Agricultural Engineering College and Research Institute

Tamil Nadu Agricultural University
Coimbatore

PROCEEDINGS OF THE 5th SCIENTISTS' MEET ON AGRICULTURAL ENGINEERING – 2017

The Scientists' Meet on Agricultural Engineering 2017 was held at Seminar Hall (RI Building), Tamil Nadu Agricultural University, Coimbatore on May 18 & 19, 2017. The session was chaired by the Registrar i/c, in which the Director of Research i/c, Dean, (Engg,) i/c, Coimbatore, Dean i/c, Kumulur, Dean i/c, HSC&RI, Madurai and Heads of Departments and Staff members of AEC&RI, Coimbatore and Kumulur, TNAU participated.

MEMBERS PRESENT

Sl. No	Name and Designation	Department
1.	Dr. C.R. Ananthakumar, Registrar	TNAU, Coimbatore
2.	Dr. M. Maheshwaran, Director of Research i/c	TNAU, Coimbatore.
3.	Dr. C.Divaker Durairaj, Dean i/c	AEC&RI, Coimbatore
4.	Dr. I. Muthuchamy, Dean i/c	AEC&RI, Kumulur
5.	Dr. S. Parvathi, Dean i/c	HSC&RI, Madurai
6.	Dr. B.J. Pandian, Director i/c	WTC, TNAU, Coimbatore
7.	Dr. D. Manohar Jesudas, Prof & Head	Agrl. Machinery Research Centre
8.	Dr. N. Varadharaju, Prof & Head	Post harvest Technology Centre
9.	Dr. S. Ganapthy, Prof & Head	Dept of F&APE
10.	Dr. S. Pugalendhi, Prof. & Head	Dept. of Bioenergy
11.	Dr. K. Kathirvel, Professor & Head	Dept. of Farm Machinery and Bioenergy, Kumulur
12.	Dr. P. Rajkumar, Professor and Head	Dept. of AP & BS, AEC&RI, Kumulur.
13.	Dr. V. Ravikumar, Professor and Head	Dept. of SWCE & AST
14.	Dr. S.V. Kottiswaran, Professor (SWC)	O/o the Dean, AEC&RI, TNAU, Coimbatore
15.	Dr. B. Shridar, Professor	AMRC, TNAU, Coimabtore.
16.	Dr. V.M. Duraisamy, Professor	AMRC, TNAU, Coimabtore.
17.	Dr. A. Surendrakumar, Professor	AMRC, TNAU, Coimabtore.
18.	Dr. R. Kavitha, Professor	AMRC, TNAU, Coimabtore.
19.	Dr. V. Palaniselvam, Assistant Professor	AMRC, TNAU, Coimbatore.
20.	Dr. B. Suthakar, Assistant Professor	AMRC, TNAU, Coimbatore.
21.	Dr. A. Raviraj, Professor (SWC)	Water Technology Centre
22.	Dr. A. Valliammai, Asst. Prof. (SWC)	Water Technology Centre
23.	Dr. P. Subramanian, Professor	Dept. of Bioenergy
24.	Dr. S. Karthikeyan, Professor (Microbiology)	Dept. of Bioenergy
25.	Dr. S. Sriramajayam, Assistant Professor	Dept. of Bioenergy
26.	Dr. R. Angeeshwaran, Assistant Professor	Dept. of Bioenergy
27.	Dr. R. Mahendiran, Asst. Prof.	Dept. of Bioenergy
28.	Dr. P. Vijayakumari, Asst. Prof.	Dept. of Bioenergy
29.	Dr. K. Thangavel, Professor	Dept. of F&APE
30.	Dr. T. Pandiyarajan, Professor	Dept. of F&APE
31.	Dr. M. Balakrishnan, Assistant Professor	Dept. of F&APE

32.	Dr. C. Indurani, Assistant Professor (Hort)	Dept. of F&APE
33.	Dr. D. Amirtham, Asst. Prof. (Biochemistry)	Dept. of F&APE
34.	Dr. P. Raja, Asst. Prof. (Micro.)	Dept. of F&APE
35.	Dr. I.P. Suthakar, Assistant Professor	Dept of F&APE
36.	Dr. P. Banumathi, Professor (FSN)	PHTC, AEC&RI, TNAU, Coimbatore.
37.	Dr. D. Malathi, Professor (FSN)	PHTC, AEC&RI, TNAU, Coimbatore.
38.	Dr. Z. John Kennedy, Prof. (Micro.)	PHTC, AEC&RI, TNAU, Coimbatore.
39.	Dr. G. Guru Meenakshi, Asst. Prof.	PHTC, AEC&RI, TNAU, Coimbatore.
40.	Dr. V. Thirupathi, Professor	DARS, Chettinad
41.	Dr. D. Ramesh, Associate Professor	HC&RI (W), Trichy
42.	Dr. M. Nagarajan, Asst. Prof. (SWC)	SWMRI, Kattuthottam.
43.	Dr. M. Manikandan, Asst. Prof.	AEC&RI, Kumulur
44.	Dr. M. Rajeshwari, Asst. Professor	AC&RI, Madurai
45.	Dr. N. Anandaraj, Asst. Professor (SWCE)	ARS, Kovilpatti

I. Details of staff and project

Sl. No.	Name of the department / station	No. of staff				No. of projects
		P	AsP	AP	T	
1.	Department of Bioenergy	3	-	5	**8**	AICRP on EAAI – 12 Nos. Externally funded – 5 Nos.
2.	Precision Farming Development Centre	1	-	-	**1**	PFDC - 4 Nos.
3.	Water Technology Centre	4	-	1	**5**	AICRP – IWM - 3 Nos. NICRA – 1 No.
4.	Department of Food and Agrl. Process Engineering	3	-	5	**8**	AICRP on PHT – 7 Nos. Externally funded – 1 No. TNAU project – 2 Nos.
5.	Post Harvest Technology Centre	6	1	-	**7**	Externally funded – 4 Nos. TNAU project – 2 Nos.
6.	Agricultural Machinery Research Centre	5	-	1	**6**	Externally funded – 1 No. AICRP on FIM – 5 Nos. ESA – 4 Nos. TNAU Project – 1 No.
7.	AEC&RI, Kumulur					
a	Department of Farm Machinery & Bioenergy, Kumulur.	3	-	6	9	TNAU project – 2 Nos.
b	Department of Soil and Water Conservation, Kumulur.	4	-	3	7	Externally funded – 1 No.
c	Department of Agrl. Process Engineering, Kumulur.	1	-	1	2	----
8.	ARS, Kovilpatti	-	-	1	1	AICRP – 3 Nos.
9.	ARS, Bhavanisagar	-	-	1	1	AICRP –IWM – 2 Nos.
10.	SWMRI, Thanjavur	-	-	1	1	TNAU project – 1 No.
11.	AC&RI, Madurai	1	-	1	2	AICRP-IWM – 1 No. Externally funded – 1 No.
12.	DARS, Chettinad	1	-	-	1	TNAU Project – 1 No.
13.	KVK, Sikkal	-	-	1	1	----
14.	KVK, Virinjipuram	-	-	1	1	----
15.	AC&RI, Eachankottai	-	-	1	1	----
16.	KVK, Sirugamani	-	-	1	1	----
17.	AC&RI, Killikulam	-	1	-	1	----

18.	ADAC&RI, Trichy	1	-	-	1	----
19.	AC&RI, Vazhavechaur	-	-	1	1	----
20.	ARS, Paiyur	-	-	1	1	----
21.	Department of RS&GIS	-	1	-	1	----
22.	Controller of Exams, CBE	1	-	-	1	----
23.	KVK, Aruppukottai	-	-	1	1	----
24.	FC&RI, Mettupalayam	-	-	1	1	----
25.	KVK, Ramanathapuram	-	-	1	1	----

II. Remarks on the ongoing research projects

Department of Bioenergy						
S. No.	**Title of the Project**	**Funded by**	**PI**	**Co-PI**	**Period**	**Remarks**
1	AICRP/AGE/CBE/BEN/001 - Design and development of tar and particulate removal system for producer gas obtained from gasification of biomass	ICAR	Dr.S.Pugalendhi Professor and Head	Dr.R.Angeeswaran	Jan 2015 to December 2016	**Proper experimentation for demarking and adjusting air incorporation to pyrolysis zone is not done. Results are not reliable**
2	AICRP/AGE/CBE/BEN/001 - Development of hydrothermal carbonization (HTC) reactor for hydrochar and chemicals production from selected lignocellulosic feedstocks	ICAR	Dr.S.Pugalendhi Professor and Head	Dr.R.Angeeswaran	Jan 2015 to December 2016	**A lab scale reactor was used to record the char production that too only for two retention times. Project is to be continued to get meaningful results.**
3	AICRP/AGE/CBE/BEN/001 - Energy audit and power factor improvement in agro industries	ICAR	Dr.S.Pugalendhi Professor and Head	Dr. R. Mahendiran	Jan 2015 to December 2016	**Power factor improvement by capacitor is not research work. Energy auditing is also not done effectively.**
4	MNRE/AEC/CBE/BEN/2014/R004 - Development of hybrid high rate biomethanation reactor with locally available media for treating waste water and solid waste	MNRE	Dr.S.Pugalendhi Professor and Head	Dr. S. Karthikeyan	April 2014 to March 2017	**No work was done, since the prototype plants are yet to be completed in construction.**
5	ICAR-CRP/AEC/CBE/BEN/2016/R005 - Consortia Research Platform	ICAR	Dr.S.Pugalendhi Professor and Head	S. Sriramajayam	Aug. 2015 – March, 2017	**Demonstration works only and no research mandate in this project.**

