

**Tamil Nadu Agricultural University,
Coimbatore**

**ACTION TAKEN REPORT ON THE PROCEEDINGS OF 83rd SCIENTIFIC
WORKERS CONFERENCE HELD ON 17.08.2017 & 18.08.2017
AT TNAU COIMBATORE**

I. ISSUES RELATING TO AGRICULTURE

Promoting newly released TNAU varieties

1. The recently developed TNAU varieties suited for various ecosystems need to be popularised. The extension officials should help in promoting the new varieties released by TNAU (Action: DOA, Director of Research and Director of Extn. Education)

- For the popularization of the varieties FLDs were conducted in different districts through the respective KVKs.

S.No.	TNAU Varieties	No. of FLDs	KVKs involved	Districts
I.	Cereals			
A.	Rice			
1.	TKM 13	40	Sikkal, Needamangalam, Sirugamani	Nagapattinam, Tiruvarur, Trichy
2.	TPS 5	30	Needamangalam, Thirupathisaram	Tiruvarur, Kanyakumari
3.	CR 1009 Sub1	30	Sikkal, Needamangalam	Nagapattinam, Tiruvarur
4.	Anna (R) 4	12	Sirugamani, Tirur	Trichy, Tiruvallur
5.	CO 52 (MGR 100)	90	Thirupathisaram, Needamangalam, Tirur, Papparapatty, Vamban, Sikkal, Tindivanam, Vriddhachalam	Kanyakumari, Tiruvarur, Tiruvallur, Dharmapuri, Pudukkottai, Nagapattinam, Villupuram, Cuddalore
6.	CSR 36	10	Sikkal	Nagapattinam
7.	BPT 5204	10	Sikkal	Nagapattinam
8.	ADT 51	10	Needamangalam	Thiruvarur
9.	MDU 6	10	Madurai	Madurai
10.	TRY 3	10	Madurai	Madurai
II.	Millets			
A.	Maize			
1.	Hybrid COH(M) 6	60	Aruppukkottai, Sirugamani, Needamangalam, Thirupathisaram, Tirur, Papparapatty, Madurai	Virudhunagar, Trichy, Thiruvarur, Kanyakumari, Tiruvallur, Dharmapuri, Madurai

2.	CO H 6	10	Tirur	Thiruvallur
3.	CO 7	10	Thirupathisaram	Kanyakumari
4.	CO H (M) 8	20	Sirugamani, Papparapatty	Trichy, Dharmapuri
5.	CO 8	40	Vriddhachalam, Papparapatty, Sirugamani	Cuddalore, Dharmapuri, Trichy
B.	Pearl Millet (Cumbu)			
1.	CO 10	54	Vamban, Aruppukkottai, Sandhiyur, Maurai, Sikkal Vamban	Pudukottai, Virudhunagar, Salem, Madurai, Nagapattinam, Pudukkottai
C.	Ragi			
1.	CO 15	20	Tindivanam, Vamban	Villupuram, Pudukkottai
D.	Varagu			
1.	CO 3	8	Vriddhachalam	Cuddalore
E.	Barnyard Millet (Kuthiraivalli)			
1.	MDU 1	90	Aruppukkottai, Madurai, Tirur, Vamban, Ramnad	Virudhunagar, Madurai, Thiruvallur, Pudukkottai, Ramnad
2.	CO(KV) 2	10	Papparapatty	Dharmapuri
F.	Tenai			
1.	CO 7	20	Madurai, Tindivanam	Madurai, Villupuram
III.	Pulses			
A.	Blackgram			
1.	VBN 6	210	Needamangalam, Aruppukkottai, Sandhiyur, Madurai Tindivanam, Sirugamani	Tiruvarur, Virudhunagar, Salem, Villupuram, Trichy, Madurai
2.	VBN 8	98	Tindivanam, Sikkal, Papparapatty, Aruppukkottai, Madurai, Sirugamani, Tindivanam	Villupuram, Nagapattinam, Dharmapuri, Virudhunagar, Madurai, Trichy, Villupuram
3.	CO 6	145	Sandhiyur, Aruppukkottai, Sirugamani, Needamangalam	Salem, Virudhunagar, Trichy, Tiruvarur
4.	ADT 6	20	Tirur, Needamangalam	Thiruvallur, Tiruvarur
5.	MDU 1	67	Sandhiyur , Madurai	Salem, Madurai
B.	Green gram			
1.	CO 8	127	Tindivanam, Sirugamani , Madurai, Sandhiyur, Papparapatty, Sikkal	Villupuram, Trichy, Madurai, Salem, Dharmapuri, Nagapattinam
2.	CO 6	24	Aruppukkottai	Virudhunagar

C.	Redgram			
1.	CO 7	66	Sandhiyur, Aruppukkottai, Sirugamani, Madurai	Salem, Virudhunagar, Trichy, Madurai
2.	CO 8	25	Papparapatty	Dharmapuri
3.	LRG 41	25	Papparapatty	Dharmapuri
D.	Cow Pea			
1	VBN 3	35	Aruppukkottai, Tirur, Papparapatty, Vamban	Virudhunagar, Thiruvallur, Dharmapuri, Pudukkottai
IV.	Commercial Crops			
A.	Cotton			
1.	SVPR 2/3	10	Madurai	Madurai
V.	Oilseeds			
A.	Groundnut			
1.	VRI 8	113	Sikkal, Virinjipuram, Vriddhachalam, Papparapatty	Nagapattinam, Vellore, Cuddalore, Dharmapuri
2.	TMV 14	5	Papparapatty	Dharmapuri
3.	VRI 2	10	Vamban	Pudukkottai
B.	Sesame			
1.	VRI 3	30	Tirur, Tindivanam, Sandhiyur, Vriddhachalam, Sirugamani	Thiruvallur, Villupuram, Salem, Cuddalore, Trichy, Dharmapuri
2.	TMV (SV) 7	25	Papparapatty	Trichy
C.	Castor			
1.	hybrid YRCH 2	10	Tindivanam	Villupuram
VI.	Forage Crops			
A.	Fodder Sorghum			
1.	CO (FS) 31	30	Needamangalam, Vamban, Tirur	Thiruvaurur Pudukkottai, Tiruvallur
2.	CSV33MF	10	Thirupathisaram	Kanyakumari
B.	Guinea Grass			
1.	Co (CG) 3	10	Thirupathisaram	Kanyakumari
C.	Fodder Cowpea			
1.	CO 9	20	Vamban, Madurai	Pudukkottai, Madurai
D.	Velimasal			
1.	CO 1	10	Vamban	Pudukkottai
VII.	Vegetables			
A.	Brinjal			
1.	Grafted Brinjal	10	Sikkal	Nagapattinam
2.	PLR 2	10	Vamban,	Pudukkottai
B.	Bhendi			
1.	CO 4	20	Aruppukkottai, Vamban	Virudhunagar, Pudukkottai

C.	Tomato			
1.	COTH 3	10	Aruppukottai	Virudhunagar
D.	Snake Gourd			
2.	CO H 1	10	Sirugamani	Trichy
E.	Lab – lab			
3.	CO (GB) 14	10	Needamangalam	Thiruvarur
F.	Chilli			
1.	CO 1	10	Ramanathapuram, Sirugamani	Ramanathapuram, Trichy
2.	Hybrid CO 1	10	Vamban	Pudukkottai
G.	Amaranthus			
1.	PLR 1	10	Thirupathisaram	Kanyakumari

(TNAU)

2. To replace the BPT rice variety, breeder seed production of CO 52 rice variety may be strengthened and area may be expanded. Likewise the area covered by TKM 13 paddy variety and CR 10009 Sub1 variety for Flood tolerance can be studied. (Action: DOA and Dir. CPBG)

- TNAU initiated breeder seed production of rice CO 52 after the receipt of the notification by the Government of India vide ref. S.O.1379 (E) dated. 27.03.2018. During summer 2018 at Department of Rice, Coimbatore, a total quantity of 4,920 kg of breeder seed was produced of which 3100 kg was supplied to the State Agricultural Departments and another 1,220 kg of breeder seed supplied to private seed growers for further multiplication and distribution to the farmers. However, due to the presence of off types above permissible limit, most of the Foundation Seed production plots were rejected by the Department of Seed Certification. Hence, concerted efforts are being made to produce genetically pure nucleus seed and breeder seeds of CO 52.
- Under the scheme on NADP (2018-2019), 100 number of FLDs were conducted in 10 districts viz., Thiruvarur, Nagapattinam, Thanjavur, Madurai, Trichy, Theni, Thiruvallur, Erode, Villupuram and Cuddalore. Through this programme, a total quantity of 10190 kg Truthfully Labeled seeds have been distributed to the farmers (100ha) for popularization and a total quantity of 264 MT of TFL seeds are available for distribution to farmers during 2019-2020.

TKM 13 : A total of 2178.97 MT of quality seeds (FS/CS/TFL) has been distributed during the period of April' 18 to June'19 which could cover an area of around 43,559 ha .

CR 1009 Sub 1: A total of 1998.12 MT of quality seeds (FS/CS/TFL) has been distributed during the period of April'18- June'19 which could cover an area of around 39,962 ha .

3. The TANSEDA should establish like with breeder seed portal of TNAU (Action: DOA and Dir.CPBG)

- The varietal descriptors and notification details can be obtained from the website maintained by the Centre for Plant Breeding and Genetics. It also has contact details of breeder seed production centres of Tamil Nadu Agricultural University, Coimbatore.

Seed Hub in Groundnut

4. **The Groundnut seed hub is to be established under Central Sector Scheme in various centres of TNAU in which 1600 MT of certified seeds should be produced during the next three years, to achieve an additional Seed Replacement Rate (SRR) of 2.1% in addition to the planned SRR of 11%. The JDAs of various districts should indicate their willingness to take up seed production in groundnut. Accordingly indent has to be placed in advance by DOA with TNAU. (Action: DOA, DR and Director, Seed Centre)**
- TNAU has sanctioned with a seed hub project entitled on “Creation of seed hubs and it’s sustenance for enhancing quality seed availability of major oilseed crops in India - Groundnut” under National Food Security Mission - Oilseeds during 2018 - 19 with a budget of 150 lakhs to produce certified seeds. The project is operating at Regional Research Station, Vridhachalam, Cuddalore. The centre is producing both foundation and certified seeds in ALG-06-320, VRI (Gn) 7, VRI (Gn) 8 and ICGV 00348 varieties. As per the approved programme, the seed production is being carried out in farmers field by famers participatory mode.
 - During rabi / summer 2018-19, a quantity of 3113 kg VRI (Gn) 7 certified seeds and 7000 kg ALG-06-320 foundation seeds were produced and ready for distribution. Seed availability was already communicated to the Director of Agriculture for lifting the seeds.

Transplanting Redgram

5. **Suitable transplanting technology for redgram variety (CO 8) may be developed (Action: Director, CPBG)**
- Redgram transplanting and foliar nutrition with the variety CO 8 was taken up at RRS, Paiyur. The soil mixtures were prepared by using 1:1:1 ratio of red soil: vermi compost: sand. These mixtures were treated with bioagents like *Pseudomonas* and biofertilizers like *rhizobium* and phospho bacteria. The polybags size of 4” x 3” was used for raising nursery. The 25 days old seedling of the redgram variety CO 8 was transplanted in the main field. Application of foliar spray of 0.5 % MAP at flowering and 15 days thereafter, recorded higher grain yield of 1450 kg/ha compared to direct sown crop (1320 kg/ha). The yield increase in transplanting technique was 9.8% and recorded higher gross income of Rs. 87000 /-and a net income of Rs. 41300 with a B:C ratio of 1.90. Besides, training on redgram transplanting technology was given to 400 ATMA farmers of Krishnagiri and Dharmapuri districts during 2018-19 for popularizing this technology.

Pulses

- In order to popularize and ensure the adoption of Transplantation method cultivation in Redgram in Dharmapuri and Krishnagiri districts, 3000 number of Demonstrations were conducted and 26 number of trainings were provided during 2017-2018 in the potential blocks.
- During 2018-19, it was programmed to conduct 12 number of trainings in Dharmapuri and 12 numbers in Krishnagiri. Pre kharif training session was conducted already in both the districts. Besides, efforts were taken to bring 3000 ha, under Redgram Transplantation in Dharmapuri and Krishnagiri districts and 2825 ha was covered under Transplantation.

Neera

6. **In order to prevent fermentation of Coconut 'Neera', suitable anti fermenting agent and processing technology is needed without loss of its nutrient content (Action, Dean (Hort.), CBE, Trichy, Dean, KKM and CRS, Veppankulam and CRS Aliyarnagar)**
- Spoilage of neera caused by micro-organisms (*Schizosaccharomyces pombe*, *Pichia sps*) and other fermenting yeasts) A new filtration Device with membrane filter has been designed to filter out microbes in order to improve the shelf-life while ensuring nutritional qualities. Shelf-life: 60 days (Cold Storage); 15 days (Ambient)

Automatic Weather Station (AWS)

7. **A separate meeting on the status of Automatic Weather Stations in Tamil Nadu has to be organised under the Chairmanship of the Director of Agriculture. It should be ensured by the Tamil Nadu Agricultural University and Director of Agriculture that the Automatic Weather Station Rainfall data is used by the Commissioner for Revenue Administration for assessing the Rainfall position. (Action: DoA and Director, CM)**
- The Registrar, TNAU has submitted a proposal to the Director of Agriculture for utilizing the unspent balance in NADP schemes at Agro Climate Research Centre and additional budget to rectify all the faulted AWS. Due to lack of funds, Annual Maintenance Contract was not effected, since 2016. After the receipt of funds from the Government, the repaired AWS will be serviced and ensured for correctness of data. Then the procedure for the data sharing to the Commissioner of Revenue will be finalized under the chairmanship of Director of Agriculture. (TNAU)

Details of Automatic Weather Stations (AWS) established by TNAU under NADP

The establishment and Hand over details of Automatic weather Stations are as follows

Phase	G.O & Year	Amount Sanctioned in L.Rs.	No of AWS Established by TNAU	Year of completion of Establishment	Year of Handover
Phase I	G.O MS No. 84 Agri (API) Dept dated 3.3.2008	1690.00	224	2012	Apr 2014 - Mar 2015
Phase II	G.O Ms No. 23 Agri (API) Dept dated 24.01.2011	576.35	73	2014	Oct 2014 - Mar 2015
Phase III	G.O Ms No. 201 Agri (API) Dept dated 31.10.2011	717.60	88	2014	Oct 2014 - Mar 2015
Total		2983.95	385		

