none"> <li>• To study the biological characteristics and economics in production of sugarcane crop.</li> </ul>	The sugar content variation with respect to evapotranspiration will be presented.
Evaluation of Water Conservation and Management Techniques for field Crops	Dr.V.Ravikumar Professor (IDE)  Dr.S.Vallalkannan Assistant Professor (Agronomy)	<ul style="list-style-type: none"> <li>• Logging of soil moisture using time domain reflectometry sensors for sugarcane crop grown under SSI Method and drip fertigation.</li> </ul>	<ul style="list-style-type: none"> <li>• Evapotranspiration estimation using meteorological data and soil moisture depletion method.</li> <li>• Economic analysis of drip fertigation to Sugarcane compared to Conventional method of Irrigation.</li> </ul>	Estimated Crop Coefficient values for drip irrigated sugarcane crop will be useful in Irrigation scheduling.

Subsurface drainage for waterlogged and salt affected lands in farmers field	Dr. M. Manikandan, Asst. Prof. (SWC)	<ul style="list-style-type: none"> <li>To install subsurface drainage system for waterlogged and salt affected lands in farmers field.</li> </ul>	<ul style="list-style-type: none"> <li>To evaluate the functional performance of the system by water table fluctuation and drain water collection, drain water quality analysis.</li> <li>To analysis technical feasibility and economic viability in farmers field.</li> </ul>	Real time experience due to implementation of drainage project in farmers field.
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## Theme II: Soil and Water Conservation Engineering

Activity	Name of the scientists	2020-21	2021-22	Deliverables / expected outcome
Effect of Dry land Technologies on water use and yield of millet crops	Dr. M. Nagarajan,, Asst. Prof, & Dr. R. Arunadevi Asst. Prof.	To study the increase in infiltration rate and moisture content in the soil.	<ul style="list-style-type: none"> <li>To estimate the yield and water use efficiency of millet crop (Ragi / sorghum)</li> <li>To suggest suitable dry land technology to sustain crop and to improve the water productivity.</li> </ul>	Best suitable dry land technology for millet production will be identified and recommended for the farmers.
Effect of drip fertigation and different colour mulches for vegetable crops under controlled condition	Dr. Balaji Kannan Assoc. Prof. &Head (SWCE) i/c	<p>To assess the Soil temperature variation for different colour mulches for vegetable crops under greenhouse condition</p> <p>To evaluate the soil moisture distribution and yield parameters under different mulches</p>	<p>To evaluate the irrigation and fertigation scheduling under different coloured mulches</p> <p>To evaluate the water use efficiency, and yield parameters under different coloured mulches</p>	<p>Soil temperature variation under different colour mulches will be analysed</p> <p>Soil moisture distribution and irrigation scheduling for different colour mulches will be estimated</p> <p>Water Use Efficiency and yield parameters</p>

Impact of Low Tunnel drip irrigation strategies on microclimate modification in horticulture crops	Dr.S.Selva kumar Assistant Professor (SWCE)	To observe the effects of different treatments on microclimate inside the low tunnels: Air temperature, soil temperature, relative humidity and solar radiation In Different Heights of Low Tunnel, different polyphone material With Various Irrigation Treatments Investigate and validate new low tunnel technologies	To compare Low Tunnel drip irrigation technology with naturally ventilated green house  Conduct an economic analysis of the production systems.	Estimating optimum Moisture level, optimum tunnel height for the best micro climatic condition enhancing in better yield
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Prediction of groundwater level in Noyyal river basin of Tamil Nadu using Artificial Neural Network (ANN)	Dr.G.Thiyagarajan, Asst. Prof. (SWCE) WTC, Coimbatore Dr. A. Raviraj, Prof. (SWCE) WTC, Coimbatore  Dr. Balaji Kannan. Asso. Prof.&Head (SWCE) i/c	Collection of Basic basin details (base map, location of rainfall gauge stations, location of observation wells, location of recharge structures, etc.) Collection of Climatic data of the basin Collection of groundwater level data of the observation wells in the basin Pre-processing of collected data	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
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## VI. PHYSICAL SCIENCES AND INFORMATION TECHNOLOGY