	on Energy from Agriculture					
6	ICAR -EM/ AEC/ CBE/ BEN/ 2016 / R009 - Process development and evaluation of plasma gasification for producer gas generation from biowastes	ICAR	Dr.S.Pugalendhi Professor and Head	S. Sriramajayam	Nov.2015 – Oct. 2017	**Plasma system is being fabricated yet with improved design and steam injection. Experiments are still not done.**
7	JCERDC/AEC/CBE/ BEN/2012/R002 - US-India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems (SALBS)	GOI	Dr.S.Karthikeyan, Professor, (Agrl. Micro)	Dr U Sivakumar, Agrl. Microbiology; Dr D. Ramesh; Dr. S.Marimuthu (Agron.) Dr.A.Yuvaraja (PBG)	11/12 To 10/16	**Work is being done using hydrodynamic cavitations to disintegrate as well to heatt optimally for enhanced efficiency of processing. Needs to be continued further.**
8	AICRP/AGE/CBE/BEN/001 - Development and evaluation of high rate biomethanation system for treating waste water from paper and pulp industry and community waste water.	AICRP-EAAI	Dr.R.Angeeswaran,	Dr.S.Karthikeyan, Microbiologist	March 2015 to April 2017	**The design conversion has not been done systematically. Experiments have not been formulated properly to methodically evaluate the design conversion.**
9	AICRP/AGE/CBE/BEN/001 - Design and development of biogas based grain drying system	AICRP-EAAI	Dr. R. Angeeswaran	Dr.S.Karthikeyan Microbiologist	March 2015 to April 2017	**No drying related work was attempted. An industry boiler was retrofitted with biogas and studied which is not related to this project.**
10	AICRP/AGE/CBE/BEN/001 - Development of software protocol for design of solar dryers	AICRP-EAAI	Dr. R. Mahendiran,		Extended till March 2017	**No research component in this project. Only more calculations in VB environment.**
11	GOI/AEC/CBE/BEN/ 2015/ R006 - Development of biogas/ biogas-cum-solar thermal energy based integrated drying system for efficient drying of ribbed	GOI-RRII – Rubber Board	Dr. R. Mahendiran,	Dr. R. Angeeswaran, Assistant Professor	2 years July 2015 – June 2017	**An effective system has been evolved and optimized. The quality of rubber obtained is also of good quality.**

	smoke sheets" (RSS)					
12	AICRP/AGE/CBE/BEN/001 - Demonstration and evaluation of domestic size fixed dome high solid state biogas plant at selected farmer's site	ICAR	Dr. D. Ramesh, Assistant Professor	-	April 2015 – March 2017	**Only demonstrations were conducted. Five biogas plants were installed in Kinathukadavu.**
13	AICRP/AGE/CBE/BEN/001 - Demonstration and evaluation of solar tunnel dryer in the selected user's sites for the drying of food products					
14	AICRP/AGE/CBE/BEN/001 - Creation of five smoke free tribal villages through promotion of TNAU smokeless chulha					
15	AICRP/AGE/CBE/BEN/001 - Design an development of pyrolytic reactor for fuel oil recovery from plastic wastes	AICRP-EAAI–LBT	Dr. S. Sriramajayam, Research Engineer	Dr. K. Chandrakumar Dr.S.Karthikeyan Dr. D. Ramesh	April 2015 – March 2017	**A one kg per hour capacity prototype has been evolved successfully, which can produce plastic oil of octane number comparable to petrol. Waste plastic bag disposal can be effective by using this technology.**
16	AICRP/AGE/CBE/BEN/001 - Design and development of biophasic reactor for butanol production	AICRP-EAAI–LBT	Dr. S. Sriramajayam, Research Engineer	Dr. K.Chandrakumar Dr.S.Karthikeyan Dr. D. Ramesh	April 2015 – March 2017	**The process has been successfully optimized for maximum butanol production. But butanol production is very low and it is acting as an inhibitor. Technology is to be evolved to quickly remove the produced butanol. Project has potential and can be proposed a new next year.**
17	AICRP/AGE/CBE/BEN/001 - Evaluation of suitable ionic	AICRP-EAAI	Dr. K.Chandrakumar	Dr. S. SriramajayamResearch	April 2015 – March	**This process needs to be evaluated in comparison with**

	liquids (IL) for low cost eco-friendly biomass pretreatment.	–LBT	Asst. Prof. (Biochemistry)	Engineer	2017	**conventional acid treatment process to make it useful.**

PFDC					
S. No.	**Title of the Project**	**Funded by**	**PI / Project Leader**	**Period**	**Remarks**
1.	GOI / AEC / CBE / SWC / 2014 / D001 / 01 - Standardization of frame sections used in poly house for their structural stability.	NCPAH	Dr.S.V.Kottiswaran, Professor	Nov. 2015 to Mar. 2017	**Frame section for poly houses were optimized for stability using FEA. All the individual compoenents of the standard configuration of polyhouses were thus standardized using FEA and the Indian wind load standards. The complete set of standards are conveyed to NCPH for implementation.**
2.	GOI / AEC / CBE / SWC / 2014 / D001 / 02 -Evaluation of Drip fertigation and plastic mulching in grafted Brinjal			June 2014 to March 2017	**The fertigation and irrigation level were optimized for maximum WUE and yield of grafted Brinjal in open field conditons. Platic mulching was found to be better in giving increased WUE.**
3.	GOI / AEC / CBE / SWC / 2014 / D001 / 03 -Feasibility study of different filler crops under protected cultivation suitable for semi arid conditions.			Nov. 2015 to Nov. 2017	**Feaibility study on filler crops proved that they can be grown in protected environment in semiarid conditions.**
4.	GOI / AEC / CBE / SWC / 2014 / D001 / 04 - Standardization of water requirement under high density planting for maximizing yield in mango			June 2014 to March 2017	**Mango crop has just been planted before 4 months and are still to establish for further experimentation.**

Water Technology Centre					
S. No.	**Title of the Project**	**Funded by**	**PI / Project Leader**	**Period**	**Remarks**
1	AICRP/WTC/CBE/IWM/001 /C1 Study on groundwater balance to assess the quantity of water available for development in the Amaravathi basin.		Dr. A. Raviraj, Professor (SWCE) Dr. A.Valliammai, Asst. Prof.(SWCE)	Oct' 2014 - March 2017	**Assessment of groundwater availability was done in the basin and compared with the rain fall pattern.**

2	AICRP/WTC/CBE/IWM/001 /C2 Conjunctive use of groundwater and canal water in the command area-Lower Bhavani Project		Dr. A. Raviraj, Professor (SWCE) Dr. A.Valliammai, Asst. Prof.(SWCE) Dr.Manikandan, Asst.Prof.(SWCE), ARS, Bhavanisagar.	Oct 2014-March 2017	**Lower Bhavani project area was surveyed for ground water and canal water availability season wise and the status has been assessed.**
3	AICRP/WTC/CBE/IWM/001 /C3 Study on augmentation of groundwater resources by artificial recharge structures and to identify the potential recharge zone using RS & GIS in selected watershed of Amaravathi basin		Dr.A.Valliammai, AP(SWCE) Dr.A.Raviraj,Prof(SWCE) Dr.D.Jayanthi, AP(SS&AC)	April 2014-March 2017	**Survey of water availability (district wise) is being attempted.**
4	ICAR/WTC/CBE/AEC/2015/ R008 ICAR-Network project on "National Initiative on Climate Resilient Agriculture"		Dr. A. Raviraj, Professor (SWCE) Dr. A.Valliammai, Asst. Prof.(SWCE)	Oct 2014-March 2017	**GIS based predictor of runoff quantity was computed. Based on the availability of runoff, potential recharge zones were identified. measurement of recharge were made to assess the recharge actually happening.**