- The weather parameters observed in the AWS are: Temperature, Relative humidity, Wind speed, Wind direction, Soil moisture at 15cm, Soil Temperature at 15 cm, Rainfall, Solar Radiation, Atmospheric pressure, Leaf wetness.-

Warranty Details

Phase	Nos Installed	Firm which installed AWS	Warranty period	Agreement for AMC and GSM charges	
				AMC Validity	GSM Charges paid
Phase I	224	M/s Sutron Hydromet Systems PVT Ltd, Delhi	31.03.2013	August 2015 (Rs. 91,13,000/- +12.36 % ST)	December 2015 Rs 2700/- per Unit, totaling Rs. 6,10,200/- + 10.3% VAT
Phase II	161	M/s GeoEdge Technologies Pvt Ltd, Coimbatore.	31.03.2017	In warranty period	March 2016
Phase III					

Current Status

As on 07.06.2019, 285 numbers of AWS are not functioning and weather data are not available due to various reasons such as theft, damage by miscreants, fire accidents, etc. The abstract of functioning of AWS are furnished below

S. No	Particulars	No of AWS
1	No. of AWS Currently working	100
2	Currently not working and data not retrieved due to signal issues	285
	Total	385

Issue / Suggestions

- Dr. S. Panneerselvam, Professor and Head of Agro Climatology Research Centre (ACRC) requests separate allocation in every year budget for Rs.1.20 Crore for maintenance of 385 AWS by TNAU. AMC split up to be provided by TNAU for further review
- TNAU requested that a liaison officer have to be identified for each district to co-ordinate with TNAU and the approved firms, so that the issues arising are settled at the earliest without time delay.
- They also requested that an officer of the department shall be posted on deputation to TNAU for the purpose of coordinating the activities related to AWS.
- Relocation of AWS stations in Secured Government places to be done to avoid further theft and damages.
- Approximate Unit Cost of a Functional Automatic Weather Station is Rs.7.75 Lakhs.
- Approximately the operation cost of Re – Location charges of one AWS is approximately Rs.80,000/- to 90,000/-

II. ISSUES RELATING TO HORTICULTURE

Poly House

1. **Developing poly house cultivation techniques for horticultural crops in plains to prevent failure. The need is to survey the status of polyhouse production of horticultural crops by the TNAU scientists along with Horticultural department officials and to identify existing drawbacks and suggest corrective measures. (Action: DHPC & Dean Hort., of Cbe, PKM, Trichy TNAU)**
 - A committee consists of three scientists from TNAU and the Joint Director of Horticulture, Krishnagiri and Deputy Director of Horticulture Dindigal have been nominated to carry out the poly house survey. The same was communicated to DHPC, Chennai for further action.
 - Two District officers were nominated from Tamil Nadu Horticultural Department for surveying the poly house vide letter No. TAN/NHM/1303/2017 dated: 22.01.2017.
2. **Guava varieties - Developing guava varieties with red pulp and Identification of rootstocks for nematode tolerance/resistance in guava.**
 - Research has been initiated to develop a red fleshed guava with less seeded / soft seeded through hybridization and selection from open pollinated populations.
 - In guava, rootstock screening work for nematode tolerance / resistance has been initiated at HC&RI, TNAU, Coimbatore
3. **Papaya Disease - Development of ring spot virus disease resistance in papaya and management technologies.**

Nursery

 - Raising of papaya seedlings under insect proof net (40-60 mesh).
 - Spraying of acephate 1.5g per litre of water on seedlings 3 days before planting

Main Field

For vector management

 - Growing of two rows of border crop of maize one month before transplanting of seedling.
 - Foliar spray with dimethoate @ 1.5ml/lit. of water at monthly interval up to 5 months after planting.

Micro nutrient Management

 - Spraying of zinc sulphate @ [5g+boron@1.0g](#) per litre of water at 4th and 7 month after planting.

Crop Improvement

 - A promising gynodioecious selection (sel C1-33) was made by crossing between CP 96 and CO 8 papaya which has expressed field tolerance to Papaya ringspot virus disease. Tree yield recorded was 73kg/tree with fruit weight of 1.4kg. The number of fruits /plant was 54.
 - Net house cultivation of papaya showed no incidence of PRSV from early growth stage till maturity of Papaya whereas 100% incidence was reported in open field

conditions. The number of fruits per tree was 77 and total yield was 236.71t/ha where as in control the number of fruits per tree was 57 with a total yield of 178.20 t/ha.

Chillies

4. **Developing chilli varieties with saline tolerance as well as with high oleoresin and pungency for value addition. Purification of traditional Ramanad Mundu chilli for its quality and fruit shape for enhancing the livelihood of farmers. Undertaking studies to assess the capsanthin content in paprika and developing varieties with high capsanthin for export. (Action: Dean Hort. of Cbe, TNAU)**

For salinity

- The saline tolerant chilli genotype IC 119546 and the following four chilli hybrids have been developed by the Department of Vegetable Crops, TNAU, Coimbatore and results will be available after confirmatory research for 3 to 4 seasons.
 - IC 119546 x CO1,
 - Guntur Local x Jayanthi
 - Arka Abhir x Jayanthi
 - Arka Abhir x K1

For high oleoresin

- Four chilli hybrids with high oleoresin, pungency and drought tolerance have been developed by the Department of Vegetable Crops, TNAU, Coimbatore and results will be available after confirmatory research for 3 to 4 seasons.
 - K1 x Virudhunagar Local
 - Guntur Teja x Aladippatti Local
 - Thoppudapatti x GNO.5
 - KKM 1 x Virudhunagar Local

Assessing the performance of Ramnad Mundu chilli

- Survey has been taken up in Mundu chilli growing areas of Ramnad and Thoothukudi districts during the cropping season. During the survey phenotypically different (pod shape and size), high yielding forty seven genotypes were collected from Ramanathapuram, Kadaladi, Toothukudi, Paramakudi and Vilathikulam. Among the genotypes evaluated, PKMCA-08, PKMCA-21, PKMCA-25, PKMCA-32 and PKMCA-38 were found to be the promising genotypes with dry fruit yield of more than 180 g/ plant. Further thirty genotypes were received from the Dept. of Vegetable Crops, HC & RI, Coimbatore for evaluation. Purification and further evaluation is in progress.

Assessing paprika varieties for high capsanthin

- Evaluation of paprika varieties is being done with 11 varieties. Among the varieties, Ktpl -18 recorded the highest capsanthin content of 131.37 ASTA followed by Bydagi Kaddi with capsanthin content of 129.30 ASTA. Hence, Paprika varieties Ktpl -18 and Bydagi Kaddi can be recommended for high capsanthin content for export.

Nematodes

5. Management of nematodes in horticultural crops through adopting solarisation/ soil sterilization and strengthening quarantine measures in the nurseries (Action: Director (CPPS)-and Horticulture division and DHPC).

- A detailed report approved by the Vice Chancellor (dated 06.03.2019) on the procedures to be followed while preparing nursery planting materials to exclude nematode infection was sent to the Agriculture Production Commissioner, for adoption by the state department officials incharge of nurseries across Tamil Nadu.
- It is informed that nursery bill has been sent to Government and a discussion was held at DHPC along with the district officials regarding Nursery Regulation Act on 03.04.2013 and the final reply was sent to Government vide Lr. No. MISC/3717/98, dated: 19.04.2010.

Jasmine

6. Promotion of Export Packaging Technology for jasmine. (Action: CAM & ABD, DHPC, Dean Coimbatore & Dir. CARDS TNAU)

- Export packaging technology for jasmine has been disseminated through training programmes, scientific forums, exhibitions and Agri Intex through presentations, posters and demonstrations.
- The demonstrations is also given to the farmers of the following places of Tamil Nadu and Andhra Pradesh.

Date	Place of training	No. of Beneficiaries
15.11.2017	Jasmine growers in Madurai districts	105
15.12.2017	Jasmine growers from Andhra Pradesh and various parts of Tamil Nadu.	110

- Hands on training was also given on "Packaging technique in Jasmine" to 23 Horticultural Officers of Tamil Nadu on 15.12.2017 at TNAU Coimbatore.

Technology is adopted by the following firms:

S. No.	Entrepreneurs	Volume of Export (kg/day)	No.of days/week of export	Countries to which flowers are exported
1.	M/s. Karthika Exports, Salem	500	3	Sri Lanka
2.	M/s. Bharath Exports, Coimbatore	800	3	Dubai
3.	M/s. FS Exports, Coimbatore	800	3	Dubai
4.	M/s. Navakshi Exports, Madurai	300	1	Singapore

5.	M/s. Jai Exports, Nilakottai	300	2	Singapore
6.	M/s. Kannan Exports, Chennai	200	3	Dubai

Market linkage- Tamil Nadu Flower Growers' Association, Sathyamangalam (3000 growers) was linked with jasmine exporters for marketing

- TNAU to demonstrate this to sellers / Exporters in coordination with marketing Dept. and DD (AB) to give feedback on adoption by sellers in December 2017.

Brinjal

7. Popularization of Grafted Brinjal technique to mitigate the nematode and soil borne pathogen infestation. (Action: DHPC and Dean Hort. Coimbatore)

- Hands on training was given to horticulture officials on 15.12.2017 and the same was communicated to DHPC, Chennai.
- Totally 35,212 grafted plants were supplied to 460 farmers in 10 districts. The farmers are satisfied with yield and tolerance to nematode and dry rot.
- In the worksheet, the cost benefit ratio has been calculated with regards to seedlings for one season and grafted plants it is for two season. If, seedlings plants method, two crops are raised the cost benefit is better for seedlings cultivation method than the grafted plants cultivation methods.
- The Grafting techniques of Brinjal have been received from TNAU and it has also been communicated to all the District officers.

Nursery

8. Promotion of certified planting material production in acid lime and mandarin. (Action: DHPC)

- Research has been initiated to produce budded/grafted plants with identified rootstocks.
- At present no mechanism has been developed for certification of planting materials by State Department of Horticulture.
- The mother plant areas of the farms are well maintained and the planting material produced in State Horticulture Farms is regularly being accredited by National Horticulture Board. The Acid lime planting materials are being produced in farms of Kancheepuram, Pudukottai, Kanyakumari, Madurai, Namakkal, Virudhunagar and Vellore districts.
- Mandarin planting material is to be produced in Thandikudi (Dindigul) farm, where mother plants were newly established. Propagation will be started in the established mother plants next year onwards and this farm will also be accredited.

9. Arrangements may be made to supply parental lines of Hybrid vegetable seeds in bulk to the Department of Horticulture by TNAU for large scale multiplication. State Horticulture Farms may be utilized for the production of Vegetable seeds with the technical guidance of the University. (Action: DHPC and Dean Hort., Coimbatore)

- A committee has been constituted with Dean (Horticulture), Director (Seed Centre) and Director (CPBG) as members for assessing the suitability of State Horticulture Farms for vegetable seed production. The committee has visited 25 State Horticulture Farms during 2018 -19 and recommended that 19 farms are suitable for vegetable seed production and 6 farms are not suitable for seed production.
- **Farms which are suitable for vegetable seed production :** SHF, Kudumiyamalai, Vallathirakottai, Nattumangalam of Pudukkottai dt. Marungulam, Thanjavur dt. Moovanallur, Thiruvarur dt., Keelapaluvur, Ariyalur dt., Vengalm, Perambalur dt., Ragunathasamudram, Thiruvannamalai dt., Virudhachalam, Neyveli, Cuddalore dt., Sathanur, Villupuram dt., Jeenur, Krishnagiri dt., Giant Orchard, Karumandurai, SHF, Karumandurai, Salem dt., Kudapattu, Navlock, Vellore dt., Melkadirpur and SHF, Melottivakkam, Kanchipuram dt.
- **Farms which are not suitable for vegetable seed production :** SHF, Aduthurai, Thanjavur district, Vanduvancherry, Nagapattinam district,, Baguthampalayam, Erode district, Thimmapuram, Krishnagiri district,, Maniyarkundram, Salem district and Vitthanthal, Kancheepuram district.
- The indent of breeder seeds for seed production of high yielding varieties of Vegetables has been placed to TNAU for 2018-19. Out of 10 varieties of breeder seeds intended Tomato, Ribbed Gourd, Amaranthus, Brinjal, Bitter Guord, Moringa and Chillies had been supplied by TNAU. During 2019-20, Indent has been placed for breeder seeds of 10 kinds of vegetables, out of which tomato and Ash Guord breeder seeds were supplied.

10. State Horticultural Farms under the Department of Horticulture and Plantation Crops should be handhold by the scientists from TNAU in seed and planting material production. (Action: DHPC and Dean Hort., Cbe., PKM, Trichy)

- A committee has been constituted to inspect the State Horticulture Farms and totally 15 farms have been inspected and the report was submitted to DHPC, Chennai.

Committee formed by TNAU comprises of

- The Director, Centre for Plant Breeding and Genetics, TNAU
- Special officer (Seeds) seed centre
- Dean, HC&RI, TNAU.

Out of 34 farms, 25 farms have been visited by the committee.

Drip Fertigation

- 11. Recommendation on drip fertigation schedule for all the crops may be informed to the Department officials through Director of Research, TNAU – Already communicated.**
- The fertigation technologies have been standardized for the following horticultural crops
 - i. Fruit Crops – Banana, Mango & Papaya
 - ii. Vegetable Crops – Tomato, Brinjal, Onion, Chilly, Gourds and Bhendi
 - iii. Flower Crops – Jasmine, Marigold, Tuberose, Carnation, Lillium & cut Chrysanthemum
 - iv. Spices & Pl. Crops – Turmeric & Cocoa
 (The details are available in the Agri portal website)

Dry land Horticulture

- 12. Pomegranates and Amla should be introduced in dry land areas (Action: DHPC and Dean Hort. Coimbatore)**
- Horticulture crops like Pomegranate & Amla are well known for cultivation under dry land and these crops can be very well recommended.
 - Hands on training were given on “Grafting technique in Jamun & amla” to 23 Horticulture Officers of Tamil Nadu on 15.12.2017 at TNAU by HC&RI, Coimbatore.
 - The quality planting materials of custard apple varieties APK 1, Balanagar, Roydurg and Mammoth is multiplied and supplied to the farmers from Regional Research Station, Aruppukottai. (TNAU)
 - Under MSDA, 82,928 Amla grafts and 21,790 Pomegranate layers produced in State Horticulture Farms are being distributed at free of cost to the Dry land Agriculture Clusters by Horticulture Department for the year 2017-18. For Phase-II, it is proposed to distribute 1, 06,142 Amla grafts, 79,400 Pomegranate layers and 1, 00,000 Bael seedlings to the Dryland farmers under MSDA at 50% subsidy.
 - During 2019-20, in Phase-III, Horticultural Planting materials will be distributed to the farmers at an outlay of rs.4.00 crore.
 - The Dean HC & RI, TNAU has been requested to provide the details and availability of root stocks for the production of Custard apple and Jamun grafts in State Horticulture Farm through this office Lr.No.FPM3/7372/17 dated: 14.11.2017. Reply is awaited from TNAU in this regard. The mother plants were not yet supplied by TNAU.