### 1. Remarks on the ongoing projects:

Sl. No.	Number and Title of the Projects	Duration	Name of the PI & Co-PI	Remarks
<b>University Research Projects</b>				
1.	<b>AECRI / MTP / STA / 2017 / 001</b>  Construction of Growth and Yield Prediction Models for <i>Neolamarckia cadamba</i> in Western Zone of Tamil Nadu	December 2017- October 2020	Dr.M.Vijaya bhama Assistant Professor (Statistics) Department of Basic and Social Sciences, FC&RI, MTP	Sample size and Sampling methods may be included in the study
2.	<b>AECRI/MTP/MAT/2018/C P169</b>  Developing Yield Prediction Model for Farm Grown Teak	January 2019 to March 2019	Dr. R. Ravi Kumar Assistant Professor (Mathematics) Dept. of Basic and Social Science, FC&RI, MTP.	Completion report may be prepared
3.	<b>AECRI/CBE/CSC/2018/C P022</b>  Developing and Creating Ontology Consortia for Multistage holders	August 2018 to Sep. 2020	Dr.V.Anandhi, Asst. Prof (CS) & TPO to the VC Dr.C.S.Sumathi, Asst. Prof (CS) Dr.S.K.Natarajan Assistant Professor (Agronomy) Dr.J.Venkitapirabu, Director, Planning and Monitoring	Completion report may be prepared.
4.	<b>AECRI/CBE/PSC/2018/001</b>  Design and Development of Android Application for Pest Management using Image Enhancement techniques to Cotton Farmers for Decision Making.	August 2018 - February 2020	Dr. M. Kalpana Assistant Professor(Computer Science) Dr.K.Senguttuvan Assistant Professor (Entomology) Dr. P. Latha Assistant	Images has to be verified with Entomologist and Pathologist in the Department of Cotton, TNAU, Coimbatore.

			Professor (Pathology)	
5.	<b>AECRI/TRY/STA/2020/001</b>  Analysis of International Trade of Pepper, Cardamom, Chilli and turmeric	July 2019- June 2020	Dr.U.Arulanandu Professor (Statistics), Department of Social Sciences, ADAC & RI, Trichy-620 009.	Work may be expedited.
6.	<b>AECRI/PKM/MAT/2020/001</b>  Studying on crop response model for grapes under varying climate change scenario.		Dr. A. Eswari Asst. Professor (Mathematics), Department of Social Sciences, HC&RI,PKM. Dr. A.Subbiah Asst.Professor (Horticulture) Dr. Duraisamy Professor & Head, Dept. of PS&IT Dr.K.Manonmani Assistant Professor (Plant Pathology),	Work may be carried out as per objectives.

## 2. Action Plan (2020-22)

### Theme 1: Mathematical and Statistical Modelling in Agriculture

Title of proposal	Scientist	Year
Big Data Analytics in Crop Yield Prediction on Rice in Thirunelveli District	Dr. R. Gangai Selvi, Assistant Professor (Statistics) Dept. of Social Sciences, AC&RI, Killikulam	Jan. 2020 – Dec. 2021
A Meta Analysis on Research Methods and Statistical Packages employed in post graduate Agricultural Research	Dr. R.Pangayar Selvi Assistant Professor(Mathematics), Dept. Of Social Sciences, AC&RI, Killikulam Dr. M.Joseph Associate Professor (Agronomy) Dept. Of Agronomy, AC&RI, Killikulam Dr.B.Arthirani Assistant Professor (Agril. Meteorology) Agricultural Research	Nov. 2019 – Setp. 2021
Deploying Mathematical Models for Effective Water Management in Rice.		Jan. 2020 – Mar. 2022

	Station, Kovilpatti	
Analysis of trend in area, production and productivity of Mango and Banana of Tamil Nadu using Hybrid Statistical Model	Ms. P. Sujatha, Asst. Professor (Maths), HC&RI (W), Trichy.	March 2020-Feb 2021
Developing forecast model for Sugarcane Productivity using weather parameters in sugarcane growing agro climatic zones of Tamil Nadu	Dr. K. Prabhakaran, Asst. Prof. (Statistics) AC&RI , Madurai	Feb 2020 to Jan 2022
Exploring the relationship between climatic changes and crop yield of major millets in Coimbatore	Dr. M. Nirmala Devi Assistant Professor(Maths) Dept, PS &IT, AEC &RI , TNAU	June 2020-june 2022
An assessment of Mathematical Modeling for Area and Production of Oilseed crops in Tamil Nadu	Dr.R.Vasanthi, Asst. Professor (Maths) Dept. PS &IT , AEC &RI, TNAU CBE	March 2020-February 2021
Yield Prediction for Mangos (Mangifera Indica) under various production environments	Dr. R. Ravi Kumar, Assistant Professor (Mathematics) FC&RI, Mettupalayam Dr. K. Kavitha, Asst.Prof.(Horti) Dr.K.Divya, Asst.Prof.(ARM)	April 2020-March 2021