Department of Food and Agrl. Process Engineering						
S. No	**Title of the Project**	**Funded by**	**PI**	**Co-PI**	**Period**	**Remarks**
1.	AICRP/AGE/CBE/PHT/004/I - Turmeric Value Chain Project					
a	AICRP/AGE/CBE/PHT/004/I/01 - Development of a washer for turmeric rhizomes	AICRP-PHETS	Dr I. P.Sudagar, Asst. Prof.	Dr. S. Ganapathy, Prof. and Head	April 2015 to March 2017	**A rotary washer with an approximate capacity of 400 kg / hr and washing efficiency of 85% has been developed.**
b	AICRP/AGE/CBE/PHT/004/I/05 - Studies on the effect of boiling, drying and storage on the biochemical constituents of turmeric rhizomes		Dr. D.Amirtham, Asst. Prof. & Dr. C.Indu Rani, Asst. Prof.	Dr. S. Ganapathy, Prof. and Head		**Pressure boiling of turmeric was tried in a developed pressure vessel, but pressure build up was not sufficient. A good steam**

						generator to build 1.0 KSC at the required inflow should be matched.
c	AICRP/AGE/CBE/PHT/004/I/03 - Development of mechanical dryer for turmeric *(Curcuma longa.* L) rhizomes		Dr. R. Arul Mari, Asst. Prof.	Dr. S. Ganapathy, Prof. and Head		**A dust containing hood has been incorporated to the developed turmeric polisher.**
d	AICRP/AGE/CBE/PHT/004/I/04 - Development of dust proof turmeric polisher		Dr. R. Arul Mari, Asst. Prof.	Dr. S. Ganapathy, Prof. and Head		**Laboratory studies on turmeric boiling were done with conventional parboiling and pressure boiling. The curcumin content was found to be maximum with pressure boiling treatment**
e	AICRP/AGE/CBE/PHT/004/I/02 - Development of boiling unit for turmeric rhizomes		Dr. T.Pandiarajan, Prof.	Dr. S. Ganapathy, Prof. and Head		**A rotary drier for turmeric has been developed, which can dry 400 kg batch from 400% to 11% moisture in 33 hours at 70^0C and at a air flow rate of 24.3m^3 / min.**
2.	AICRP/AGE/CBE/PHT/004/II - Consortia Project on Development of integrated dhal milling system suitable for black gram and green gram	AICRP - PHETS	Dr.T.Pandiarajan Prof.	Dr. S. Ganapathy, Prof. and Head	April 2015 to March 2017	**A dhal mill exclusively for black and green gram is being developed with emery rollers. 85% milling efficiency is obtained. But there is scope for improving the performance.**
3.	AICRP/AGE/CBE/PHT/004/III - Controlled Atmospheric Storage of Pulses	AICRP - PHETS	Dr.T.Pandiarajan Prof.	Dr. S. Ganapathy**,** Prof. and Head	April 2016 to March 2018	**1 – 2 ton capacity CA system is being planned. Preliminary**

						studies using lab models are being made on CA storage of black and green gram.
4.	AICRP/AGE/CBE/PHT/004/IV - Development of efficient supply chain for *aggregatum* onion	AICRP-PHET	Dr.S.Ganapathy, Prof. and Head	Dr.C.Indu Rani, Asst. Prof.	April 2015 to March 2017	**Basic studies on the changes of properties of onion aggregatum during curing process were studies. It was found that insignificant changes in properties were effected by curing.**
5.	AICTE / AEC / CBE / FAP / 2014 / 003 - Design and development of ozone based farm level storage bin condition.	AICTE	Dr.T.Pandiarajan, Prof.	---	Apr 2014 - Mar 2017	**It was found that ozone infusion into stored grain has significant mortality on storage pests. A commercially viable system is built.**
6.	Evolving grading standards for dehusked coconut and mango.		Dr.T.Pandiarajan, Prof.	---	April 2016 to March 2018	**A commercial fruit grader was tried on coconut and was found to work well. Weight based grading is to be evolved next.**
7.	Design and development of deep and dryer for high moisture paddy.		Dr. S. Ganapathy, Prof. and Head	---	April 2016 to March 2018	**Experimental studies are being made to understand air flow through highly moist grain of different bed thicknesses.**

Agricultural Machinery Research Centre						
S. No	**Title of the Project**	**Funded by**	**PI / Project Leader**	**Co-PI**	**Period**	**Remarks**
1	AICRP/AGE/CBE/FMR/002/15/07 - Design Development of transplanter for SSI Sugarcane seedlings	AICRP on FIM	Dr.R.Kavitha, Professor	Dr.D.Manohar Jesudas, Professor	1.1.2014 to 31.3.2018	**Machine is not responding to required speed and hence better interventions are**

						needed
2	AICRP/AGE/CBE/FMR/002/15-16/01 - Development of harvester cum collector for cluster onion	AICRP on FIM	Dr.B.Shridar, Professor	Dr.R.Kavitha, Professor	1.4.2015 to 31.3.2017	**Seperation of soil from onion is to be improved. Collection of dug onions into the conveyor bin is to be improved. University project will be proposed for the machine.**
3	AICRP/AGE/CBE/FMR/002/15-16/02 - Development of tapioca detopper cum binder	AICRP on FIM	Dr.V.M.Duraisamy, Professor	Dr.R.Kavitha, Professor	1.4.2015 to 31.3.2017	**Machine does not work as required.**
4	AICRP/AGE/CBE/FMR/002/15-16/03 - Development of a system for controlled level of puddling	AICRP on FIM	Dr.D.Manohar Jesudas, Professor & Head	Dr.B.Shridar, Professor	Oct. 2015 to 31.3.2017	**It can work with two wheel tractor and cage wheel. The equipment goes with a pair of hydraulic actuators and a special mount. The leveling will be within a band of ±1 cm. However the best option is to use a 4 wheel drive tractor. This technology can be released.**
5	AICRP/AGE/CBE/FMR/002/16-17/01 – Design and Development of redgram protray seeder	AICRP on FIM	Dr.B.Suthakar, Asst. Professor	--	--	**Work is in progress. The intermittent motion of conveyor and the media feeders have been developed. Picker unit is to be developed.**
6	CAERI/CBE/FMC/2013/001 - Development of a seeder for carrot	University Project	Dr. D. Manohar Jesudas, Professor and Head	--	Dec. 2013 to Nov. 2016	**Carrot seeder for pelleted seeds have been evolved. More trials are to be taken up. It will be taken up for trials under PFT of AICRP-FIM and subsequently released.**
7	AICRP/AGE/CBE/FMR/03/14/001 - Ergonomic evaluation and refinement of power weeders for paddy	ESA	Dr.A.Surendrakumar, Professor	Dr.D.Manohar Jesudas, Professor	Nov. 2014 to Mar. 2018	**Material substitution provided 2kg weight reduction. The float handles and hood were modified.**
8	AICRP/AGE/CBE/FMR/03/14/001 Interventions for minimizing health hazards of workers in turmeric polishing.	ESA	Dr.A.Surendrakumar, Professor	Dr.D.Manohar Jesudas, Professor, Dr. S. Ganapath	Oct. 2014 to Mar. 2018	**The dust enclosure hood had earlier a rope system for locking the two folded halves together. A Velcro**

				y, P&H, F&APE and Dr. V. Palaniselvam, AP		**system has now been added instead and is being testing for workability.**
9	AICRP/AGE/CBE/FMR/002/16-17/02 Development of coconut tree climbing robot	ESA	Dr.B. Shridar, Professor	--	4.1.2016 to 31.3.2017	**Prototype will be provided within two months though the project is over.**
10	AICRP/AGE/CBE/FMR/03/14/003 - Studies on ergonomic interventions in hand tools for selected activities in grape cultivation in Tamil Nadu	ESA	Dr.V.Palanis elvam, Asst. Professor	--	Oct. 2014 to Mar. 2018	**No work was done in this project except assessment of force for cutting using a pruning tool.**
11	ICAR-EM/AEC/CBE / AME / 2016 / R002 - Manually propelled platform for harvesting vegetables	Extra mural proje ct	Dr.D.Manoha r Jesudas, Professor and Head	--	Feb. 2016 to Jan. 2018	**Under progress. Steering system is to be added to the developed machine.**

Post Harvest Technology Centre						
S. No.	**Title of the Project**	**Funded by**	**PI**	**Co-PI**	**Period**	**Remarks**
1	ICAR-CRP/ AEC / CBE /PHT / 2015 / R002: Use of protective foods in the development of micronutrients rich food products.	ICAR -CRP	Dr.N.Varadha raju Dr.D.Malathi	PI	April. 2015 to March 2017	**Encapsulation technology of β carotene from carrot and papaya has been evolved. This has been used to fortify edible oils. The technology can be released.**
2.	ICAR – NRM/NST/CBE/2015/ R010 Development of antimicrobial and antioxidative nano packaging film for perishables	ICAR – Nanotechn ology Platform	Dr.N.Varadha raju	PI	June 2015-Sept. 2017	**Antimicrobial / anti oxidative element incorporation in nano film has been tried. However, more work needs to be done.**
3.	AECRI/CBE/FAP/FRU/2016/001 Design and Development of singulating system for continuous deseeding of aonla	TNAU	Dr.N.Varadha raju	PI	June 2016-June 2017	**The work is completed and released 2016-17.**
4.	IDRC/ AEC/CBE/PHT/2016/ R004 Scaling up small millet post harvest and nutritious food products	IDRC - Canada	Dr. D. Malathi	PI	June 2016-March 2018	**11 trainings have been conducted on millet processing and value addition. More millet based products by including moringa leaves, methi and palak have been developed.**

5.	HSCRI/CBE/FSN/2015/006 Utilization of fruit waste for the development of nutrient rich value added products"	University sub project	Dr.P.Banumathi		Sept. 2015-Sept. 2017	**Recipes with incorporation of amla pomace have been developed.**
6.	ICAR-EM/AEC/CBE/PHT/2016/R003 Conversion of mango fruit waste into a micronutrient fortifying agent for the development of functional foods	ICAR – Extramural	Dr. G.Gurumeenakshi	PI	November 2016-March 2018	**Solvent extraction using Hexane has been proved successful for extracting β carotene from mango peel and pomace. Simultaneous running of extraction process with pulping can yield an use ful income from β carotene extraction process.**