Turmeric

- 13. The Turmeric varieties cultivated in Erode/Tiruppur districts may be improved with high Curcumin content, so that it can fetch better price to the farmers as that of Salem farmers. (Action: Dean Hort., CBE and ARS, Bhavanisagar)**
- Survey has been conducted and CO 2 is the variety suitable for high curcumin content. The survey report has been submitted to the Agriculture Production Commissioner, Chennai.
 - Letter has been sent to DHPC to get details on the requirement of turmeric transplants of CO2 variety for multiplication and no indent has been received.
 - In addition hands on training on protray nursery techniques in turmeric is also given to Horticulture Officers on 15.12.2017 at HC&RI, TNAU, Coimbatore.

Training

- 14. Training in following aspects to the horticultural official and progressive farmers to be planned at TNAU, Coimbatore.**
- **Nematode management in Horticultural crops**
 - **Grafting technique in Brinjal**
 - **Protray nursery technique in turmeric**
 - **Packing technique in Jasmine (Action: DHPC & Dean Hort., Coimbatore, TNAU)**
- Hands on training was given to 23 Horticulture Officers in the following aspects on 15.12.2017 at HC&RI, TNAU, Coimbatore.
 - Grafting techniques in brinjal
 - Protray nursery technique in turmeric
 - Grafting technique in Jamum & Amla
 - Packaging technique in jasmine
 - Nematode management in Horticultural crops (TNAU)
 - 55 Horticulture officers were deputed to attend the training at Tamil Nadu Agricultural University, Coimbatore on 15.12.2017 vide letter No.TAN/NHM/1303/2017 dated: 13.12.2017 and MIS/118/2018 towards the following Techniques.
 - Grafting Techniques in Brinjal
 - Grafting Techniques of Custard Apple and Jamun.
 - Protray nursery techniques in Turmeric.
 - Packing Techniques in Jasmine&
 - Nematode Management in Horticultural Crops.

III. ISSUES RELATING TO AGRICULTURAL MARKETING

Market advisories

1. **TNAU, DEMIC unit and CAM &AB should together develop market advisories for major crops including fruits and vegetables and dissemination. (Action: Comm. Ag. Marketing and Dir (CARDS))**
 - Domestic and Export Market Intelligence Cell (DEMIC) of TNAU is generating and disseminating pre –sowing and pre –harvest market advisories for 15 major crops including fruits and vegetables in Tamil Nadu. Agricultural crops include maize, blackgram, greengram, groundnut, sesame, cotton, chilli, coconut and copra. The horticultural crops include banana (Poovan, Karpooravalli and Nendran) and vegetable crops such as, tomato, brinjal and bhendi. 25 forecasts were made between the period from Oct 2018 to July 2019. Forecast validity of the pre-sowing and pre-harvest market advisories is around 91 per cent and 94 per cent respectively. Pre sowing advisories are given to farmers to take appropriate sowing decision, choice of crop and extent of crop area. Pre- harvest market advisories are given to farmers to take appropriate selling/storing decisions. Market advisories are also disseminated through SMS to the registered farmers by Agro- Market Intelligence and Business Promotion Centre (AMI & BPC), Trichy functioning under the Commissionerate of Agricultural Marketing and Agri Business (CAM & AB). During 2018-19, market advisories of DEMIC are send through SMS to 1.2 million beneficiaries, which include farmers, processors, scientists and policy makers. (TNAU)

Virgin Coconut Oil

2. **Director CARDS, TNAU should conduct market research for virgin coconut oil and provide information to CAM&AB (Action: Comm. Ag. Marketing and Dir. CARDS)**
 - Virgin Coconut Oil (VCO) is extracted from the coconut milk which is more nutritious and has therapeutic values. Though it has a history of more than ten years still it is in introduction stage of the product lifecycle. On the supply side, 17 manufacturers produce VCO in Tamil Nadu with capacities ranging from 500 kgs per day to 8000 kgs per day capacity. Oil recovery is 10-12 kgs per 100 kgs of nut (compared to the traditional oil recovery of 14-18 kgs per 100 kg). Most of the units are concentrated in western part of the Tamil Nadu. On the demand side, VCO is purchased by private firms like Patanjali, 24 Mantra, Sri SriTattuvaansCavin's care. These companies are buying VCO in bulk mainly for export. The major export destinations are US, Japan, Australia, UK and UAE. The export value increased from 5 crores in 2013-14 to 26 crores in 2015-16. In the domestic market, it is popular only in cities. In Coimbatore city Branded VCO was found in 5 supermarkets. There were 7 brands of VCO and marketed in different Stocking Keeping Units (SKUs) ranging from 200 ml to 1000 ml containers. There are also wide variations in prices of different brands of VCO. For example the price of a 200 ml pack varies from Rs.155 to Rs.190. There is huge difference in the prices of similar quantity packages. If we compare the price of 500ml packs of various brands like Organic India, Maxcare, LOIL, Ripple and Maharaja the prices were Rs.725, Rs.350, Rs.250, Rs.199 and Rs.160. If we compare the prices of 250ml packs of various brands like Maxcare, Elements, Patanjali and MRT organics it was Rs.190, Rs.185, Rs.170 and Rs.155

respectively. The survey found that VCO is not very popular among consumers in the city. (TNAU)

Capacity Building

3. Capacity building programme on post harvesting technology and value addition should be organized for department Officials / farmers (Dean Agril. Engineering, TNAU in coordination with CAM & AB and CE AED.). (Action: Comm. Agril. Marketing and Dean Agril. Engg. TNAU and CE AWD)

- The Department of Agricultural Marketing, Govt. of Tamil Nadu requested the TNAU to organize training on Post Harvest Technology and Value Addition for 3 days duration to 600 second level officers working in the respective departments. So far the following 2 trainings have been organized and 57 officials have been trained in latest post harvest technologies and value addition. Also they were also exposed to various post harvest machineries which are successful in reducing the post harvest losses. (TNAU)
- Agricultural Marketing Department, Govt. of Tamil Nadu

Name of the training	Year	Batch	No. of Trainees	Duration	Date
Post Harvest Management and Value Addition	2017-18	I	30	3 Days	11.12.2017-13.12.2017
	2018-19	II	27	3 Days	10.04.2018-12.04.2018

TANSAMB training centre had conducted 41 trainings for DDA's, Secretaries, AO's, Superintendents, Supervisors, AAO's, Assistant's, Junior Assistants and Farmers regarding grain storage, grading, agricultural marketing extension, food processing and value addition, supply chain management and computer.

4. Training to FPOs on business plan preparation and Detailed Project Report preparation for funding be organized. (Action: Comm.Ag.Marketing and Dir(CARDS))

- Trainings were organized for capacity building for CEOs and Directors of FPOs on topics like business plan preparation, agribusiness strategy formulation and implementation, agribusiness models and Project preparation and feasibility analysis. These training were organized at AC&RI, Madurai (218 participants in 4 trainings), ADAC&RI, Trichy (107 participants in 4 trainings) and in TNSAMB Training Centre, Salem(39 participants in one training) in 2018. (TNAU)

Nano Chip Field Testing

5. Field testing of nano chip for the preservation of fruit crops, especially Banana need to be done (Action:Agri.Marketing & Director, NRM)

- Nano-stickers (100 nos.) were distributed to two locations one in University of Nairobi, Kenya and Harsha Fresh, Krishnagiri. The data have shown the nano stickers can process upto 2 weeks. Nano-stickers were also tested in the Dept. of NST and found to preserve mango (Alphanso and Banglora) and banana (Grand naine and Ney poovan) for 2-3 weeks under ambient storage conditions. Overall, the data suggest the nano-stickers measuring 5x5 cm can be used to extend shelf-life of fruits. The patents have been filed. (NRM)

IV. ISSUES RELATING TO AGRICULTURAL ENGINEERING

Farm Mechanization

1. **The wetland laser levelling system is promising and may be demonstrated in rice growing areas by TNAU in collaboration with AED. (Action: AED/DoA/Dean Engg., Coimbatore)**
 - The demonstration of the laser controlled puddler was conducted at Lalgudi on 8-11-2017. The demonstration was conducted in collaboration with AEE, Lalgudi. The tractor, cage wheels and the laser control system were transported to Lalgudi. The roto puddler of 2.8m width required for the demonstration was provided by AEE, Thanjavur. The demonstration was conducted in farmers field at Nagar village. An area of around 0.3 ha was puddled during the demonstration. The demonstration was witnessed by 15 staff from AED and 60 farmers in the region.



Laser leveler in operation



The salient features being explained



The demonstration



Demonstration

Demonstration of the laser controlled puddler for RICE at Thanjavur

The demonstration at Thanjavur was arranged by the AEE, Thanjavur. The logistic support and personnel for both the demonstration were also provided by the Dean AEC&RI, Kumalur. The roto puddler was provided by the AED, Thanjavur. The demonstration was done at the village Kalimedu near Thanjavur. An area of around 0.6ha were operated and demonstration was done. The soil was heavy clay soil and had grass coverage. 70 farmers and SE, EE, AEE, AE and field staff of AED department witnessed the demonstration.



Participants in demonstration



Demonstration

2. The TNAU developed technology of mechanized sowing of seeds in portray and mechanized transplanting is suggested for popularization by AED for vegetable crops. (Action: AED/DHPC/Dean Engg., Coimbatore)

Demonstration of portray seeder

- Demonstration of the machine was taken up in collaboration with Agricultural Engineering Department & Department of Horticulture, Coimbatore. The performance of the machine was confirmed by the Assistant Director of Horticulture, Coimbatore with poly coated tomato seeds and the performance was found to be acceptable. The field demonstration of the unit was carried out at M/s. Naveen Nurseries, Kembanur, Thondamuthur on 26.10.2017. The demonstration was witnessed by the nursery growers of Thondamuthur area and local farmers. These nurseries are growing cabbage, chilli, brinjal, tomato and other seedlings as per the requirement under green house. The demonstration was also witnessed by
 1. Superintending Engineer, AED, Coimbatore
 2. Assistant Executive Engineer, AED, Coimbatore
 3. Assistant Engineer, AED, Coimbatore
 4. Assistant Director Of Horticulture, Department of Horticulture, Coimbatore.
- The demonstration was conducted by Agricultural Machinery Research Centre, TNAU, Coimbatore and attended by Professor and Head, AMRC and Professors, AMRC. Dr.Aphijit P.Desphande, Professor, IIT,Chennai who is an expert of Polymer chemistry also attended the field demonstration to understand extension activities under rural technology dissemination.
- The equipment was demonstrated for sowing poly coated cabbage seeds. The farmers shown keen interest in the machine and the nursery growers have expressed that such a machine will be highly useful to eliminate the manual labour. Presently they are sowing 12000 seeds in the trays by one labour in a day. The pro tray sowing machine can sow 600 trays per day or 60000 seeds per day and hence can replace five labours. The nursery growers expressed their satisfaction with the machine since labour availability is not reliable.



3. Mechanized sowing of Groundnut and mechanized harvesting and threshing of groundnut may be developed and promoted. (Action: AED/DoA/Dean Engg., Coimbatore)

- The demonstration of the groundnut machinery was taken up in collaboration with AED Thirupur. The demonstration was done by staff of AMRC. The demonstration was done in an area of 0.75 ha . The demonstration was attended by 35 farmers and 6 officials of AED. The farmers expressed satisfaction with the equipment. Demonstration of the ground nut harvester was conducted in collaboration with ICAR KVK Cimbatore during January 2018 at Periya Goundanur and Govindapuram and an area of around 25 acres was harvested in farmers fields. The tractor operated ground nut thresher (TNAU model) was also demonstrated in the above villages.



Demonstration of Groundnut Digger

4. AED should explore possibilities of initiating pilot mechanization demonstration roject in collaboration with TNAU to promote mechanized row crop cultivation in garden and dry land crops. (Action: AED)

- The SE (AED) Madurai visited the mechanized cotton cultivation farm at TNAU campus on 6-11-2017 and the package for mechanization of cotton crop in irrigated and drip irrigated systems was explained. The land preparation, broad bed formation, sowing with tractor operated planter, Spraying of weedicides by tractor was explained. The configuration for facilitating mechanized weeding was also explained. On receiving the information about identification of suitable fields for demonstration of mechanized cultivation by SE (AED), Madurai, the machinery will be provided by AMRC.

Agro processing

5. The chain of Turmeric processing machinery developed at AEC&RI, TNAU, Coimbatore may be promoted in custom hire mode. (Action: CAM & AB and CE AED)

- Turmeric processing machinery namely washer, boiling vessel, dryer and polisher were developed. The details of the machinery are as follows:

Sl. No.	Machine	Capacity (kg/h)	Cost(Rs.)
1	Turmeric washer	300	2,00,000
2	Turmeric boiler	200	25,000
3	Turmeric dryer	500 kg/batch in 2 days	7,00,000
4	Turmeric polisher	700	3,00,000

- The machinery were demonstrated to about 2000 farmers in the Machinery Melas conducted at TNAU from 2017-19. The AED officials communicated that they will take these machinery next year to the fields. In the 18 Postharvest trainings conducted at TNAU, the AED officials were given demonstration of turmeric machinery
- 6. Processing machineries are to be certified by test centres for inclusion in Government programmes. Since only one institute is presently authorized to test and certify processing equipment, proposal may be sent to Government of India for inclusion of TNAU, Kumulur centre for testing processing equipments also. (Action: Dean Engg., Cbe, Kumulur – TNAU and CE AED)**
- A proposal for establishment of Processing equipment testing centre was submitted to Dept. of Agriculture, Government of India, New Delhi and a high level committee comprising of Dr.P.P.Rao, Director, Southern region Farm machinery training and testing centre, Anandapur (A.P) and Dr.P.K.Chopra, Additional commissioner (Mechanization and Technology division) Dept of Agriculture, Govt of India, New Delhi reviewed the facilities at AEC&RI, Kumulur on 28.1.19. As per the suggestions of the committee, a revised proposal was submitted on 22.2.19 for approval. The proposal is under process.
- 7. The optimum drying environment for different agricultural produce should be standardized. (Action: Dean Engg.,Cbe, Kumulur – TNAU)**
- The optimal drying environment recommended for agricultural produce is 50°C and 40-50% relative humidity for the drying air. This will result in quality retention and energy conservation.
- 8. Portable storage system for short term storage of cluster onion should be developed. (Action : Dean Engg., Cbe, Kumulur – TNAU)**
- A portable storage structure for small onions (Aggregatum onion) of 2 tonnes capacity with forced ventilation has been developed. The cost of the unit is Rs. 1.0 lakh and storage cost is Rs. 500 per tonne per month. The onions can be safely stored for 6 months.
- 9. An agricultural processing technology for vegetables has to be developed. (Action: Dean Engg., Cbe, Kumulur – TNAU)**
- Modified atmosphere packaging technology (oxygen concentration 2-4%; carbon dioxide concentration 8-10%) is recommended for vegetables such as tomato, brinjal, onion, capsicum, beans, coriander leaves and curry leaves for extending shelf life by 18-20 days. Vacuum packaging of banana is recommended for extension of shelf life to 21 days.