<b>Theme 2: Computer applications in Agriculture</b>		
<b>Title of proposal</b>	<b>Scientist</b>	<b>Year</b>
Web Application to access the details of ornamental trees at TNAU Botanical Garden through smart phone by using QR code	Dr.J.Arockia Stephen Raj, Asst. Professor (CS) Dr. P. Aruna, Assoc. Prof. (Hort.), Dept. of Flori. & Landscape Architecture, HC&RI, CBE	April 2020-March 2022
Design and development of effective e-content resources for Agricultural Graduates (Agro informatics)	Dr. C.S. Sumathi, Asst. Prof.(CS) Dr. M. Kalpana, Asst. Prof.(CS)	April 2020-March 2022
Developing R package for CRD, RBD and Split plot Design	Dr. Patil Santosh Ganapati, Asst. Prof. (Statistics) Dept, PS &IT, AEC &RI , TNAU	June 2020-February 2022
Ag-IoT - Institutional Development Plan (IDP) entitled "Enhancing the learning outcome, employability and entrepreneurial skills of farm graduates through excellence in education"	Dr. S. Sridevy, Asst. Prof.(CS)	Aug. 2019 to July, 2022
Virtual Reality and Augmented Reality based class modules - Institutional Development Plan (IDP) entitled "Enhancing the learning outcome, employability and entrepreneurial skills"		

of farm graduates through excellence in education"		
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Virtual Classroom - Institutional Development Plan (IDP) entitled "Enhancing the learning outcome, employability and entrepreneurial skills of farm graduates through excellence in education"		
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## VII. Recommendations made on Action Taken

1. Training on "Operation and maintenance of laser guided leveller" at AEC&RI, Kumulur may be imparted to the University drivers working in Research Stations / Colleges / KVKs where Laser Guided Levelers are available. (**Action:** Dean (Engg), Kumulur)
2. A separate team with the scientists of Engineering and Forestry may be formulated for the development of Bird Scarer. (**Action:** Dean (Engg), Coimbatore).
3. Buildings adjacent to AMRC, occupied by the Department of Spices and Plantation crops have to be allotted to the Professor and Head, Dept. of Farm Machinery and Power Engineering for establishing Plant Protection Equipment Laboratory at Agricultural Machinery Research Centre (AMRC). Possibility of getting approval for Plant Protection Equipment Testing Centre at Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University, Coimbatore may be explored in consultation with the Chief Engineer, AED (Action : Dean (Engg), AEC&RI, Coimbatore, Registrar and Dean (Hort), Coimbatore)
4. Department of Food Process Engineering and Post Harvest Technology Centre may be merged since most of the projects dealt by the departments are in the field of processing. (**Action:** Dean (Engg), AEC&RI, Coimbatore)
5. Explore the possibility of development of two row corn cob harvester against the developed mini tractor operated single row corn cob harvester. (**Action:** P&H, FMPE, Coimbatore)
6. Refinement and adoption of commercial power operated arecanut tree climbers for coconut trees in collaboration with AMMA. (**Action:** P&H, FMPE, Coimbatore)
7. Performance and spraying characteristics of spraying drone may be studied. (**Action:** P&H, FMPE, Coimbatore)
8. Coffee processing unit established at Thadiyankudisai may be visited and the latest coffee washers with minimum disposal of slurry may be studied. A low capacity coffee washer may be developed for small coffee estates. (**Action:** P&H, FPE, Coimbatore)
9. The colour of Millet beverage may be improved for marketing (Action: P&H, CPHT, Coimbatore)