Out stations

AEC&RI, Kumulur						
S. No.	**Title of the Project**	**Funded by**	**PI**	**Co-PI**	**Period**	**Remarks**
1	ICAR / EM / AEC / KUM / PBG / 2016/ 006 - Fertigation Scheduling for Paddy by Simulation Modelling	ICAR-NRM (Extramural)	Dr.V.Ravikumar, Professor	Dr.T. Sherene Jenita Rajammal	January-2016 – March-2017	**Two dimensional simulation of drip fertigated uptake by plants have been successfully attempted. The input parameters such as root spread, Hydraulic conductivity, etc were measured. A fertigation schedule based on the requirement of crops was arrived based on these simulations with iterated variable inputs. The real uptake will be tested in the next year for correlating with the simulations. An university project for I year may be formulated.**
2	CAEK/KUM/FMP/14/003 Development of Solar Powered Bird Scarer	TNAU	J. John Gunasekar, Professor (BE)		June 2014 – May 2017	**Revolving spherical reflectors were tried to scare away the birds, that**

						are driven by solar powered motors. However the effect of these reflectors on birds is not appreciable and hence the development was found not to be feasible.
3	AECRI / KUM /FMP / 2014 / 002 - Self Propelled Cleaning System for Solar PV Panels		S.A.Ramjani, Assistant Professor (BE)		June 2014 – May 2016	**Micro sprinklers were tried to give a cleaning water sprinkle which is found to be effective. About 700 W cell panel area required about 40w pump to sprinkle and clean the surface. A 2 minutes spray daily in the morning proves to be effective. A solar driven pump can use the water pressure to operate the micro sprinklers.**
4	AICRP / WTC / CBE / IWM – Optimization of depth of placement of lateral using HYDRUS for different soil types.	AICRP	Dr. M. Manikandan, Asst. Prof. (SWCE)		Sep. 2016 to Aug. 2018	**Weting width of different drippers have been measured. This will be used later in HYDRUS for simulation.**
5	AICRP / WTC / CBE / IWM – 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.	AICRP	Dr. M. Manikandan, Asst. Prof. (SWCE)		Sep. 2016 to Aug. 2018	**Experimental plan for study of the effect of lateral spacing, dripper discharge in two types of soils was prepared. Experiment is yet to be conducted.**
Agricultural Research Station, Kovilpatti						
6	AICRP/DCM/KPT/AGR/1971/004 Catchment - storage - command area relationship for enhancing water	AICRP	Dr. N. Anandaraj Assistant Professor (SWC)		April 2006 - LT	**Since of no rainfall, it is claimed that the crop has failed and work was not done in all the three projects.**

	productivity in a micro – watershed.					
7	AICRP/DCM/KPT/AGR/1971/004 Evaluation of tillage methods for improving water use efficiency in rainfed cotton - Pulses crop rotation	AICRP	Dr. N. Anandaraj Assistant Professor (SWC)		April 2014 – March 2017	
8	AICRP/DCM/KPT/AGR/1971/004 Performance evaluation of tractor operated air assisted seed drill for sowing minor millets	AICRP	Dr. N. Anandaraj Assistant Professor (SWC)		April 2014 – March 2017	
SWMRI, Thanjavur						
9	AECRI/TNJ/SWC/MAZ/2015/001 Impulse response on water productivity pattern under drip fertigation for maize		Dr. M. Nagarajan, Asst. Prof. (SWC)	Dr. S. Porpavai, Professor and Head	2015 to 2017 (Summer crop)	**Moisture content responses were identified for different discharges from drippers in maize. No salient findings are available yet.**
AC&RI, Kudumiyanmalai						
10	AECRI / KDM / BOE / 2016 / 001 – Biomethanation of seaweeds evaluation of subsurface drainage water loss and salt effected hands on farmers hand.		Dr. P. Vijayakumari, Asst. Prof. (BE)	-	June 2016 to May 2018	**Sea weeds of two types were collected and the relevant compositions were studied in detail. They are compatible for biomethanation. Future work should concentrate on biomethanation process, development.**
AC&RI, Madurai.						
11	AICRP / WTC / CBE / IWM / 001 – Techno economic evaluation of rain gun irrigation on yield of finger millet		Dr. M. Rajeshwari, Professor (SWCE)	-	March 2016 to March 2018	**Experimental design has not been properly laid out. The raingun coverage has not been overlapped and a lot of field area has not been hence not be covered. Uniformity of irrigation water applied has not been contended properly. Yield of finger millet has**

						been claimed to be good while using raingun.
Dry land Agricultural Research Station, Chettinad						
12	AECRI/CTN/FAP/2014/001 Process Optimization for millet based Extruded Products		Dr.V.Thirupathi (F&APE)	Dr.E.Tamilselvi (FSN)	Nov. 2014 – March 2017	**Millet based extruded products, mainly noodles have been developed. Evaluation of the products is still pending.**

IV. ACTION PLAN (2016-2019)

FARM MACHINERY

Theme: Development of Machinery and technology to provide complete mechanization in selected crops.

1. Mechanization of groundnut cultivation - Development of groundnut harvester with collection bin

Activities	Y1	Y2	Y3	Scientists involved	
1. Design of a harvester with collection arrangement				Dr. B. Shridar Dr. A. Surendrakumar	25% 25%
2. Fabrication of the harvester				Dr. R.Kavitha	25%
3. Field trials with harvester				Dr. B. Suthakar	25%

- Planting of groundnut had already been mechanised - Tractor drawn cultivator planter developed by AMRC is being used by farmers extensively.
- TNAU had also developed tractor operated groundnut digger. This implement has been adopted by various firms and different types of diggers are available commercially.

Development of groundnut harvester with collection device

- To eliminate the need to collect the plants dug and discharged by the digger, a conveyer type collection device was developed and attached to the existing digger.

Development of picker combine for groundnut

- A research project to pick the dried ground nut vines and separate the pods from the groundnut vines had been proposed. The groundnut vines dugout by the digger will be deposited in windrows and allowed to dry in the field.
- After drying for four to five days the dried vines will be picked and threshed by a picker combine. The picker part of the unit was adopted from the picker head of a commercial straw baler. Preliminary trials were conducted with the picker head.

2. Technology for mechanization in wide spaced irrigated crops (Cotton, maize and Redgram)

Activities	Y1	Y2	Y3	Scientists involved	
1. Raised bed forming suitable for furrow irrigated /drip irrigated systems				Dr. Monohar Jesudas Dr. A.Surendrakumar Dr. B. Shridar	40 % 20 % 20 %
2. Development of modular raised bed former cum seeder				Dr. R.Kavitha	20%
3. Field trials with Raised Bed planter					

- Mechanization trials were conducted under

- i. Drip irrigated field (Drip tape) and
- ii. Conventionally irrigated field
- In the drip irrigated plots, the main pipelines were laid under the ground and the laterals were laid for each row after sowing. The laterals were shifted during mechanized weeding and harvesting operations.
- Since there is no cross channels, the machinery could be operated conveniently.

Following operations were mechanized under cotton and maize crop (drip irrigated field)

- Mechanized land preparation - primary tillage with disc plough and secondary with rotavator.
- Sowing with inclined plate planter at the required row to row spacing and plant to plant spacing with appropriate seed plate.
- Spraying the pre-emergence weedicide with tractor operated air sleeve boom sprayer.
- Irrigation with drip tape system.
- Mechanical weeding with self propelled power weeder.
- Cutting of the maize stalk with self propelled vertical reaper conveyer.

Mechanization in Conventional irrigated cotton crop

- Mechanized land preparation - Primary tillage with disc plough and secondary with vertical rotary harrow.
- Land shaping to raised bed configuration with bed former with bed spacing of 73 cm in order to enable standard tractor to move through the field with regular tyre size.
- Sowing with inclined plate planter at the required row to row spacing and plant to plant spacing with appropriate seed plate (sowing at the side of the beds).

Mechanization in Conventional irrigated cotton crop

- Spraying the pre emergence weedicide with tractor operated air sleeve boom sprayer.

Mechanization in Conventional irrigated cotton crop

- Irrigation in the furrows with limited cross channels.
- Weeding of the cotton crop with standard tractor and modified hoe setting.

3. Mechanization of vegetable crop

Development of a vegetable transplanter with variable row spacing

Activity	Y1	Y2	Y3	Scientists involved	
1. Design of Vegetable Transplanter				Dr. D. Monohar Jesudas Dr. C. Divaker Durairaj	60 % 20%
2. Fabrication of Transplanter				Dr. R. Kavitha	20%
3. Field trials					

Mechanization of vegetable crops

Two different vegetable transplanting implements have been developed by TNAU viz., gripper chain type transplanter for bare root seedlings, cassette type transplanter for protray grown seedlings

Fully automatic vegetable transplanter (Experimental)

- The protray was held vertically and the seedlings were ejected by ejection pins that were driven by miniature geared motors. The synchronization of the seedling ejection and the tray traverse were made possible by microprocessor control.
- Preliminary trials were conducted with this device to transplant tomato seedlings.

Drum type automatic transplanter

- An automatic vegetable transplanter with similar seedling ejection device, but with a drum type protray holding and indexing arrangement had been designed.
- A research project to develop an fully automatic vegetable transplanter with suitable plant gripping and removal arrangement is also proposed.