Bioenergy

- 10. Solar tunnel dryers are popular with farmers and are also covered under subsidy programme. The protocol for design of solar tunnel dryer and its operations should be prepared by TNAU and given to AED. (Action: Dean Engg., Cbe, Kumulur – TNAU & CE AED)**

- The solar tunnel dryer have been commercialized through approved license of TNAU and popularized in Tamil Nadu region for drying of various agro-industrial products by TNAU. Solar tunnel dryers were installed successfully for drying of coconut, chillies and medicinal plants. Government of Tamil Nadu has promoted this technology to farming community for drying coconut and chilli with subsidy of Rs.50000/- per unit under NADP and IAMWARM scheme during the year 2013-14. The following firms have been entered MoU with ABD, TNAU for commercialization of Technology.

Approved license of TNAU

1.	M/s. Focusun Energy Systems, 30, Dr. Jagannath Nagar, Near CIT, Coimbatore – 641014.	9842216174 gopi@focussunsolar.com enquiry@focussunsolar.com
2.	M/s. Excess Renew Tech Pvt. Ltd., No-5, Vinayagar Koil Street Krishnasamy Nagar Ramanathapuram, Coimbatore – 45	0422-4223413/6575008 9894623157, 8220788488 venkat@excessindia.com www.excessindia.com
3.	M/s. Unique Fabricators, 10/3, Athipalayam Road, Chinnavedampatty, Coimbatore – 641 006.	0422 – 2665257, 2669615 9842290691, 9842472875 <unique_fab@sify.com>
4.	M/s.Reny Agro Engineering Private Ltd No.474, Mainiyakaram Palayam Nallam Palayam, (Near Sabari Kitchen), Ganapathy, Coimbatore – 6	9842217881 9842177225 <sales@renymarketing.com>
5.	M/s. Libra Innovations Private Limited, 276/1, Anjaneyar Koil Street, Vengaivasal, Chennai – 600 126.	044-22780045, 22781972 9380519151 <librachennai@sify.com>

- Currently M/s. Focusun Energy Systems, Coimbatore – 641014 is having MoU tenure of three years for manufacturing and installation of solar tunnel dryer.

Protocol for design of solar tunnel dryer

- The solar tunnel dryer was designed based on quantity of agro-products to be dried, initial and final moisture content of the produce, amount water to be removed, volume of air required, area of the solar collector and chimney (exhaust) with temperature/humidity controllers. Polyethylene collector is used as solar collector material in the dryer. The overall dimension of the dryer is 18.0 m x 3.75 m x 2.0 m. The standard design procedure was adopted based on the above said parameters. The drying capacity, drying time and optimum drying temperature of the products are given below.

Sl. No.	Product	Mass (kg)	Drying time	Optimum temp, °C
1.	Coconut	1000	4-5 days	60
2.	Chilli	500-600	7-8 days	60
3.	Rosemary	500 kg	1-2 days	60
4.	Medicinal leaves, Moringa, vallarai, roots and branches	500 – 750 kg	6-8 h	45-50
5.	Turmeric	800 kg	8 - 10 days	62

Size of solar tunnel dryer

- Overall size of the solar tunnel dryer can be installed as 6x3.75x2 m, 9x3.75x2 m and 18x3.75x2m for 300 kg, 500 kg and 1000 kg of coconut respectively. This can be increased by installing trays and movable trolley structure for higher loads upto 2000 kg.

Biomass-Solar hybrid dryer

- Biomass hot air generation system is developed by department of Renewable Energy Engineering, TNAU, Coimbatore supplying hot air during off-sunshine hours. This can be integrated with existing solar tunnel dryer to make it hybrid source for continuous drying application. The system can be used for bulk drying applications during off-sun shine hours and rainy hours. The capacity of hybrid biomass air heating system is 2 tonnes per batch of copra with an additional investment of Rs. 6 lakhs including trays, structure (stainless steel) and exhaust control systems. The hybrid solar-biomass drying technology may be promoted under subsidy schemes among the farming community in Tamil Nadu.

Operation of the dryer

- Drying floor should be ensured free from dust and dirt before operation.
 - Product loading and unloading can be done manually, in bulk drying the tray with trolley system is preferred.
 - Keep always open the fresh air entry ports while drying process
 - In drying operation, the door should be closed always for maintaining temperature.
 - RH should be maintained in the range 50-60 % to avoid moisture accumulation inside the dryer during initial period of drying and rainy/cloudy days.
 - Chimney should be kept open during initial stage of drying and it may be adjusted during the end of drying with relation to temperature build up inside the dryer with auto-exhaust control mechanism. Exhaust fan in the chimney should be operated based on set points of RH/temperature sensing with specific to agro products to be dried. This operation ensures best quality of the agro-products.
 - Products should be unloaded once drying process over for maintaining the quality.
 - Polyethylene collector may be replaced once in 5 years for higher transmissivity.
- 11. Solar PV systems are popular among farmers. However possibility of utilizing PV power for non pumping application and also connecting the same to grid are to be explored. (Action: Dean Engg., Cbe, Kumulur – TNAU & CE AED)**
- A project proposal titled "Augmentation of Solar Photo Voltaic Powered Water System to meet the power demand of farm and allied enterprises" has been submitted to TNSCST on 14.2.2019 and approval is awaited. The project proposal was prepared to suggest effective use of Solar panels fixed in water pumping systems during non-pumping periods.

12. AED should explore the possibilities to include biomass gasifier for pumping applications under popularization program. (Action:CE AED)

- The SE, AED, Madurai visited the mechanized cotton cultivation farm at TNAU campus on 6-11-2017 and the package for mechanization of cotton crop in irrigated and drip irrigated systems was explained.
- The land preparation, broad bed formation, sowing with tractor operated planter, Spraying of weedicides by tractor operated boom sprayer was explained. The configuration for facilitating mechanized weeding was also explained.
- On receiving the information about identification of suitable fields for demonstration of mechanized cultivation by SE (AED), Madurai, the machinery will be provided by AMRC.

13. Suitable sensors are required for sensor based irrigation system and it has to be developed. (Action: Dean Engg., CBE, Kumulur – TNAU)

- The irrigation scheduling based on moisture sensors is the latest approach in improving the water use efficiency in crops. In this regard, the soil moisture sensors have been installed in Water Technology centre irrigation cafeteria with an objective to assess the crop water requirements using soil moisture sensors. The installed system is capable of scheduling irrigation based on time, volume and soil moisture sensors. The soil moisture sensor fixed in the root zone can measure the existing soil moisture and the irrigation scheduling is done based on the soil moisture. If the soil moisture in the root zone reduces below the predetermined level (i.e. the allowable soil moisture depletion level which varies according to the crop) the irrigation is carried out, whereas the irrigation stops once the soil moisture reaches the upper limit (i.e. the field capacity level). Standardization and calibration of sensors are carried out in the sugarcane and banana crop. To compare various automation concepts such as time based, volume based, sensor based irrigation scheduling, and two experiments have been laid out in vegetable crops and trials are in progress.

14. Crop water requirement based on agro climatic data for different stages of crop are required for making recommendations for micro irrigation systems. (Action: Dean Engg., CBE, Kumulur – TNAU)

- Following research projects are in progress in Dept of Irrigation and Drainage Engg. and SWC for determination of crop water requirement for drip irrigated crops.
 - Crop water requirement for drip irrigated crops funded under Core project, TN Gov.
 - Evaluation of Water Conservation and Management Techniques for field Crops funded under Core project, TN Gov.
 - Estimation of crop coefficient and Water requirement of Capsicum under poly-house and open field condition funded under Core project, TN Gov.
 - Estimation of crop coefficient and Water requirement of Chilli and Cucumber under poly-house and open field condition funded under University Research Project, TNAU

- 15. The design of poly houses, their constructional features, materials and structures may be standardized and communicated to AED & DHPC. (Action: DHPC, Dean Engg., CBE, Kumulur – Dean, Hort., CBE, TNAU & CE AED)**
- A project on “Standardization of frame sections used in polyhouse for the structural stability” was carried out at Precision Farming Development Centre, AEC & RI, Coimbatore.
 - Using LISA software on FEA the various stresses developed in the polyhouse were calculated.
 - The size of the framed sections are standardized. BIS 1161 – 2014 standard pipes can be used for constructing a polyhouse. This will help to reduce the cost of the pipe sections as a “A” class pipes can be used with BIS 1161-2014 instead of BIS 1239-2004 where “B” class pipes are recommended for the same factor of safety as 4.0. The result shows 5 percent reductions in cost / sq. meter.

V. GENERAL ISSUES

1. **TNAU has to offer training to officials of AED in the areas of agro processing and Bioenergy. Grants for the setting up of mini dhal mills and mini oil expeller units and Training to officials of Agricultural Marketing. (Action: Commissioner Agri Marketing, CE Agri Engineering and Dean Engineering CBE & Kumulur, TNAU)**
 - The following trainings are conducted in the batch wise as per schedule in the areas of Farm mechanization, Utilization of Solar Energy in Agri and Allied Sector, Food Processing technology and Post Harvest Management and Value addition to Agricultural Engineering department officials in all over Tamil Nadu at TNAU, Coimbatore with State Agricultural Management and Extension Training Institute (SAMETI), Pudukottai.

Name of the Area	Batch	Duration	Date	No. of trainees / batch	Participants
Utilisation of solar energy in Agri. and allied sector	I	3 days	21.11.2017 - 23.11.2017	30	Assistant Engineers / Junior Engineers
	II	3 days	27.11.2017 - 29.11.2017	30	
	III	3 days	18.12.2017 - 20.12.2017	30	
	IV	3 days	26.12.2018 - 28.12.2018	30	
	V	3 days	09.01.2019- 11.01.2019	30	
	VI	3 days	23.01.2019- 25.01.2019	25	
Food Processing Technology	I	3 days	27.12.2017 - 29.12.2017	30	
Food Processing Technology	II	3 days	19.2.2018 - 21.2.2018	30	
Farm Mechanization	I	3 days	22.1.2018 - 24.1.2018	30	Assistant Engineers / Junior Engineers
	II	3 days	29.1.2018 - 31.1.2018	30	
	III	3 days	5.2.2018 - 7.2.2018	30	
Post Harvest Processing and Value Addition Technology	I	3 Days	27.12.2017- 29.12.2017	27	Agricultural Engineering Department (AED), Govt. of Tamil Nadu
	II	3 Days	29.01.2018- 31.01.2018	29	
	III	3 Days	05.02.2018- 07.02.2018	28	
	IV	3 Days	19.02.2018- 21.02.2018	34	
	V	3 Days	26.02.2018- 28.02.2018	30	
	VI	3 Days	05.03.2018- 07.03.2018	26	
	VII	3 Days	12.03.2018- 14.03.2018	24	

Post Harvest Processing and Value Addition Technology	VIII	3 Days	12.06.2018-14.06.2018	30	Agricultural Engineering Department (AED), Govt. of Tamil Nadu
	IX	3 Days	27.06.2018-29.06.2018	28	
	X	3 Days	04.07.2018-06.07.2018	30	
	XI	3 Days	18.07.2018-20.07.2018	31	
	XII	3 Days	06.08.2018-08.08.2018	31	
	XIII	3 Days	29.08.2018-31.08.2018	31	
	XIV	3 Days	05.09.2018-07.09.2018	32	
	XV	3 Days	18.09.2018-20.09.2018	35	
	XVI	3 Days	10.10.2018-12.10.2018	31	
Post Harvest Technology for Horticultural crops	I	3 Days	02.01.2019-04.01.2019	30	Official from Department of Horticulture Govt. of Tamil Nadu

Award

2. **APC Suggested giving Award to the Scientists and Officials for their contribution towards the development of new varieties and technologies during the forthcoming SWC 2018. (Action: Registrar, TNAU)**

- The scientists responsible for the release of varieties, technologies and extension services were appreciated with awards in the Award function conducted on 1st July 2019. Accordingly, Best Research Award (7), Best Woman Scientists award (1), Best teacher award (4), Best Extension Professional award (4), Best KVK award (1), Best Seed Production Centre award (3), Excellence in NICHE area Award (23) were awarded apart from award for scientists who were involved in the release of varieties and technologies. The scientists who brought funds through Externally funding to the University were also recognized with suitable awards.

Mentorship of Colleges

3. **Hand holding of field officials including seed production training to the Extension officials need to be provided at the district level by assigning Mentorship to Colleges, Stations and KVKs. In this regard regular Quarterly review of the work plan was also suggested. The Registrar TNAU to allocate one college to each district JDA/JDH/ DDH/ EE AED/AM&AB in consultation with APC (Action: Registrar, TNAU)**

- The concept of hand holding of field officials is established at district/block level by the Directorate of CARDS. A special 'Task force' of scientists has been formulated who are assigned with mentorship to co-ordinate at block level.