10. In collaboration with M/s. A1 chips-Coimbatore, needy banana processing machinery and also new value added products may be identified and developed. (**Action:** P&H, FPE, Coimbatore)
11. Alternative cost effective pectin sources may be explored for the preparation of Sapota jam. (**Action:** P&H, CPHT, Coimbatore)
12. Technology for storage of Neera may be standardized and released before the end of July 2020. Action may also be initiated for Patenting the Neera storage technology. (**Action :** P&H, CPHT, Coimbatore)
13. Coconut grader may be installed at Coconut Research Station, Aliyar Nagar for conducting OFT. Possibility of grading of coconuts based on weight may also be explored. (**Action:** P&H, FPE, Coimbatore)
14. Super-heated steam model may be tried for continuous process of boiling, drying, and polishing of Turmeric. (**Action:** P&H, FPE, Coimbatore)
15. Suitable technology for oil extraction from turmeric leaves may be identified. (**Action:** P&H, FPE, Coimbatore)
16. Hands on training may be arranged for farm level works on "Technology for removal of clogging of drip laterals for perennial crops" (Action: Dean (Engg), Coimbatore and Director, WTC, Coimbatore)
17. More training may be given to the rural youths on "Repair and maintenance of farm implement under Skill Development Centre (**Action:** Dean (Engg), Kumulur)
18. Development of low cost Aero phonics and Hydroponics technology may be evolved. (Action : Assoc. Prof & Head, SWEC, Coimbatore and Prof & Head, FMPE, Coimabtoe)
19. Soil and water conservation measures may be taken up at ARS, Kovilpatti for increasing the crop production. (**Action:** ARS, Kovilpatti)
20. Custom hiring of Farm implements available at AEC&RI, Kumulur for revenue generation and also mechanization of farms around AEC&RI, Kumulur may be carried. (**Action:** Dean (Engg), Kumulur)
21. Testing fee should be deposited in to Revolving Fund Account for effective utilization on developmental activities (**Action:** Dean (Engg), Kumulur)
22. Scientists of PS&IT have to be associated in development of softwares for the research activities of the University (**Action:** All Teaching staff of Computer science)

## VIII. Remarks of the Vice Chancellor

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

1. Action may be taken for commercialization of KUMET software developed for calculating the evapotranspiration of the crops (**Action:** P&H, SWEC, Kumulur)
2. Solar pumps may be installed in Coimbatore and also in other research farms. (**Action:** P&H, REE, Coimbatore)
3. Revamping of Renewable Energy Park with newer equipment may be initiated. (**Action:** P&H, REE, Coimbatore)
4. Turmeric value chain machinery may be installed in a single point in concurrence with SHG or Turmeric Growers Association for large scale adoption. (**Action:** P&H, FPE, Coimbatore)
5. Effective utilization of Pilot plant installed at CPHT (**Action:** P&H, CPHT, Coimbatore)
6. Possibilities of Energy conversion from municipal waste may be tried. (**Action:** P&H, REE, Coimbatore)
7. Identification of one scientist for mechanization of each major crops viz., rice, sugarcane, maize, cotton etc., in selected Research Stations of the University (**Action:** P&H, FMPE, Coimbatore)
8. Low cost poly house technology may be evolved and to be communicated to the Department of Agrl.Engg. (**Action:** P&H, SWCE, Kumulur / Assoc. P&H i/c, SWCE, Coimbatore)
9. Establishment of Farm Machinery Museum using funds available under RFS scheme at AMRC to showcase the antique and various developed farm machinery from the inception of the AICRP on FIM. (**Action:** P&H, FMPE, Coimbatore)
10. Inventory for Farm machinery available at University level has to be prepared and transfer of machinery to the needy places. (**Action:** Dean (Engg), AEC&RI, Coimbatore)
11. Ways and means of improving the efficiency of drip irrigation through advanced technologies (**Action:** P&H, SWEC / P&H, IDE, Kumulur / Assoc. P&H i/c, SWCE, Coimbatore.)

### Remarks of the Director of Research:

1. Flag of issues mentioned earlier in Farm Machinery, Renewable Energy Engineering, Food Process Engineering, Soil and Water Conservation Engineering and Physical Sciences and Information Technology may be focused and research works as per action plan may be expedited. (**Action:** All the P&H of AEC&RI, Coimbatore and Kumulur)

2. Standard Operational Protocols for Complete Mechanization for selected crops may be documented (**Action** : Dean, AEC &RI, Coimbatore)
3. A dedicated taskforce may be set up to take the stock of mechanization available for Bird scaring and prevention of other Human - Animal Conflicts and to identify potential technologies for adoption (**Action** : Director of Research; Dean, AEC & RI, Coimbatore; Dean, FC & RI, Mettupalayam)
4. Research on Artificial Intelligence, Robotics in Agriculture and farm automation concepts may be promoted involving Anna University, Chennai (**Action** : Director of Research; Dean, AEC & RI, Coimbatore).

## **IX. Contact details of scientists participated in the 8<sup>th</sup> Agricultural Engineering Scientists' Meet, 2020.**

### **Farm Machinery**

<b>SI. No</b>	<b>Name &amp; Designation with full address</b>	<b>Mobile Number</b>	<b>Email ID</b>
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### **Renewable Energy Engineering**

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