BIOENERGY

Theme: Enhanced energy and resource recovery from biomass and wastewater

Thrust area: Biomass Refinement and Resource Recovery for Sustainable Energy Management

Approach

- Hydrothermal carbonization (HTC) of biomass and municipal biosolids for fertilizer and biocoal production
- Development of reactor for biochar production for use in purification of gaseous biofuels by absorption

Deliverable

- Nutrient and energy recovery system for wastewater streams
- Reduction in carbon and energy foot print in bioconversions

PROJECT 1: HYDROTHERMAL CARBONIZATION (HTC) OF BIOMASS HTC UNIT FOR HYDROCHAR PRODUCTION

Reactor Design

- SS with teflon lining
- High pressure reactor with locally available materials
- Simple and compact in design
- Non stirred type
- Low cost
- time and temperature controller
- Data logging
- Capacity : 1 L (Biomass + Water) per batch, Reaction Temperature : 180 – 250˚C
- Reaction Pressure : 10 - 22 bar , Hydrochar yield: 50 - 80% , Cost : Rs.90,000/-
- Calorific Value of lignocellulosic biomass : 15 – 19 MJ kg^{-1}
- Calorific Value of Arecanut husk hydrochar (Bio-coal) : 23 MJ kg^{-1} at 9 h treatment
- CV of conventional coal : 28 MJ kg^{-1}

Salient findings

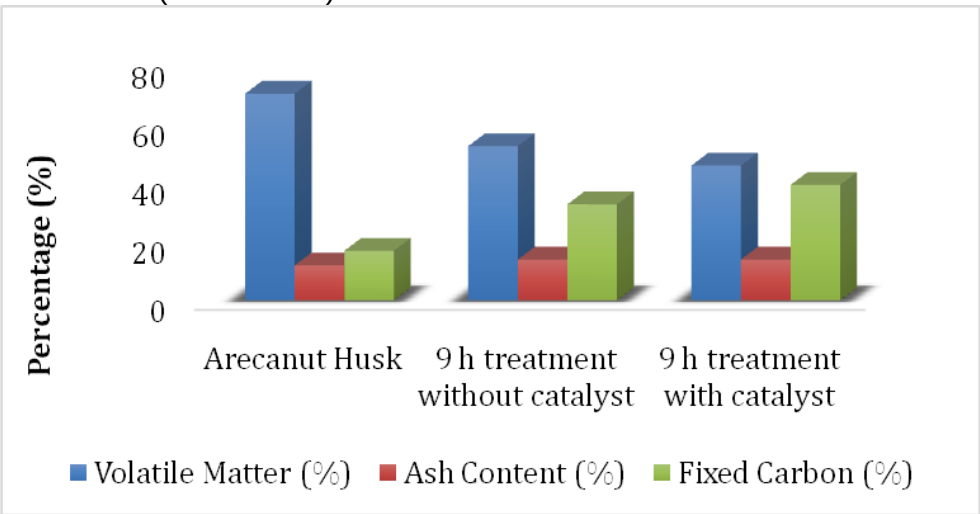
- Hydrochar yield is affected by the catalyst dosage and water ratio
- Hydrochar yield % at different combination of substrate and catalyst
  Does not varies as much as the residence time increases from 3h to 6h 73% weight loss was observed with catalyst treatment when compared to treatment without catalyst as 62% catalyst [@12.5g biomass]

- Treatment from 9 h increases the c.v of the hydrochar treated with catalyst (37.5g biomass /25mg 10 water ratio) and increases the energy yield and mass density
- HTC 50g of arecanut husk biomass with 50mg of citric acid mixed with water ratio of 5 (250 ml) and continuously hydrotreated for 9h gave maximum char yield of 33.55g with the hydrochar yield of 67.10%

Properties	**Arecanut Husk**	**9 h treatment without catalyst**	**9 h treatment with catalyst**
Hydrogen (%)	5.28 ± 0.02	5.00 ± 0.03	4.93 ± 0.03
Oxygen (%)	38.96 ± 0.07	35.26 ± 0.27	34.11 ± 0.26
Mass of pretreated biomass (g)	37.5	20.27	22.02
Mass Yield (%)	-	54.05	58.72
Energy Densification Ratio	-	1.24	1.35
Energy Yield (%)	-	67	79.2

Arecanut husk Biomass
Hydrochar

- Carbon 43% to 46%
  - Fixed carbon 17% to 39.7%
  - HHV 16.98 MJ Kg^{-1} to 23 MJ Kg^{-1}
- Volatile matter (71% to 46%)

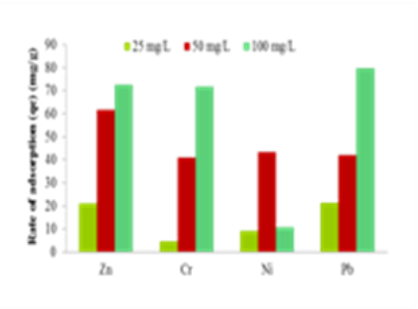


Capacity : 1 L (Biomass + Water) per batch, Reaction Temperature : 180 – 250˚C
Reaction Pressure : 10 - 22 bar , Hydrochar yield: 50 - 80% , Cost : Rs.90,000/-
Calorific Value of lignocellulosic biomass : 15 – 19 MJ kg^{-1}
Calorific Value of Arecanut husk hydrochar (Bio-coal) : 23 MJ kg^{-1} (9 h ttmt)
Calorific Value of conventional coal : 28 MJ kg^{-1}

APPLICATION OF HYDROCHAR

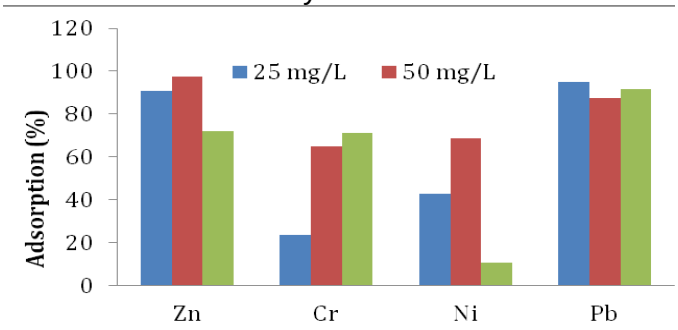
Batch adsorption experiments using 0.1% of hydrochar with varied metal concentrations (0, 25, 50 and 100 mg L-1) of nickel, lead, chromium and zinc at pH 6.0

Properties	Areca husk Hydrochar
Pore space (%)	56
Maximum water holding capacity (%)	76
pH	5.56
EC (dS m^{-1})	0.19
CEC (Meq / gram)	19



Salient findings

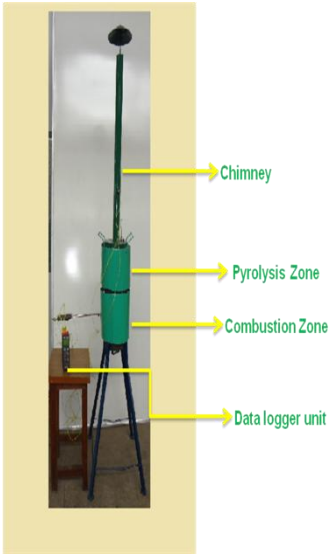
- Highest removal percent of 90.72, 23.65 and 95.08 % for Zn, Cr and Pb at 25 mg/L (initial) respectively.
- Ni (50 mg/l), maximum removal 68.4%
- Order of metal removal for Arecanut hydrochar Pb>Zn>Ni>Cr



Rate of adsorption of Zn2+, Cr6+, Ni2+ and Pb 2+ with hydrochars in aqueous solutions

PROJECT 2: REACTOR FOR BIOCHAR PRODUCTION
SLOW PYROLYZER UNIT FOR BIOCHAR PRODUCTION

Highlights of the reactor
Capacity :2 kg
Efficiency : 30 – 33 %
Residence time : 45 – 60 mins
Cost : Rs.4,000/-



Proximate composition (%)

Sample	Moisture content (%)	Weight by dry basis (%)		
		Volatile matter	Fixed carbon	Ash content
Coconut shell Biomass	11.90	73.50	24.50	2.00
Coconut Shell Biochar	0.29	13.20	86.00	0.80
Casuarina Biomass	7.40	80.18	18.12	1.70
Casuarina Biochar	1.42	21.00	77.70	1.30

Electrochemical Properties (%)

Biochar	pH	EC dS m-1	CEC cmol kg-1
Coconut Shell Biochar	9.64	1.20	11.50
Casuarina Biochar	9.27	1.10	7.40

Total potential carbon 82.95 million tonnes per year from biochar &
Carbon sequestration potential estimated as 243.31 million tonnes per year