NOTES FOR DISCUSSION (QUERIES)

AGRICULTURE

JDA, Tirunelveli

Paddy

1. **In Tirunelveli district, farmers are slowly shifting over from bold to super fine varieties, since super fine varieties fetches higher price in the market. The private varieties like komal, Atchaya, Komal king, Amman pinni are being cultivated in large area in Tirunelveli district. Hence suitable super fine varieties may be evolved for Pishanam season to replace these private varieties may be evolved.**

Research needs

Evolving super fine varieties for Tirunelveli district

The medium duration rice varieties TKM 13 and CO 52 are medium slender type with 1000grain weight of 13.8 and 14.10g respectively and these two varieties can be popularized

2. **Paddy ASD 16 is being cultivated in larger area irrespective of seasons in Tirunelveli district. During Pishanam 2004-05 blast incidence was noticed and during 2006-07, 2007-08 and 2008-09, severe blast incidence was observed in most of the ASD 16 cultivated fields. Suitable short duration Blast resistant short bold paddy variety to substitute ASD 16 may be evolved to overcome the specific problem of Tirunelveli District.**

Research needs

Evolving blast resistant short duration paddy variety to substitute ASD 16

Alternate variety for ASD16 is TPS 5 (2014) with short bold white grain with duration of 110 to 115 days and moderately resistant to blast.

The two short bold grain rice cultures AS 15024 and AS 16004 with yield potential of 6547kg/ha and 6897kg/ha are being evaluated under MLT 2019.

These cultures moderately resistant to blast disease

3. **During 2010-2011, 2011-2012 both in Kar and Pishanam seasons of Tirunelveli District the Paddy Crop was severely affected by Stem borer. The remedial measures taken to manage the pest had less effect. Therefore a suitable IPM module to overcome the stem borer problem to be worked out.**

- Remove/destroy stubbles after harvest
- Use light traps (1/ha) to monitor pest incidence
- Use pheromone traps (12/ha) to monitor stem borer incidence
- Remove and destroy egg masses of stem borer by clipping off the tips of seedlings
- Release of the egg parasitoid, *Trichogramma japonicum* thrice @ 1,00,000/ha each release (when moth activity is noticed)
- Use suggested insecticides at recommended doses based on ETL (2 egg

masses/m² or 10% dead hearts or 2% white ear)

- Avoid repeated use of same insecticide
- Dose recommended are per ha, unless otherwise specified
- Spray (per ha) *Bacillus thuringiensis* var. *kurstaki* @ 1.50 kg or Acephate 75 % SP 670-1000 g or Chlorantraniliprole 18.5% SC 150 ml or Fipronil 5% SC 1000-1500 g or Thiamethoxam 25% WG 100 g

Cholam

- 4. In Tirunelveli District irrigated Cholam is being cultivated in about 3000 Ha. in Sankarankoil, Tenkasi, Alankulam and Shencotai taluks. In Tirunelveli, farmers prefer sorghum variety with white and small sized grains as the of K Tall. It is a very old variety. Hence a suitable short duration cholam variety may be evolved for Tirunelveli District.**

The variety, CO 30 is a dual purpose variety maturing in 95 -105 days suited for both rainfed and irrigated situations giving an average grain yield of 2800 and 3600 kg /ha and fodder yield of 7 and 9 tonnes/ha respectively in rainfed and irrigated conditions. The grain colour is white.

JDA, Nagarcoil

- 1. In Kanyakumari district during Pishanam season the paddy area is covered by varieties like TPS 3 and CR 1009 sub 1. TPS 3 is medium duration, short bold grain type variety which comes under variety more than 10 years of notification and so could not be further multiplied due to the promotion of less than 10 years variety. Also this variety is severely infested by stem borer which leads to heavy yield loss.**

Research needs

Alternate medium duration (130 days) variety with short bold grain type, resistant to stem borer and with high tillering.

The medium duration varieties TNAU Rice (TRY 3) and CO (R) 50 with bold grain type could be the alternate varieties for TPS 3.

Field level demonstration of paddy variety TRY 3 along with TPS 3 was conducted in farmers field during 2013-14 in Kanyakumari district through KVK. TRY 3 recorded higher grain yield of 6880kg/ha which is 12.42% increase over TPS 3 (6120kg/ha).

Besides four rice cultures with short bold grain types maturing in 125 days are in advance stage of evaluation.

- 2. In Kanyakumari district, rice fallow pulses cultivation is done in Yela conditions and the heavy summer rains during April, May months severely damage the crops as water stagnation persists for more 24 hours**

Research needs

Blackgram varieties tolerant to water stagnation

Generally the black gram is highly sensitive to water logging conditions. However, the released blackgram varieties and cultures in ART/ OFT could be evaluated in Yela condition to assess the water logging tolerance level .

JDA, Sivagangai

- 1. In paddy, short duration drought tolerant fine variety to replace BPT 5204 with best milling quality for samba season other than CO 51.**

The variety ADT 53 released during 2018, matures in 105 days is having medium slender grain type with the test weight of 14.8 g. The milling per cent of this variety is 65%.

Anna (R) 4 matures in 105-110 days having long slender grain type with 66.1% milling percent.

- 2. Blast resistant variety in Ragi**

The high yielding and medium duration ragi variety, CO15 has been notified during 2017 and is popular among the farmers. It is tolerant to all three types of blasts (Leaf, Finger and Neck blasts) when grown in June-July and September-October seasons.

One pre release ragi culture, TNEc 1285 has been evaluated in about 140 trials under ART for the last two years (2016-2018). It is having a yield potential of 3250 Kg/ha and matures in about 115 days. It is also tolerant to leaf, finger and neck blasts. This culture is drought tolerant and highly suitably for rainfed condition. The ear head is compact with bold seeds.

- 3. Short duration drought tolerant varieties for sorghum**

The variety K12 which matures in 95 days is tolerant to drought was released in 2017 for rainfed cultivation having average grain yield of 3123 kg/ha and fodder yield of 11.9 t/ha under rainfed conditions. Besides it is moderately resistant to shootfly and stemborer and resistant to downy mildew with creamy white grains.

- 4. Variety with good vegetative and grain yield in fodder sorghum**

TNAU sorghum variety CO 30 is a dual purpose variety released for both grain yield and dry fodder yield and it recorded an average grain yield of 2800 and 3600 kg/ha and fodder yield of 7 and 9 tonnes/ ha in rainfed and irrigated conditions.

5. **Need combined harvester for paddy and millet with suitable adjustments**

Most of the commercial combine harvesters that are wheel mounted can harvest both rice and millets. The modifications required when changing over from one crop to other are

- Changing of the cleaner sieves
- Adjusting blower air
- Adjusting the chaffer clearance
- In addition, the threshing drum speed will also be adjusted according to the crop.

The existing combines can be used for both rice and millets using the above adjustments

Most of the combines operated on hire basis are changed from one crop to another as per the requirement.

JDA, Theni

Paddy

1. **Use if apt indigenous low cost weeders to be tested and formulation of ideal spacing as well as depth for planting need to be tested with different types of mechanical transplanters**

TNAU has developed a two row powered weeder for rice, which is suitable for wide range of soil conditions and can be operated in row spacing of 200 – 300mm. Different sets of weeding rotors are provided to weed at different stages of crop.

Mechanical transplanters have been standardized with row spacing of 23.8 cm (Chinese) and 30 cm (Japaneses). The plant to plant spacing can be altered around 12 to 22 cm. The spacing can be varied and adopted as per crops agronomical requirements.

2. **Sensitivity of crop towards blast need to be studied and an apt strategy to increase the resistance of diff. hybrids & varieties Paddy need to be finalized**

New rice varieties released from TNAU such as CO 48, CO 49, CO 50 and CO 51 and rice hybrids such as CORH 3 are moderately resistant to blast. Likewise TNAU rice hybrid CO (R) 4 is resistant to blast.

3. **In the delayed water receipt situation, a suitable paddy variety with short duration is needed. Since the reliance on Dam water release is sometimes affecting farmers.**

The short duration rice varieties CO (R) 51 and ADT 53 maturing in 105 days are recommended for this situation

4. Seed pelleting technique for paddy may be tested and ideal practical package is needed.

Seed pelleting is not suitable for paddy since, the sprouted seeds are used for sowing which required soaking and incubation. Hence, pelleting technology cannot be adopted for paddy.

5. Seed storage study needed in paddy.

- Seed storage technology is already available for paddy.
- Proper drying of seeds to a moisture content of 12- 13%.
- Seed treatment with carbendazim @ 2g/kg of seeds before storage.
- Seed treatment with Malathion dust @ 10g/kg of seeds before storage to manage the storage pest.
- Non-woven bags can be used as cost effective alternate seed packing material instead of gunny bag for storing rice seeds with above 80% germination upto 12 months of storage.

Oilseeds

1. Packages like pregerminated seeds, for Groundnut need to be studied using Panja Kavya.

- To induce pre germination in groundnut seeds, 6 hours soaking in equal volume of water followed by 14 hours incubation is recommended.
- To identify and separate live seeds or sprouted seeds in groundnut, soaking in 0.5% CaCl₂ for 6 hours followed by incubation for overnight is recommended.
- There is no information on panchagavya for germination improvement in groundnut. However, in bitter gourd and tomato, seeds soaked in three and one per cent panchagavya improved the germination and seedling vigour.

Pulse

1. In black gram, seed pelleting and population maintenance using seed drills need to be tested.

Seed drill for pulses is available already. However, evaluation of mechanized sowing of pelleted seeds using seed drill has been proposed as action plan in the Crop Scientists Meet (Pulses) 2019. The studies are in progress.

Tree borne

1. Suitable neem species for Theni need to be tested and research on botanicals like pungam leaf extract is needed. Buying the oil from Theni by a quality test is needed for Chekku Oil quality standards need to be specified for short life.

- Superior neem genotypes with high oil and aza available with FC&RI, Mettupalayam will be tested at Theni
- Neem chekku oil from Theni areas will be collected and its quality standard will be tested and intimated to the concerned District Joint Director
- Pungam leaves are collected and incorporated in paddy fields before puddling & used as biopesticide in Karnataka (TNAU Agritech portal – Indigenous farming)

- Acetone extract of Pungam was effective in pest management (Mukesh kumar and Ram singh, 2002. Biological Agriculture & Horticulture, 20 (1) : 29 – 50
Title : Potential of *Pongamia glabra* rent as an Insecticide of plant origin)
- 7.5% leaf extract (Ethanol extract of *Pongamia pinnata* was used against rice plant hopper) (Venkat Reddy *et al.* 2012). Evaluation of botanical & other extracts against plants hoppers in rice. Journal of Biopesticide 5 (1)
- Pungam leaf extract has antifeeding property (Vinodhini *et al.*, 2011. Indian Journal of Agricultural Research)

JDA, Madurai

Paddy

1. Co (R) – 51 Lodging problem particularly samba season

Co (R) – 51 now popularized cultivation during samba season. Due to lodging problem seed germination and harvest. How to rectify it

CO (R) 51 is a short duration rice variety with 120 days duration, suitable for cultivation during Kuruvai (June-July sowing) and Navarai (Dec- Jan sowing) seasons. Therefore, the variety is not recommended for cultivation during samba season. Split application of fertilizers, particularly nitrogenous fertilizers could help in reduction of lodging in rice.

Short duration variety for ayacut areas

Short duration variety of 90 days with good yield potential has to be evolved for Ayacut areas and the tail end area of periyar vaigai project area

The released variety, ADT 48 matures in 95 days under direct seeded condition . An advanced stabilised rice culture AD 16019 which matures in 90 days (direct seeding) and 95 days (transplanted) has been developed by TRRI,Aduthurai and it is being evaluated under Multi Location Trials of 2019-2020

Alternate variety for Atchaya

Private improved variety like Atchaya preferred by farmers than our variety due to fitness for higher price. How is the variation of fitness grain occur in private variety, why not possible in TNAU variety

The medium duration rice varieties IW Ponni, TKM 13 and CO 52 are possessing fine grain type and could be popularised

2. Maize

All hybrids are already treated with insecticide and fungicide

Now in FAW control measures, how much it will be materialized if again treated with *Beauveria bassiana*

Beauveria bassiana recommended only if the maize seeds are not previously treated with any of the insecticides by the Seed Producer. In case of previous seed treatment with fungicides during packaging, the recommendation of seed treatment with *Beauveria bassiana* @ 10g/kg seed sequentially at the time of sowing will hold good and there is loss of viability of the spores.

3. Cotton

Cultivation of ELS cotton varieties in Madurai District is initiated through schemes

Its suitability to this tract and management practices are needed.

Cotton variety -Co 14 is an ELS variety, released from TNAU. The suitability of this variety in Madurai tract could be tested through demonstration trials during the ensuing season/ year. The package of practices recommended for cotton varieties are suitable for this ELS variety also.

4. Coconut

Occurrence of Rugose spiringling Whitefly

Effective and correct management of Rugose spiringling Whitefly

The TNAU recommendation is given below for adoption

TNAU technology capsule for the management of Coconut RSW:

1. Release of *Encarsiaguadeloupae* @ 100 parasitoids /ac (10 leafbits/ac)
2. Installation of yellow sticky traps (5 ft. x 1.5 ft.) smeared with castor oil @ 8 / ac
3. Release of *Chrysoperlazastrowisillemi* eggs @ 500/ac in young palms

'Pesticide holiday' must be declared to conserve the natural enemies fauna in the whitefly affected coconut plantations

HORTICULTURE

Drumstick

1. Need technology to induce off season bearing in Moringa (Ariyalur)

For off season production of Moringa, sowing of moringa seeds on May 15 and three months after sowing two sprays of nitrobenzene @ 0.5% at 15 days interval will induce flowering during winter month.

In the existing crop, pruning during June followed by three months after pruning spraying of nitrobenzene @ 0.5% two sprays at 15 days interval will induce flowering during winter months

Cashew

2. Off season bearing causing yield loss to main crop up to 35% in VRI 3 variety (Cuddalore)

Pruning may be initiated during the month of June – July which will induce uniform flowering and fruit set.

Tuberose

3. Nematode menace in Tuberose (Dharmapuri)

Varieties with complete resistance / tolerance to nematodes are not available till date.

Bulb treatment with *Pochonia chlamydosporia* @ 1 kg /ha followed by soil application @ 2.5 kg /ha mixed with 100kg FYM is recommended.

Besides recommended practice of neem cake application @ 5t/ha.

Jasmine

4. Non availability of flowers during winter season. (Dindigul)

Pruning of Gundu malli (*Jaminum sambac*) during last week of September encourages off- season flowering

Research to standardize a wholesome package of practices for off-season flowering in jasmine is under progress.

Tomato

Tomato crops affected due to high temperature (Dindigul)

New research work will be initiated for development of F1 hybrid in tomato for summer cultivation

Pollination support in Poly house

Poor pollination in Capsicum and Tomato under polyhouse.

- Spraying of auxins at lower concentration (200ppm) is recommended to improve the fruit set.
- Dammer bee hives may be maintained only under temperature controlled poly green house under bio pesticide application.
- Electrical vibrators can be used to enhance the pollination

Banana & Vegetables

5. **Wild boar menace seen in the forest fronts of Anthiyur, Ammapettai and Sathyamangalam blocks in banana, tapioca and many other crops (Erode)**

- Planting of thorny bushes around the crop.
- Use of human hairs/local dogs for scaring.
- Use of crackers, drumming and alarming calls.
- Lining with used colour sarees along the fence.
- Spraying of 1% of local pig dung solution.

Tapioca

The Tapioca being an industrial crops in Erode, it is priced based on the starch content. (Erode)

Pre release culture ME 681 is identified at TCRS, Yethapur which is having starch content of 30.5% with an average yield of 47.6t/ha. It is under ART.

Suitable crops for polluted water

Water bodies in this district are polluted due to dyeing industry waste. Increase in the EC, TDS and BoD of irrigation water become a challenge for crop cultivation. (Erode)

Dyeing industry polluted water having high EC, TDS, and BOD can't be used for irrigation as such. Besides, Dyeing industry polluted water may also contain Azodyes and other toxic heavy metals. Therefore such polluted water is not advisable to be used as irrigation source for the food and fruit crops. Depending upon the degree of salinity (EC level) and TDS level in the polluted water, this can be utilized judiciously for the forage and tree crops.

Ployhouse cultivation

6. **Due to urbanization, availability of land is highly decreasing trend in this district. Hence, cultivation of vegetable under protected structure is the only way of increasing production and productivity (Kancheepuram)**

Technologies have been standardized for tomato, cucumber and capsicum.

The details of the technologies are available at TNAU website.

Research on net house cultivation of greens and short duration vegetable crops are under progress.

Clove

7. **Clove cultivated in Mahendragiri & Maramalai hills in Kanniyakumari District shows decline symptoms which resembles like citrus decline. This problem needs immediate attention including physiological study in this area to save the clove crop in Kanniyakumari District.**

The regular plant protection methods are not effective against this pest. (Kanyakumari)

It was identified that the sudden decline is induced by *Colletotrichum gleosporioides* and *Cylindro cladium*. It was also observed that the infection per cent was high in south western aspect of the hills wherein high amount of mist persists.

The control measures:

- Pre monsoon spray: Bordeaux mixture 0.5%,
- Mid monsoon spray: Systemic fungicide with the combination of carbendazim + mancozeb 0.2% spray
- Post monsoon spray: Bordeaux mixture 0.5%

Rubber

Rubber is cultivated 27,235 ha in Kanyakumari District. Due to low price, it is proposed to conduct research for the following issues to help the small growers in Kanyakumari District.

Inter cropping – Banana and Pineapple are cultivated as intercrop in newly planted Rubber for first two years. Thereafter there is no practice of inter cultivation in Rubber. (Kanyakumari)

From third year onwards, a foliage filler crop *Draecena massangeana* can be planted as intercrop in rubber plantations provided assured market is available. Further, bee hives can be introduced in the rubber plantations to get additional revenue.

Betel vine

8. Mites and Bacterial diseases (Karur)

Mite:

Spraying of azadirachtin 10000 ppm – 2.5ml/litre or NSKE -5%.

Bacterial wilt:

Soil drenching with Streptomycin sulphate 0.03% (300ppm) along with COC @ 0.1%.

Ixora

Lack of standard cultivation practices (Karur)

Fertilizer recommendation : NPK @ 80 : 55 : 80 Kg/ha

Micronutrients recommendation: Foliar application of 0.5 % FeSo₄ + 0.5 % ZnSo₄ + 0.3% Borax at 15 days interval.

Avacado

9. Avacado is cultivated in large extent at Upper and lower part of kodaikanal.

For the last three years this crop has been heavily affected by wilt disease and this problem is mostly noticed on the three to five years plant. Symptoms noticed are dropping of fruits and eventually plant death. (Kodaikanal)

Enriching the soil with organic manure @ 50Kg/tree supplemented with *Trichoderma asperellum* @ 50g/tree or *Bacillus amyloliquefaciens* @ 50g/tree along with AM fungi @ 100g/tree at quarterly intervals.

Soil drenching with Aliette @ 2g /litre or Metalaxyl (Ridomyl) @ 1.5g/litre or drenching root zone with 1% Bordeaux mixture @ 20litres /tree.

Poly house

- 10. Low yield under poly house condition due to nematode, leaf curl virus, Thrips & Mites. (Krishnagiri)**

Nematode Management :

- Soil solarisation of moistened soil using transparent polyethene sheets 25 micron thickness for a period of 2-3 weeks during peak summer (May-June).
- Soil application of *Purpureocillium lilacinum* @ 50g /m² mixed with FYM.
- Crop rotation with marigold for one season.

Tuberose

- 11. Staggered spike production in Tuberose (Madurai)**

Planting of uniform sized bulbs (25-30 g) will ensure uniform spike production. Following the fertilizer application as per crop production guide will ensure uniform flowering.

Papaya

Red flesh papaya with the size of 1-2 Kg having good keeping quality is preferred by farmers. At present there is no such TNAU variety having Hermaphrodite nature is available (Madurai)

Research is in progress to develop gynodioecious red fleshed, medium sized papaya variety with good keeping quality

Jasmine

Need micronutrient mixture specific to jasmine crop (Madurai)

Foliar spray of 0.25 % ZnSo₄ + 0.5 % Mg So₄ + 0.5 % FeSo₄ wherever deficiency symptoms are expressed is recommended for *Jasminum sambac*. In case of expression of micronutrient deficiency spraying should be done at fortnightly intervals until the chlorotic symptoms disappear.

Brinjal

- 12. During Gaja cyclone, inflow of sea water was occurred up to 1 km distance. A Brinjal crop cultivated in the affected region was dried and scattered flowering occurred, also fruit set was reduced more than 70%. If at all, fruit set occurred, bitterness in fruit was noticed (Nagapattinam)**

Grafting technology has been standardized in brinjal using *Solanum torvum* as root stock which is tolerant to salt stress condition

Datepalm

13. Datepalm cultivation need to be popularized (Namakkal)

Datepalm varieties: Hallawi, Khadrawi, Shamran, Medjool, Barhee, Hayany, Zahidi.

Pollination technique : Natural pollination by wind, bees and insects

Placing an entire male spathe in the crown of the female palm and leaving the rest to wind pollination.

Turmeric

Need specific variety for late season cultivation (Namakkal)

Turmeric variety IISR Pragathi is recommended for late season sowing.

Organic cultivation

14. Lack of knowledge followed in cultivation of organic vegetable and plantation crops (The Nilgiris)

Has developed organic package of practices for vegetable crops like beetroot, chilli and bhendi during 2013-17 through network experiments under the guidance of ICAR-IIFSR. At present, development of package of practices for organic brinjal, chilli and tomato is ongoing at TNAU, Coimbatore since 2018. The package of practices for other horticultural crops grown in the District of Nilgiris will be developed in the near future in association with the Department of Vegetable crops, TNAU, Coimbatore.

Mechanization

Mechanization is very difficult because of the small holdings of the farmers and the topography of Nilgiris.

Manually operated carrot seeder has been developed at TNAU and the specifications are:

Function	:	Suitable for sowing pelletized carrot seeds
Specification		
(i) Type	:	Manually operated
(ii) Power Requirement	:	12V battery for operating the metering mechanism
(iii) Weight	:	19 kg
(iv) Capacity	:	0.064 ha/day

Tapioca

15 Iron deficiency combined with Mosaic Viruses (Perambalur)

Cassava tonic has been formulated at TCRS, Yethapur which can mitigate iron deficiency and CMV

Onion

Propagation is done by Bulbs, which is prone to diseases like bulb rot. Farmers are refusing to sow seeds since it takes long duration and after harvest also seed sown bulbs couldn't able to store for longer period(Perambalur)

The seed propagated short duration small onion pre release culture Aca 15 has been identified at Department of vegetable science, HC&RI, Coimbatore. It recorded the highest bulb yield of 22.84 t /ha which is 22.32 % increased yield over CO (On) 5. The bulbs of Aca 15 are bold and pink colored with 18.04 ° brix TSS. The duration of the crop is 65-70 days for bulb crop and 115 days for seed to bulb crop with high storage

Brinjal

16. A local variety with good taste and market preference are susceptible to stem & fruit borer in Pudukottai district (Pudukottai)

Development of location specific varieties/hybrids with pest and disease tolerance is under progress at HC &RI (W), VRS, Palur, HC&RI, Periyakulam, HC &RI, Coimbatore.

Jack

Gaja cyclone devastated Jack trees in Pudukottai. (Pudukottai)

Replanting with improved varieties has to be taken up.
Broken branches may be pruned and cut ends to be smeared with Bordeaux mixture.

Chillies

17. Lack of improved chilli varieties (Ramanathapuram)

Phenotypically different (pod shape and size), high yielding seventy eight genotypes were collected from Ramanathapuram, Kadaladi, Toothukudi, Paramakudi and Vilathikulam blocks. Among the genotypes evaluated during the year 2018-19, five promising Mundu chilli genotypes were identified. Purification and further evaluation is in progress

Sodic soil

Sodic soil – major problem in cultivation of Horticulture crops (Ramanathapuram)

The following technologies currently available can be used to tackle the problem of sodic soils (pH > 8.5 ; ESP > 15; SAR > 13).

- Application of gypsum based on soil test report.
- Providing proper drainage facilities
- FYM / green manure / green leaf manure application
- Application of pressmud @ 10 t ha⁻¹.
- Raising the crops in ridges and furrows
- Growing tolerant crops /varieties
- Application of 25 % excess recommended nutrients.

Poor quality water

Salty water (Ramanathapuram)

Continuous use of saline water for irrigation will affect the soil health. The following management practices are to be adopted for maintaining soil health

- Mix saline water with good quality water for irrigation.
- Irrigate the field once with saline water followed by canal water or good quality water twice.
- Rain water harvesting in saline water irrigated areas.
- Raising of crops in ridges and furrows during rainy season in fields having good drainage facilities.
- Application of organic manures regularly.
- Raising saline tolerant crop varieties
- Balanced fertilization for increasing crop growth.

Poor quality irrigation water is not suitable for sprinkler irrigation. However drip irrigation is a potential means of utilizing poor quality water. As it wets the soil surface around the crop continuously there is hardly little chance for accumulation of salt on the surface.

Jasmine

18. Most of the Jasmine varieties have short stalk length. There is good market demand for long stalked Jasmine flowers (Salem)

Adequate irrigation, nutrition and micronutrient management will encourage production of flowers with good stalk length

The new variety of jasmine, Co1 star jasmine (*J. nitidum*) released by TNAU in Jan 2019 produces bolder flowers buds with longer stalks. This variety also flowers during off- season. This can be included along with other jasmine varieties of Gundumalli, Jathimalli and Mullai to get flowers throughout the year

Banana

Crop loss due to panama wilt and leaf spot disease (Salem)

Wilt:

Bio-hardening of the rhizomes with *Pseudomonas fluorescens* @ 1% (10⁸ cfu/g) or dipping of rhizomes in 0.1% carbendazim 50% WP solution for 10minutes.

Soil drenching with 0.1% carbendazim 50% WP on 3rd, 5th and 7th month after planting.

Leaf Spot:

Foliar application of 0.1% propiconazole at fortnightly intervals after the symptom initiation.

Chillies

- 19. In Sivagangai district chillies local ramnad mundu variety is being cultivated in rain fed condition in about 5000 Ha in ilayangudi, kalayarkoil and thiruppuvanam block. But it is susceptible to drought To substitute this local ramnad mundu variety we require high yielding drought tolerant, mundu hybrid chillies seeds to suit Sivagangai district in rain fed conditions (Sivagangai)**

High yielding drought tolerance genotypes were identified for developing F1 hybrids

Betel vine

In thiruppuvanam block betle vine var. Karpura is being cultivated in large scale and this variety is susceptible to wilt.

We require wilt resistant variety with ideal characters of var. Karpura light green leaves which have more alkaloid content (Sivagangai)

The TNAU Variety SGM 2 is recommended as it is moderately resistant to wilt

Cocoa

- 20. The Cocoa cultivation in Thanjavur District is practiced as intercrop in coconut gardens. Due to damage caused by squirrel and wood dog (An Asian Palm Civet) most of the farmers are in position of being away from cocoa cultivation (Thanjavur)**

Use of farm civet trap @ 5/acre

Grapes

- 21. The farmers are deciding the time of pruning of vines based on the bud forecast technique. But now a days due to change in climatic conditions and poor soil fertility, flower primordia in vines delayed (Theni)**

Action has been initiated for bud forecast at GRS, Theni. In addition, facilities are created with trained scientist.

Greens

- 22. Rust in greens (Tiruvallur)**

Foliar application of mancozeb @ 0.25% or metalaxyl+mancozeb 0.1% at fortnightly intervals after the symptom initiation.

Saline soil

- 23. In Thoothukudi district most of the area under rain fed condition. High salinity and drought is a major problem (Thoothukudi)**

Custard apple (Sitapal -*Annona squamosa*) and Jamun can be recommended as these crops are tolerant to both salinity and drought

Banana

- 24. Corm Rot incident in banana crop noticed in Tirunelveli district. (Tirunelveli)**

Soil drenching with Bordeaux mixture @ 0.1% or COC @ 0.25%.

Bellary onion

- 25. Crop loss due to Maggots and Blight attack (Tirupur)**

Maggot

Drenching with 0.15% fipronil 80WG or Chlorpyrifos 20EC 0.1%.

Leaf Blight

Foliar application of mancozeb @ 0.25% or metalaxyl+mancozeb 0.1% at fortnightly intervals after the symptom initiation.

Litchi

- 26. Litchi is recently cultivated in Thiruvannamalai district. There is no standard good agricultural practices suiting to Tamil Nadu condition (Thiruvannamalai)**

The package of practices are available in Crop Production guide and agritech portal website

Onion

- 27. Small Onion is extensively cultivated in Trichy district. Downy mildew is a major problem. (Trichy)**

Treatment of onion bulbs in 1% *Bacillus subtilis* or *Pseudomonas fluorescens* followed by foliar application with 1% *Bacillus subtilis* or *Pseudomonas fluorescens* at fortnightly intervals.

Saline soil

Salinity is a major problem in Trichy district. Farmers needs salt tolerant mango variety. (Trichy)

Work has been initiated to develop salt tolerant rootstocks in mango at HC&RI, TNAU, Coimbatore.