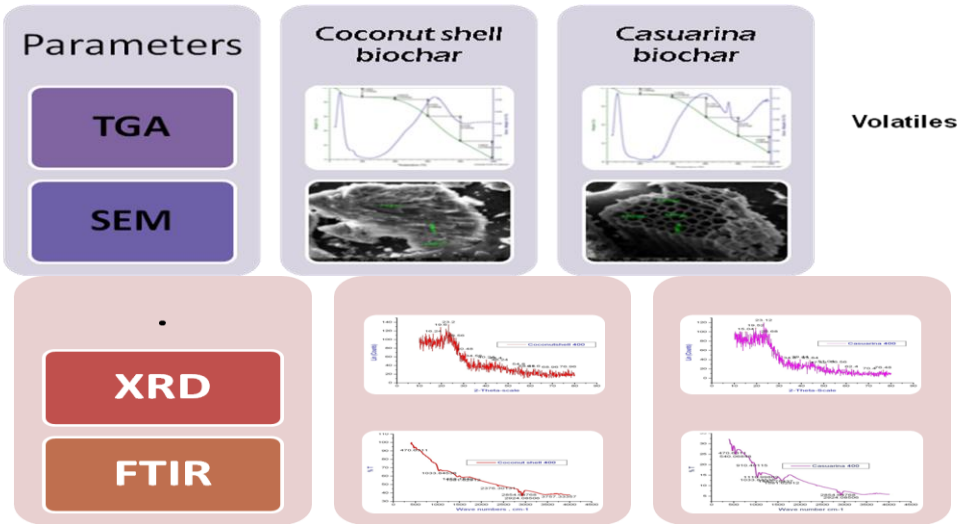
BIOCHAR CHARACTERIZATION

TGA

SEM

Coconut shell biochar

Casuarina biochar



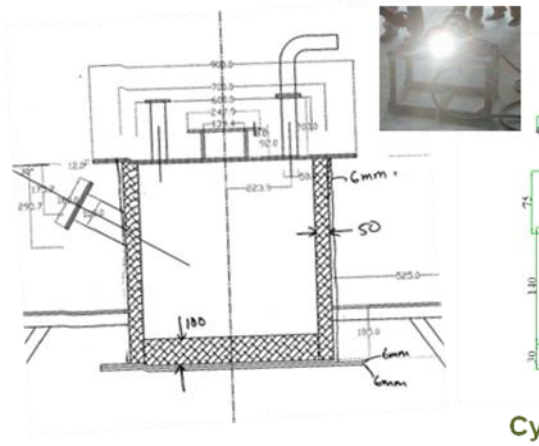
crystalline structure

Wavelength 1500: C-C bond ---aromaticity 3500: presence of OH group (water)

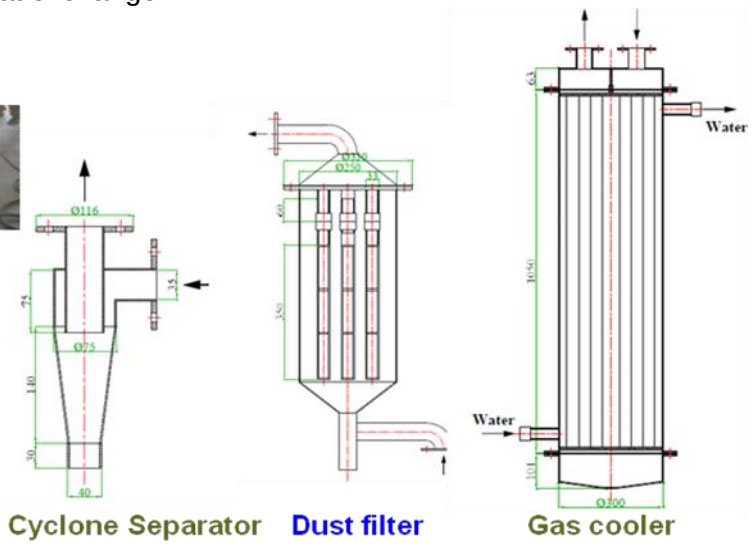
WORKS OF INTEREST UNDER PROGRESS

DESIGN OF PLASMA GASIFER AND GAS COOLING SYSTEM

- Design of plasma gasifier – 50 kg capacity
- No of Plasma torch : 4
- Design of gas cooling system
- Dry Cyclone Separator -Removal the particulates
- Dust filter- Cylindrical shell containing 6 filter elements to remove dust (> 150 micron)
- Gas cooler – Shell and tube heat exchanger



Design of Plasma Gasifier



Design of Gas Cooling System

PLASMA GASIFICATION

- Plasma gasifier was developed for gasification of agro residues and MSW.
- Producer gas yield of plasma torch based gasifier was 3.99 Nm3 kg-1, heating value of 4.33 MJ Nm-3, with thermal efficiency of 38.7%.
- Efficiency of Plasma torch: 65.9%

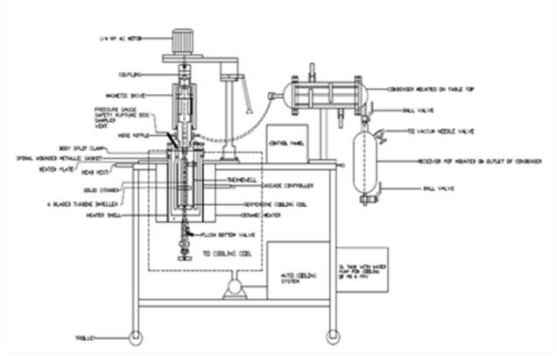
PERFORMANCE EVALUATION OF PLASMA GASIFIER WITH SINGLE TORCH

	Plasma	Gasifier
CO	33.45 %	13.37%
CO2	14.57 %	10.12%
H2	21.17 %	4.04%
CH4	8.93 %	4.12%

HYDROTHERMAL LIQUEFACTION

- Hydrothermal and acid/alkali treatments significantly removed hemicelluloses and lignin.
- Treatment PM biomass at of 12.5% total solid loading at 160˚C with reaction time of 30 min. resulted in a total lignin loss of 74.9% and the glucan content increased to 51.7%.
- Cellulose content increased from 54.12 to 78.99.

Design of HTL reactor



Design details of reactor

Details	Dimensions
Volume of reactor	5 litres
Diameter of reactor	0.562 m
Height of reactor	0.73 m
Thickness of reactor	0.027 m
Diameter of impeller	0.003 m
Length of impeller	0.18 m
Area of condenser	0.2 m²

HTL reactor

CHARACTERIZATION OF FEEDSTOCK

Feed stock	Proximate composition, %				Chemical composition, %			CV MJ kg-1
	MC	VM	Ash	FC	Hemi cellulose	Lignin	Cellulose	
Orange peel	73.5	64.61	2.17	33.22	8.5	3.46	54.08	22.99
Dairy manure	84.03	50	16.97	33.01	28	14.08	40.87	21.49
Food waste	76.68	66	4.21	29.79	29	5.04	21	24.24

Water hyacinth	89	82.5	12.73	4.77	10	5.65	44.31	15.62
Banana peducnle	92	76.7	22.18	1.12	24.5	4.54	48.99	15.49
Sugarcane bagasse	52/9	75.3	2.44	22.26	24	17	27	16.37
Banana pseudo stem	93.8	61.69	7.74	30.57	17	15.4	30	19.12
Tea dust waste	85.46	65.02	1.73	33.25	28.5	11.25	22.1	22.44

Product extraction using DCM

Sample : Orange peel
Operating conditions
Temperature: 275ºC ,
Retention time: 20 min
Biomass loading: 15%
(450 g sample + 2550 ml of water)

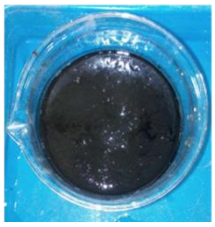
Products obtained:

Reaction mixture (char): 191.8 g
Condensate: 1800 ml
Bio-crude : 275 ml
Aqueous co-product: 1420 ml

Reaction mixture

Condensate

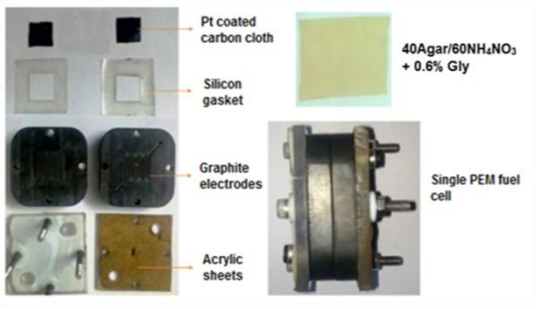
Aqueous co-product and biocrude separated



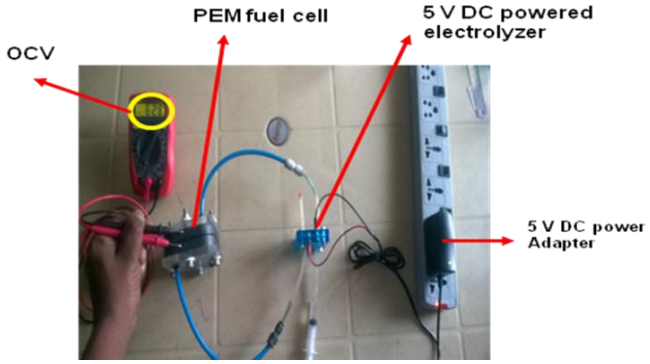
Biocrude

PROTON EXCHANGE MEMBRANE FUEL CELLS

- Single proton exchange membrane fuel cell was constructed using agar as ion conducting polymer and the output circuit voltage was measured.
- Ionic conductivity was measured using AC impedance analyser and the maximum conductivity value of 1.4×10-3 S cm-1 was observed in 40 Agar/60 NH_4NO_3 (Dopant) + 0.5% Glycerol
- Hydrogen gas with flow rate of 10 ml/min and oxygen gas at a rate of 6 ml/min were passed and a voltage of 628 mV was obtained



Single PEM fuel cell



PYROLYTIC OIL FROM WASTE PLASTICS


Developed pyrolytic reactor (1 kg/h)