Papaya**28. Ring spot and Leaf curl virus cause severe crop loss. (Vellore)**

Planting of disease free seedlings

Rouging of infected plants.

Raising either maize or sorghum @ 2-3 rows as border crop.

Foliar spraying with systemic insecticide dimethoate 2ml or acephate 1g/Litre.

Gourds**29. Red Mites incidence in gourds such as water melon, musk melon, Ash gourds etc. (Villupuram)**

Foliar application of spiromezifen @ 0.1% at fortnightly intervals.

Chilli**30. Chilli is the major crop cultivated in Virudhunagar district (Virudhunagar)**

Chilli breeding programme was initiated to develop samba chilli varieties with high yield and pungency. Screening was done at Virudhunagar. Based on the screening, four hybrids were developed (K1xVirudhunagar local, Guntur local x Aladipatti local, Thoppudapatti local x Gnt.No.5, KKM1 x Virudhunagar local). These chilli cultures with drought tolerance, high dry pod yield (128g per plant) and high capsaicin content (0.41%) will be forwarded for large scale testing

DEPT. OF AGRL. MARKETING & AGRI BUSINESS

1. Technologies for enhancing the shelf life of Neera

Pasteurization at 85°C for 20 minutes followed by in bottle sterilization at 85°C for 5 minutes using preservative will enhance the shelf life of Neera up to 30 days under refrigerated condition.

2. Biological method of Copra drying

Biomass-Solar hybrid dryer

Biomass hot air generation system is developed by department of Renewable Energy Engineering, TNAU, Coimbatore supplying hot air during off-sunshine hours. This can be integrated with existing solar tunnel dryer to make it hybrid source for continuous drying application. The system can be used for bulk drying applications during off-sun shine hours and rainy hours. Coconut husk and locally available biomass can be used as feedstock for hot air generation. This hybrid dryer will enhance the quality of the dried produce. The capacity of hybrid biomass air heating system is 2 tonnes per batch of copra with investment cost of Rs.6 lakhs including combustion chamber, heat exchanger, blower and duct with control systems.

3. Samba Chillies variety for Black soil (Thoothukudi)

Tamil Nadu Agricultural University initiated a chilli breeding programme to develop samba chilli varieties with high yield and pungency for cultivation in black soil. Screening was done at Virudhunagar. Based on the screening, four hybrids were developed (K1xVirudhunagar local, Guntur local x Aladipatti local, Thoppudapatti local x Gnt.No.5, KKM1 x Virudhunagar local). These chilli cultures with drought tolerance, high dry pod yield (128g per plant) and high capsaicin content (0.41%) will be forwarded for large scale testing

4. Banana export variety other than Grand Naine

Primarily for UK, USA markets Grand Naine is exported especially from Maharashtra, Gujarat. The post harvest handling products were standardized for Grand Naine. However, to Middle East and South East Asian Countries Ney Poovan, Nendran and Red banana are exported. The volume of the markets is very less.

5. Value addition for Betelvine and Jackfruit.

Value added products of Betel leaves

1. Dehydrated Betel leaves
2. Dehydrated Betel Leaves powder
3. Papad from dehydrated Betel leaves
4. Herbal drink (from betel leaves extract with Cumin, Coriander, Black Pepper, Ajowan, Salt, Sugar etc.)

Jackfruit

Value added products which can be made out of jackfruit are as follows

Jackfruit candy, Nectar, Chips, Flakes, Halwa, Wine, Vinegar, Jackfruit Bribe, Raw Jackfruit curry, Juice, Squash, Geer and Bar

6. Research on export varieties of Mango and Guava**Mango**

Research programs are taken for increasing the productivity of existing mango varieties viz., UHDP and other cultural methods. However, survey of existing seedling progenies of Tamil Nadu is taken up for indentifying suitable varieties for export.

Guava

Research on open pollinated progenies of Red flesh variety Arka Kiran is taking up and suitable variety with export quality will be evolved.

AGRICULTURAL ENGINEERING

DDA, Nagarcoil

Paddy

1. **Mobile Paddy Dryer cum winnowing (Dual purpose) machine is the major prerequisite for our Paddy cultivators of Kanyakumari District owing to heavy rainfall and high atmospheric humidity.**

A paddy winnower has been developed and commercialized by TNAU. Two versions of mobile type paddy dryers are available for adoption by farmers for drying paddy. The AICRP centres of OUAT, Bhubaneswar and Bapatla, Andhra Pradesh have recently developed those dryers. They could handle 3 tonnes of paddy in 6 h. The two versions cost Rs. 8.0 and 15.0 lakhs respectively. These dryers can be made available for Kanyakumari paddy farmers through subsidy.

Banana

1. **Recent technical advances in banana packing methods for longer distance transport.**

1. Vacuum packaging of banana bunches in polythene bags packaged in carton boxes by means of a vacuum pump is recommended for the long distance transport of banana.

2. Tamil Nadu Agricultural University developed a Banana Cable conveyor system for transport of banana bunches from the field to the Pack House. The system with a carrying capacity of one tonne of banana bunches in a single run was designed and developed. The cable way conveyor facilitates to reduce the post harvest loss in handling the bunches from the farm to pack-house and also avoids human handling and physical drudgery.

To overcome the above drudgery and poor handling practices, a cable conveying system was fabricated for conveying the banana bunches to a distance for 200 m. The system was designed in such a way that it can withstand to carry the load ranging between 1100-1250 kg. The conveying system was commissioned by assembling various components and supporting structure for ease of handling of banana bunches in the farmer's field.

The banana samples conveyed through the cable conveyor was washed and deheaded and packed in a carton boxes. A trial shipment to Italy by following the needed post harvest protocol is carried out for Grand Naine variety of banana from Theni district and the container is departed from Cochin port on 1st of November 2018 on a sea voyage and reached Port of Trieste, Italy on 29.11.2018 with better quality. The Special features of the system are

- Length of the conveyor : 180 m
- Width of the conveyor : 1 m
- Height of the Conveyor : 3 m
- Capacity : 2 t/h
- Speed of the conveyor : 5 km/h
- Power requirement : 4 hp
- Cost of the operation: Rs. 50/batch
- Comparative savings in time and labour - Time - 200 % & Labour – 250 %

- Coverage: 1 ha/day
- Cost of equipment : Rs. 4 lakhs

It is suitable for large farms and also for collective small holdings in transporting the farm inputs and to bring out the produce. This would further pave way for professional banana exports from Tamil Nadu, and for furthering the business opportunities by export of India grown bananas namely Grand Naine, Red banana, Ney Poovan and Nendran to European continent

Coconut

- 1. Neera tapping, processing and preservation technique having longer shelf life period is pressing demand for coconut farmers of kanyakumari district.**

A technology was developed for processing of Neera to enhance the shelf life using thermal methods with preservatives. The product was shelf stable at refrigerated condition ($\pm 4^{\circ}\text{C}$) for a period of 20 days. There was no significant change in pH, TSS ($^{\circ}\text{B}$) and total acidity of neera up to 20 days of storage.

The organoleptic evaluation of Neera on color, taste, flavor, appearance showed that the score for taste was 4.91/5.00. The overall acceptability of the bottled neera was 4.83/ 5.00 which indicated the product is highly acceptable.

Clove

- 1. Sorting and Grading of Clove machine developed by Agricultural Engineering wing of TNAU.**

Sorting and grading machine for cloves has not been developed so far. The research can be taken up in this area.

- 2. Extraction and standardization of clove leaf oil developed by TNAU**

TNAU has not standardized technology specifically for clove leaf oil. However, the clove leaf oil can be extracted through steam distillation procedure which is applicable for crops like eucalyptus, tea tree oil, Cyprus, geranium, rosemary, thyme *etc.*, Percentage of oil recovery from leaves is 0.8%.

SEED CERTIFICATION & ORGANIC CERTIFICATION

1. Need for latest promising competitive public notified varieties / hybrids under millet & Oil seed crops (Maize, Sorghum, Cumbu & Sunflower)

Maize

Two maize hybrids CO 6 and COH(M) 8 are highly suited for cultivation in Tamil Nadu. Both the hybrids were test verified for their yielding ability against the popular private hybrids. The hybrid Co 6 recorded 10.6 and 8.2 per cent increased grain yield over the private hybrids namely 900 M Gold and NK 6240 respectively. The hybrid COH(M) 8 recorded 15.1, 34.2 and 32.1 % increased yield over private hybrids namely Bio 9637, HM 8 and HM 9 in breeding trials. The hybrid CO 6 was notified by SVRC (2012) and CVRC (2013) while COH(M) 8 (2014) was notified by CVRC.

Sorghum

Two varieties viz., CO 30 and K 12 have been released during 2012 and 2017 respectively for cultivation.

The variety CO 30 is a dual purpose variety suited for both rainfed and irrigated situations with an average grain yield of 2800 and 3600 kg /ha and fodder yield of 7 and 9 tonnes/ha respectively in rainfed and irrigated conditions.

The variety K12 from Kovilpatti is tolerant to drought and highly suitable for rainfed cultivation in southern districts of TN. This variety gives an average grain yield of 3123 kg/ha and fodder yield of 11.9 t/ha.

Cumbu

A high yielding, medium tall, bold grain pearl millet composite CO 10 was developed and released during 2016 to replace the earlier composite Co (cu) 9. This composite is medium tall (160 -180 cm) and medium in duration (85 – 90 days). It is highly resistant to downy mildew. It has recorded a mean grain yield of 3526 kg / ha under irrigated conditions. The mean grain yield under rainfed conditions is 2923 kg / ha.

Sunflower

Sunflower hybrid COH 3 has been released during 2018 for commercial cultivation in Tamil Nadu. This hybrid recorded high seed yield of 2410 kg/ha which is 14% over CO2 hybrid and 14.2% over Sunbred 275. It contains high oil content of 42%, high volume weight (47g/100ml) with resistance to *Alternaria* leaf spot, powdery mildew and necrosis.

2. Need for latest performing public notified varieties/hybrids for Tomato, Chillies, Brinjal, Bhendi and other vegetable crops released by TNAU

Latest Performing Public Notified Varieties/Hybrids

S. No	Crop and Variety/Hybrid	Salient Features
1	TNAU Bhendi Hybrid CO 4	<ul style="list-style-type: none"> • Yield- 25.6 t/ha • Twenty two harvests can be made in a duration of 110 days starting from 39 days after sowing. • Resistant to yellow vein mosaic virus disease with high yield.
2	Onion CO(On)5	<ul style="list-style-type: none"> • Mass pedigree method • Yield : 18.9 tonnes /ha • Duration: 90 days • Specialty: Flowering and fruitset throughout Tamil Nadu and produce attractive pink colour bulbs
3	NAU Ash Gourd Hybrid CO 1	<ul style="list-style-type: none"> • Fruits are oblong and medium sized (4-5kg) in a duration of 120-130 days and suitable for small families. • High yielding with an average yield of 91.82 t/ha
4	TNAU Bottle Gourd Hybrid CO 1	<ul style="list-style-type: none"> • Crop is suitable for bower system of cultivation. • Fruits are cylindrical, without crook neck, medium sized (0.95-1.00 kg) and suitable for nuclear family. • High yielding (79.03 t/ha)

3. Transplanted Red gram – Need for long duration promising varieties

The recently released long duration (170 -180 days) redgram variety CO 8 is suitable for transplanting

4. Need for latest promising variety in Black gram suitable for Delta regions

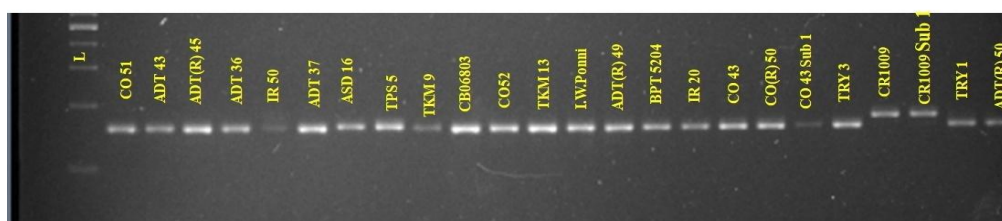
ADT 6 released during 2016, is suitable for Rice Fallow condition in delta districts

5. Breeder seed of recently release varieties with its characters are needed in spite of it being unnotified varieties / hybrids

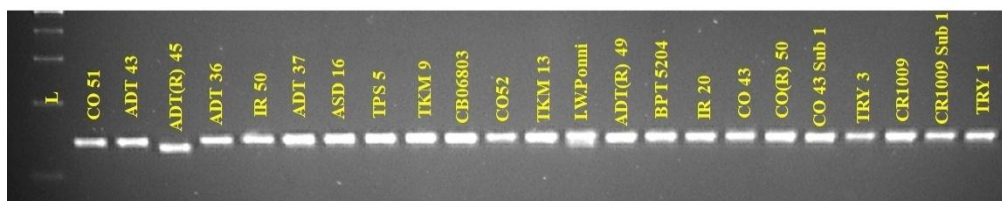
Sufficient quantity of breeder seed of the newly released varieties are available and would be supplied as per the indent from the Director of Agriculture, Chennai. Varietal descriptors can be obtained from the respective research centres.

6. DNA based markers for all notified varieties in Tamil Nadu and also that of all the released varieties of TNAU required for the purpose of assessing seed purity

DNA finger printing of TNAU released rice varieties is attempted using the Simple Sequence Repeat (SSR) markers. Among the available DNA markers for fingerprinting, the SSR markers are simple and easy to use and cost effective. The released and notified rice varieties are used for fingerprinting viz., CO51, ADT43, ADT(R)45, ADT36, IR50, ADT37, ASD16, TPS5, TKM9, CB06803, CO52, TKM13, I.W.Ponni, ADT(R)49, BPT5204, IR50, CO43, CO(R)50, CO43 sub1, TRY3, CR1009, CR1009 sub1, TRY1, ADT(R)50 and ADT51. A total of 25 popular rice varieties are screened using 55 highly polymorphic SSR markers among 2000 available SSR makers. The SSR markers RM324 helped to differentiate CR1009 and CR1009 sub1 from other rice varieties. Similarly RM145 for ADT 45, RM1278 for ADT36, RM1880 for TRY3, ART5 for CR1009 sub 1 and CO43 sub1. Likewise it is possible to differentiate both rice varieties which are essentially to be characterized at molecular level. However, TNAU develops molecular fingerprint for the pre- release cultures and submitting fingerprint data along with variety release proposals



PCR check with RM324



PCR check with RM145

7. **Genotyping data to be provided for varieties/hybrids to be released by TNAU**

DNA fingerprinting and barcoding of varieties and hybrids and pre-release cultures for varieties/hybrids identification and notification is started in major cereals and horticultural crops. The SSR marker resources are available in major cereals are Rice, Maize, Sorghum, Pearl millet, Finger millet and Barnyard millet are used for development of varietal specific fingerprints. The fingerprinting of prerelease cultures is also in progress for pulses, oilseeds, cotton varieties/hybrids and vegetable crops using SSR markers. The SSR based DNA finger print developed in crop varieties is helpful for varietal identification in case of disputes and seed purity testing

Finger printing in Maize inbreds/hybrids: Finger printing of maize hybrids CO6, CO8 and CO9 and its parental lines UMI1200, UMI1230, UMI1201, UMI1205 and UMI1220 are taken up using the SSR markers. Sixty SSR makers were obtained from the Maize GDB and polymorphic survey conducted between the parents. Among the SSR primers umc 2017, umc192, umc1710 umc2101, umc1674 umc1552 showed polymorphism between the parents and can be used for the CO6, CO8 and CO9 hybrid purity test.