OPTIMIZED RESULTS OF PRODUCT YIELDS ON PYROLYSIS OF PLASTIC

Plastic wastes	Temperature, 0C	Nitrogen flow rate, mL min-1	Feed rate, kg / h	Oil yield, %	Solid residue, %	Gas yield, %
HDPE	483	12.98	0.61	86.28	4.72	9.00
LDPE	481	13.16	0.64	87.02	5.62	7.36
PP	481	13.21	0.61	89.34	2.74	7.92

cost of fuel oil : rs. 105 / litre

FUEL OIL PROPERTIES WITH TRANSPORTATION FUELS

Properties	HDPE waste Fuel oil	LDPE waste Fuel oil	PP waste Fuel oil	Petrol	Diesel
Specific gravity	0.801-0.808	0.802-0.816	0.785-0.809	0.720	0.82-0.85
Kinematic viscosity @ 400C, mm2 s-1	4.16-5.37	3.8-5.21	2.27-4.67	1.17	1.9-4.1
Calorific value MJ / kg	42.6-44.1	44.52 – 46.27	43.67-45.42	42-46	42-45
Ash content, %	0.001-0.005	0.001-0.005	0.001-0.005	-	0.01
Carbon residue, %	0.4-0.7	0.3-0.7	0.3-0.6	-	0.20
Octane number	82.4	83.1	85.1	81-85	-

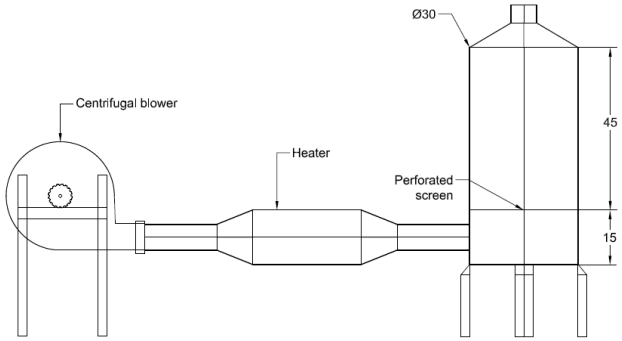
FOOD AND AGRICULTURAL PROCESS ENGINEERING

Themes: 1. Development of improved drying technologies

Objectives	Timeline Y1	Y2	Y3	Scientists
Project 1. Design of improved dryer for high moisture paddy				
1. Design and fabrication of improved on farm dryer				**S. GANAPATHY**

2. Performance evaluation of dryer				
3. Model development and improvising the design				

Pilot scale in-bin dryer
Deep bed dryer: H/D = 1.5
Height = 45 cm
Diameter = 30 cm
Size of plenum chamber
H – 15 cm D – 30 cm
Centrifugal blower- 0.75 kW
Air flow rate –
0.2– 0.4 m3/s/m2



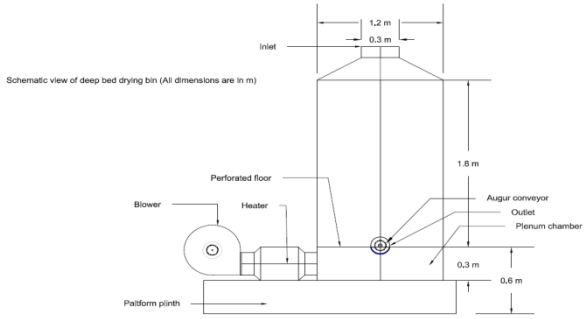
Schematic view of bin dryer

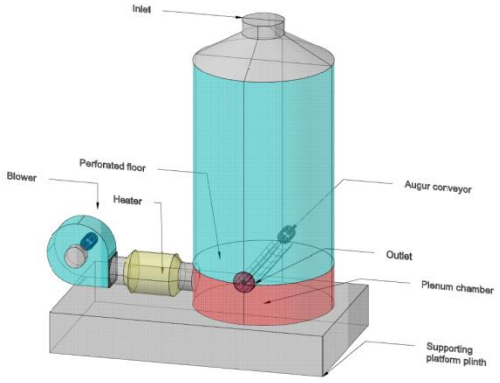
Findings of Pilot Bin Study

- In bin drying with near ambient air of high moisture paddy is feasible for tropical weather conditions
- Grain quality is retained to the maximum when the temperature of air held at 50° C
- Temperature and moisture front velocities at 50° C and 0.2 m3/s.m2 were found to be 3.21 cm/h and 2.81 cm/h respectively.

Works in Progress

An in bin dryer for 1 tonne of paddy has been designed and fabrication works in progress

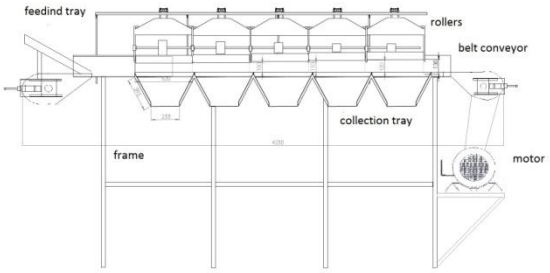




Themes: 2. Improved post harvest handling of fruits and vegetables

Objectives	Timeline Y1	Y2	Y3	Scientists
Project 2. Development of a grader for dehusked coconuts				
1. Assessment of grading parameters of dehusked nuts				**T. Pandiarajan**
2. Design of grader based on physical properties				
3. Field evaluation and improvisation				

Modified size grader



Coconut size grader **Evaluation at the laboratory**

Works to be done

- Design and Development of weight grading machine for dehusked coconut
- Performance evaluation of developed weight grading machine

POST HARVEST TECHNOLOGY CENTRE

Thematic area: Sapota and value addition of Sapota

Project (1): Developing a process for uniform ripening and enhancing the shelf-life and quality of sapota (*Manilkara achras* (Mill.) Fosberg.)"

Objectives	Y1	Y2	Y3	Scientist involved
To standardize the pre harvest spray to obtain quality fruits				Dr. K. Venkatesan Dr. N. Varadharaju Dr. Z. John kennedy Dr. M. Balakrishnan
Development of a sensor to assess the maturity index of sapota based on its latex content.				
Optimization of application of ethylene for uniform ripening.				
Development of process to enhance the shelf life by vacuum packaging and Controlled atmospheric storage.				

Work Done

- Standardized the Pre harvest treatment to obtain the uniform ripening.
- Optimized modified atmospheric packaging and storage condition for enhancing the shelf life.

Pre harvest treatment to obtain the uniform ripening

Treatments

T1 - Control
T2 - Potassium Sulphate @ 1 %
T3 - Potassium Sulphate @ 2 %
T4 - Potassium Nitrate @ 1 %
T5 - Potassium Nitrate @ 2 %
T6 - GA3 50 ppm

T7 - GA3 100 ppm

Design: RBD **Replications:** 3 **Variety:** PKM 1

Results

- The best performing Pre harvest treatment was spraying Potassium sulphate (2%) .
- The fruits of this treatment recorded the highest fruit length (9.28 cm), fruit girth (13.76 cm), fruit weight (106.56 g), firmness (3.72 kg/cm2), TSS (20.450B), reducing sugar (9.95%) and lowest values for titrable acidity (0.14%) and tannin (0.16%).

Modified Atmospheric Packaging of Ripened Sapota

Result

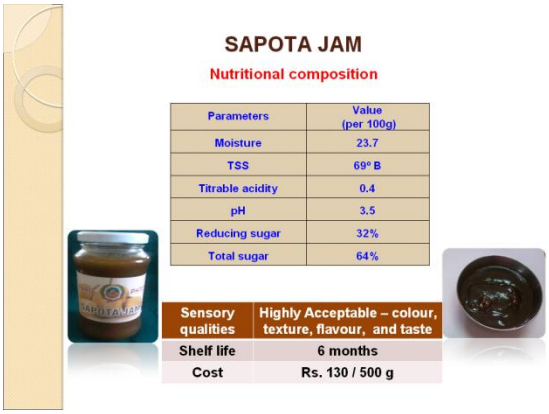
- The ideal gas composition for MAP was found to be
  - Nitrogen : 92%
  - Oxygen : 3%
  - Carbon dioxide : 4%
- The shelf life of the ripened sapota under MAP was
  - 2 weeks in ambient condition.
  - 3 weeks in refrigerated condition.
- These samples were more firm with minimum TSS and Reducing sugars and the highest moisture content.

Work to be done

- Development of a sensor to assess the maturity index of Sapota based on its latex content.
- Optimization of application of ethylene for uniform ripening.
- Development of process to enhance the shelf life by vacuum packaging and Controlled atmospheric storage.

Project (2): Development and quality evaluation of value added products from sapota

Objectives	Y1	Y2	Y3	Scientist involved
Development and quality evaluation of sapota jam and sapota candy				Dr. G. Gurumeenakshi Dr. N. Varadharaju
Development and quality evaluation of sapota blended jam, sapota flakes and sapota powder				
Development and quality evaluation of Sapota fruit bar and concentrated sapota pulp				
Popularisation and commercialization of the products				



WORK TO BE DONE

Development and quality analysis of the following

- Sapota flakes.
- Sapota fruit bar.
- Concentrated Sapota pulp and
- Sapota powder.
- Sapota blended jam.

Popularisation and commercialization of the product.