Finger printing of Sorghum varieties: The sorghum varieties CO 30, CO(S) 28, TNS 648, TNS 660, TNS 661 and a fodder sorghum CSV 33 MF were taken for SSR marker fingerprinting. Twenty seven SSR primers are used to find polymorphism among the varieties, in which only four markers showed polymorphism. The SSR marker Xtxp075 produced unique allele in TNS 648 thus differentiating it from other varieties. The SSR marker Xtxp201 and Xtxp297 produced unique allele in the fodder sorghum CSV 33 MF differentiating it from the other varieties. The SSR marker Xtxp027 produced unique allele in TNS 661.

Fingerprinting of Pearl Millet varieties: The pearl millet varieties CO (Cu) 9, CO 10, TNAU cumbu hybrid CO 9 and it's parents, A' line, ICMA 93111 A and R' line PT 6029 were selected for SSR fingerprinting. PCR was performed using 46 Pearl millet specific SSR primers to find out polymorphism. The SSR marker ICMP3021 (200 bp) and PSMP2089 (150 bp) produced unique allele in CO 9 which distinguish it from the other Pearl millet varieties. The SSR marker ICMP3018 distinguishes the variety CO10 from other Pearl millet cultivars.

Finger printing of little millet varieties: In little millet, the maize SSR marker phi213984 showed unique 310 bp allele in ALT 1 Samai when compare to BL6, TNPsu 176, Co (Samai) 4 and Paiyur 2 which showed 300 bp allele.

8. **In Maize, presently it is still awaited for notified varieties / hybrids to be released by TNAU so as to compete with private hybrids. The performance of Hybrid Maize Co (HM) 6 is not consistent in all the districts.**

All the state/nationally released maize hybrids were already notified. The hybrids CO 6 and COH(M) 8 are well suited to both irrigated and rainfed situations. The hybrid CO 6 was notified by SVRC (2012) and CVRC (2013) while COH(M) 8

(2014) was notified by CVRC. Both these hybrids are resistant to downy mildew, post flowering rot and moderately resistant to stem borer. Both these hybrids are performing consistently well even in the other states viz., Gujarat, West Bengal, Karnataka indicating their wide adaptability. These two hybrids have been found to be suitable for water limiting environments too. The pollen fertility reduction is very minimal in both the hybrids under high temperature conditions.

In addition, two more pre release hybrids CMH15-005 and CMH 12-686 were also found to be high yielders and better than the private hybrids. Both these hybrids are under On Farm Testing.

9. Need for notified Groundnut variety for rainfed / Irrigated cultivation so as to cope up with the late sowing situations too.

Recently released groundnut varieties such as BSR2 ,TMV 14 and VRI 8 are able to cope up with given situations

BSR 2 matures in 105-110 days with pod yield of 2360kg/ha (irrigated) and 2222 kg/ha (rainfed).

TMV 14 matures in 95-100 days with pod yield of 2124kg/ha (rainfed).

VRI 8 matures in 105-110 days with pod yield of 2700 kg/ha (irrigated)

SUGARS

1. **Regional Research Stations of TNAU has not come up with location specific varieties to replace Co 86032, cultivated predominantly in most of the sugar mills in Tamil Nadu, new varieties are released every year are without adequate coordinated trial with sugar mills and hence varieties released are not adopted by farmers**

Sugarcane Research Station, Cuddalore coordinates Adaptive Research Trial (ART) in 4 sugar mills, Sugarcane Research Station, Sirugamani coordinate Adaptive Research Trial in 5 sugar mills, Sugarcane Research Station, Melalathur coordinates Adaptive Research trial (ART) in 5 sugar mills and Sugarcane Breeding Institute, Coimbatore coordinates Adaptive Research Trial in 4 sugar mills. The sugarcane breeders from the concerned research stations are responsible to multiply the seed materials of all clones and check varieties required to conduct trial in their respective sugar mills.

For conducting the ART (2019-2020), five clones which include the test clones from Cuddalore, Melalathur and Coimbatore and five check varieties have been approved and the seed multiplication of these entries was taken up in the respective station to conduct the trial. The seed availability and its multiplication are periodically reviewed by the Director, CPBG, TNAU, Coimbatore.

2. **There is a vast difference is noticed between the yield and CCS% reported by the researches and the actual yield and CCS% obtained by the sugarcane farmers and sugar mills as already reported by us vide reference 1st cited (This office letter in Rc.No.8964/Cane 3/2017 dated 07.06.2018(2) addressed to the Director of Research, TNAU, Coimbatore).**

Utilization of required crop management practices like healthy seed material, gap filling, integrated nutrient management, detrashing, propping, ratoon management, SSI technology, micro irrigation and plant protection measures when ever needed may reduce the gap of cane yield and CCS% obtained by the sugarcane farmers and sugar mills.

3. **Adoptive Research Trial (ART) has to be conducted in each sugar mill area before releasing a variety as already requested in our letter cited in the reference 2nd cited. (This office letter in Rc.No.4004/Cane 3/2018 dated 22.11.2018 addressed to the Director of Research, TNAU, Coimbatore).**

The pre release clone C 29442 developed from Sugarcane Research Station, Cuddalore has been evaluated in 18 co operative sugar mills with a total of 92 demonstrations to assess the potential of the clone. Big mill test was conducted in five sugar mills. A total of 54 ARTs in 18 sugar mills has been conducted.

A total of 36 ART were conducted in 12 sugar mills for another pre release clone G2005047 developed by Sugarcane Research Station, Melalathur.

4. Sugarcane farmers are facing wild boar problem in some of the sugar mills areas. At present to control the wild boar no effective measures are available

- Planting of thorny bushes around the crop
- Solar fencing around the crop within approved norms
- Fencing around the crops
- Use of local dogs for scaring away wild boars
- Traditional methods like sound of crackers, drumming; alarming calls
- Spraying of local pigs' dung solution
- Spreading used colour sarrees in the fence

5. Suitable modifications have to be carried out and the sugarcane harvesters are redesigned to harvest in small holdings and in normal plating space.

Though sugarcane is grown in different spacing in Tamil Nadu, to enable mechanical harvesting at economical rates, machines of high capacity are required. The available machines in the market are suitable for sugarcane grown in 4feet spacing or 5 feet spacing. Different indigeneous and multinational companies are making sugarcane harvesting machines as detailed below

Sl. No	Make	Model
1	Shaktiman Harvester	Sugarcane 3737 173HP Cummins Engine Row spacing-1100mm
2	Shaktiman Harvester	Sugarcane 3737-Tejas 173HP Volvo Diesel Engine Row spacing-1100mm
3	CASE	Austoft 4000 176 HP Cummins Engine Row spacing-1100mm
4	CASE	Austoft 8010 358 HP Cummins Engine Row spacing-2390mm
5	John Deere	CH330 198HP Engine Row spacing 1300mm

Commercial machines are available in the market and hence the specifications of the machines are fixed. The farmers who intend to do mechanical harvesting have to adopt row spacing suitable for the harvester.

6. Utmost importance should be given to identify the drought management measures to manage the drought apart from the existing practices.

Early planting (Dec – Jan) of sugarcane is to be recommended such that the crop could evades its critical stages of crop growth from drought situation

which occurs usually from March to June.

Before planting, the sugarcane setts are to be treated with calcium hydroxide @ 1 kg/100 lit of water for 1 acre. Such that the crop could tolerate the incidences of drought through improving its cell wall turgidity.

The foliar application of Kaoline @ of 6% on 90 and 120 DAP through which the crop could withstand the drought situation through reflecting intensive solar radiation. During drought incidence situation, the foliar spraying of 2% potash, MOP could also save the sugarcane crop through regulating the stomatal closure.

During planting, 5 feet double row planting of setts may be advocated such that the total area could be minimized and through which the utilization of irrigation water also get reduced.

The surface drip / sub surface drip irrigation methodology may be recommended which could reduce the irrigation water requirement by 35 to 45%.

- 7. Sugarcane farmers are hesitant to adopt the following new cultivation techniques considering the various factors such as yield loss etc.,**
- **Wider row planting**
 - **Budchip seedling planting**
 - **Detopping of in budchip seedling planted plants**
 - **Single bud direct planting**

The reasons for sugarcane farmers hesitant to adopt the above cultivation practices are as follows:

- a) Nursery raising with portrays involves more cost
 - b) Shadenet structure required for nursery raising
 - c) Transport of portrays with budchip seedling plants involves more cost
 - d) Labour intensive/non-availability of labour
- 8. No field trials and studies on yield incase by adopting SSI methods are shared with mills or farmers. Since Government attaches lots of importance to SSI system, best practices suitable for agro-climatic conditions and a general Do's and Don'ts may be prescribed.**

Studies on yield increase in sugarcane by adopting SSI Methods have been conducted in TNAU research stations & KVKs. In KVK's alone, 15 trainings have been conducted in 14 locations and through this system 750 sugarcane farmers benefitted. Apart from this, training for cane officers was conducted in 6 districts viz., Dharmapuri, Salem, Krishnagiri, Madurai, Trichy and Cuddalore.

9. This Department destines to achieve minimum of 50% cane area under drip irrigation/ drip fertigation. A calendar of operations for plant and ratoon crop for fields under drip with liquid fertilizers application schedule and drip maintenance schedule may be prepared.

Fertigation Schedule for Sugarcane crop

Crop Stage (Days)	Nitrogen (N) (Kg/ha)	Phosphorous (P) (Kg/ha)	Potassium (K) (Kg/ha)
0-30	44.4	20.0	0
31-60	60.6	34.25	19.0
61-90	61.5	25.50	39.5
91-120	60.2	20.25	41.0
121-180	57.8	0	40.5
181-220	10.5	0	35.0
221-250	5.0	0	25.0
Total	300	100	200

MAINTENANCE OF DRIP SYSTEMS

- Both screen and sand media filters in a drip irrigation system should be checked during or after each operating period and cleaned if necessary.
- A clogged screen or grooved-disk filter can be cleaned with a stiff bristle brush or by soaking in water.
- A sand media filter should be back flushed when pressure gauges located at the inlet and outlet sides indicate a 0.2 ksc difference. Check drip irrigation lines for excessive leaking and look for large wet patches in the planting area that indicate a leaking tube or defective emitter.
- Flush sub mains and laterals periodically to remove sediments that could clog emitters.
- If water quality is poor, increase the frequency of flushing and cleaning for laterals, main lines, filters and filter rings.

Chlorine Wash

Chlorine kills algae and can loosen up bonded organic matter, enabling it to be flushed. Silt and organic matter consume chlorine as it proceeds through the system. An injection of chlorine at the rate of 5 to 20 ppm is recommended, depending on the severity of the problem.

Acid Wash

To remove the salt deposition in the system, HCl acid should be injected once in 3 months through the ventury. (To 10 litres of irrigation water; add acid one milli-litre at a time and test the pH until the solution reach pH less than 4). Approximately, 7-10 lit. of 33% concentrated HCl is required. After 24 hours the drip systems should be flushed strongly with water. Add acid to water.

Root intrusion

Root intrusion in the sugarcane sub surface drip system can be controlled by application of 1 lit. of pendimethalin per acre. After 24 hours the drip system should be flushed strongly with water.

Never add water to acid.

Pumps, filters, valves and control systems also need maintenance.

Drip Irrigation Maintenance Schedule

Frequency	Item	Task and Action
Daily	Pressures	Check that pump and block pressures (2.5 to 3.5 ksc)
	Emitter operation	Check for clogged, broken or misplaced emitters. Repair, replace, unclog or reposition emitters.
	Leaks	Check for water wastage and leaks in pipes and other equipment and repair immediately.
	Primary filter	Flush primary filters
Weekly	Lateral lines	Flush lateral lines using flesh valve
	Secondary filters	Open and clean the secondary filters with water
	System pressure and flow	Check the system pressure and flow (Operating pressure at the end of lateral 1 ksc)
Monthly	Valves, water meters, and gauges	Visually check valves, water meters and gauges and look for damage and / or vandalism.
	Pump pipe work	Check for leaks at pump station that causes water losses and air locks.
	Pump motor	Pump motor must be greased
Annually	Valves	Service valves and physically check for correct operation.
	Filters	Clean filters thoroughly and replace sand in sand filters annually or biennially.
	Pump	Change oil in the pump.
	Water sampling	Take a water sample at the end of lateral lines and send it in for analysis.
	Emitter delivery tests	Test specific emitters for discharge and pressure.
2-10 years	Pump	Replace bearings and other wearing parts in the pump and the motor every five years
	Hydraulic valves	Replace diaphragms on hydraulic valves every three years
	Poly pipe and emitters	Replace poly pipe and emitters every seven to ten years

10. **Periodical interaction on the above issues may be provided to the cane department officials of sugar mills.**

Researchers and Extension Worker Interaction Meet during Monthly Zonal Workshop

- All the KVKs of TNAU periodically organize Monthly Zonal Workshop (MZWs) in the KVK premises every month. During the Monthly Zonal Workshops, the scientists of KVK and nearby Research Stations participate, discuss, deliberate and present / provide needful technologies. During the interaction, the scientists also get feedback from the farmers problems.

Researchers and Extension Worker Interaction Meet during Grievances Day Meeting at District Collectorate

- The Heads of KVKs / Scientists from KVKs of TNAU and Research Stations of TNAU periodically attend meeting at the district Collectorate at the respective districts and interact with extension workers of line departments and farmers.