WATER TECHNOLOGY CENTRE

Theme:- Climate Proofing and Sustainable Watershed Development

Project 1:- To study the effectiveness of artificial recharge techniques in increasing the recharge rate and to improve the ground water quality

Objective	Timeline			Scientists involved
	Y1	Y2	Y3	
To study the stage volume relationship of the identified recharge structures in the study area by topographical survey				Dr.A.Valliammai, AP(SWCE),WTC-60% Dr.A.Raviraj, Prof(SWCE),WTC-40%
Estimation of natural and artificial recharge due to artificial recharge structures				

Assessment of groundwater quality before and after monsoon		
Study on impact of various recharge structures in increasing the recharge rate and to improve the ground water quality		

Study area

- Thondamuthur watershed(4B2B3d3) , Coimbatore district
- Over exploited category
- Noyyal sub basin
- Area-76.93 sq kms
- Average rainfall - 600 mm
- The hydrological soil group 'C' with a slow rate of infiltration and moderate runoff covers about 60% of the area
- The area has very gentle slope (1–2%).
- The major land use of the Thondamuthur block is Agricultural land
- The rock types include charnockite and gneiss.
- Thickness of the weathered zone ranges from 10 to 40 m

Plan of work during 2017-18

- Estimation of recharge in the study area
- Estimation of recharge rate due to artificial recharge structures
- Assessment of ground water quality before and after monsoon

Project 2: Hydrological evaluation of Watershed by Morphometric Analysis

Objective	Timeline			Scientists involved
	Y1	Y2	Y3	
Preparation of hydrological thematic maps of the study area Viz. land use/cover, land forms, geology, Geomorphology and soil in the GIS domain				1. Dr.A.Valliammai, AP(SWCE),WTC,TNAU (50%) 2. Dr.A.Raviraj, Prof(SWCE), WTC,TNAU(25%) 3. Dr.Balaji Kannan, AP(SWCE), Dept' of RS & GIS, TNAU(25%).
Estimation of morphological parameters of the watershed				
Integration of morphological parameters with hydrological information for the site suitability analysis of soil and water conservation structures in the basin and technology transfer				

Study area-Koraiyar watershed

- Koraiyar watershed (5A2B5a) Kinathukadavu block, Coimbatore district
- Over exploited category
- Walayar sub basin,PAP
- 10°43'07" to 10°55'27" N latitude and 76°53'32" to 77°09'27" E longitude
- Four toposheets (58B/13,58B/14,58 F/1,58 F/2)
- Area-289.83 sq.kms
- Weighted average rainfall of the study area is 688.69 mm

Work done

- Base line survey of the study area
- Preparation of various hydrological thematic layers of the study area

- Delineation of micro watersheds in the study area
- Morphometric parameters of the watershed

Delineation of Micro watersheds

- 14 micro watersheds are delineated in the study area for morphometric analysis
- Morphometric parameters
- Average basin length-9.085 km
- Mean stream length:-198.1m
- Drainage density-93.2
- Stream frequency-1.88
- Circulatory ratio-0.0014

Plan of work for the year 2017-18

- Estimation of morphometric parameters of the micro watersheds
- Integration of morphological parameters with hydrological information in GIS domain

SOIL AND WATER CONSERVATION ENGINEERING

Thematic area: Water Flow & Nutrient transport Studies in Paddy fields

Project (1): Estimation of Water uptake of Paddy by soil moisture estimation by sensors

Objectives	Y1	Y2	Y3	Scientist involved
To measure soil moisture by Time Domain Reflectometry sensors in Drip irrigated Paddy				Dr. V.Ravikumar Ms.Ankaleeswari, Ph.D student
To estimate Evapotranspiration by soil moisture modelling and by Penman-Montieth method				
To estimate crop coefficients for Drip irrigated Paddy				

WORK DONE

- Paddy crop planted on 17.3.2017
  - short duration (CO-15)
- Soil moisture data logged
  - Every 15 minutes
- Evapotranspiration estimated

WORK TO BE DONE

- To estimate Evapotranspiration for drip irrigated paddy by soil moisture modelling for different crop seasons
- To estimate crop coefficents for drip irrigated paddy

Project (2): Estimation of nutrients uptake and transport by field studies and modeling

Objectives	Y1	Y2	Scientists involved
To estimate reaction rate constants of Urea reactions in soil by field experimentation and modelling			Dr. V.Ravikumar Ms.Vanitha, Ph.D student
To compare urea, ammonium & nitrate dynamics by field observations and modelling			

Work Done

- Paddy Crop raised under
  - Continuously flooded

- Alternate and Wet & Dry
- Urea, Ammonium and Nitrate in soil
  - sampled at three depths 7.5 cm, 22.5 cm, 37.5 cm at different times

S. No.	Observation	Continous Flood Irrigation	Alternate Wet and Dry Irrigation
1	Depth of water	1164 (mm)	1020 (mm)
2	Total yield of paddy (Variety - CORH4)	8.74 (t/ha)	8.25 (t/ha)

Work to be done
Find the reaction rate constant by modelling using field collected data

Thematic area Subsurface drainage for water logged & salt affected lands

Project (1): Studying the scope of integration of irrigation through sub surface drain pipes in waterlogged areas

Objectives	Y1	Y2	Scientist involved
To install different configurations of subsurface cum Irrigation system			Dr.I.Muthuswamy Mr.Selvaperumal, Ph.D student
To evaluate different configurations of subsurface cum Irrigation system			

Project (2): Subsurface drainage for waterlogged and salt affected lands in farmers field

Work started only in May 2017

Objectives	Y1	Y2	Y3	Scientist involved
To collect water and soil samples in the study area and to characterize the soil				Dr.M.Manikandan Asst.Prof (SWCE)
Implement chemical soil treatment methods and installation of drains at pilot scale				Dr.K.Sivasubramanian Asst.Prof (Env. Sc.)
Performance Evaluation of the Project				Dr.Baskar Associate Prof (Soil Science)

Study area
- Lalgudi Taluk
- Villages
  - Thinniam
  - Sembarai
  - Mullal,
- Total affected area
  - 300 ha

Primary Investigations in the study area
Soil and water samples collected

Villages	Soil		Water	
	pH	EC (dS/m)	pH	EC (dS/m)
Thinniam	8.6	1.98	8.4	0.98

Sembarai	9.2	1.32	7.9	0.95
Mullal	8.5	1.67	8.1	1.3

- Soil is Alkaline
- Water is marginally saline

Reason

- Due to prolonged irrigation and lack of drainage

Work to be done

- To collect water and soil samples in the study area and to characterize the soil
- Implement chemical soil treatment methods and installation of drains at pilot scale
- Performance Evaluation of the Project

Thematic area: Estimation of Soil Erosion from Cropped Fields and using Rainfall Simulator

Project: Estimation of Soil Erosion from Cropped Fields and using Rainfall Simulator

Objectives	**Y1**	**Y2**	**Y3**	**Scientist involved**
To assess the uncertainty of topographic factor (LS Factor) using Geostatistical Techniques				Dr. R. Lalitha, Professor
To estimate annual soil erosion of the watershed by RUSLE model				Ms.Anjitha Krishna, PG student
To estimate soil loss using rainfall simulator				

STUDY AREA

- Trichy District in Tamilnadu state
- Lalgudy Taluk in Trichy district
- Kullakudi watershed in Lalgudi taluk

Soil Erosion Class

Sl. No.	**Av. Annual Soil Loss (t/ha)**	**Area (ha)**	**% of Total Area**
1	0.02 – 1.00	2860	79
2	1.0 – 3.5	663	18
3	3.5 – 10.0	86	2
4	10.0 – 24.0	12	< 0.5 (0.34)
5	24.0 – 51.0	2	< 0.5 (0.04)
		3623	100

Erosion Class	Annual Soil Loss (t/ha)
None to slight	< 10
Moderate	10 to 50
High	50 to 200
Very high	> 200

Work to be done

- To estimate soil loss using rainfall simulator (2017-2019)

V. ACTION PLAN PROPOSED FOR 2017-2019

SUGGESTION

(Action: AMRC, TNAU, Coimbatore)

1. Development of harvester cum collector for cluster onion :
   Mechanism may be provided to remove the soil clods to avoid the collection of soil in the collection device.
2. Development of a system for controlled level of puddling: The water may be drained from the field after leveling with laser leveler. The contour of the field may be prepared for both, before and after the use of laser leveller.
3. Design and Development of Red gram protray seeder :
   Field establishment of redgram seedlings grown in polybag/root trainer may be studied in collaboration with Agronomist.

(Action: Department of F&APE)

1. Comparative evaluation of commercially available dhal mills of 500 kg/h capacity may be done and further scaling up of TNAU mini dhal mill to 500 kg/h capacity may be done
2. Extraction of curcumin from raw turmeric without curing may be explored
3. As many of the on going projects are in the area of agricultural processing, new projects may be formulated in the area of food processing

(Action: Department of Bioenergy)

1. Producer gas conditioning through combined primary and secondary tar cleaning system.
2. Development of energy efficient wood chulhas.
3. Value addition of jack fruit using solar dryer.

(Action: Post Harvest Technology Centre)

1. Utilisation of grape pomace may be explored
2. A novel method for enhancing the shelf life of dehulled millets may be developed.

(Action: PFDC, AEC&RI, Coimbatore)

1. Standardization of cladding materials for its thickness (microns) and colour in poly house.
2. Standardization of media for soilless cultivation of cucumber (*Cucumis sativus)* under naturally ventilated poly house.

(Action: AEC&RI, Kumulur)

1. Fertigation Scheduling for Paddy by Simulation Modelling:
   The optimal fertigation policy developed by simulation in the scheme has to be field verified and reported
2. For drip irrigation in order to estimate crop water requirement accurately, crop coefficients have to be determined by field experiments. Field experiments may be started for different crops under drip irrigation

Sd/- C. Divaker Durairaj
Dean (Engg.) i/c