

# **TAMIL NADU AGRICULTURAL UNIVERSITY**

## **PROCEEDINGS**

### **41<sup>st</sup> Millets and Forage Crops Scientist Meet (3<sup>rd</sup> June 2023)**

#### **Lead Center**

Department of Millets and Department of Forage Crops  
Centre for Plant Breeding and Genetics  
Coimbatore

#### **Directorate of Research**

Tamil Nadu Agricultural University  
Coimbatore

**2023**

**PROCEEDINGS**  
**41<sup>st</sup> Millets and Forage Crops Scientists' Meet**  
**(03.06.2023)**

Review of research projects, Action taken on OFT, Action plan was made by the concerned Technical Directors in the concurrent sessions held on 18.05.2023. The 41<sup>st</sup> Millets and Forage Crops Scientists Meet was held on 03.06.2023 at the Vice Chancellors committee room, TNAU, Coimbatore through hybrid mode involving scientists of all college campuses, research stations and KVVs.

Respected Vice-Chancellor, **Dr. V. Geethalakshmi** chaired the session and offered opening remarks. It was suggested to take up multi-disciplinary research for the management of FAW and Aflatoxin in maize. Short duration millet Panivaragu, can be utilized in cropping system studies to develop new models. It was suggested to develop small machineries/equipments for value addition/post harvest processing of small millets. While stressing the urgent need for release of new varieties in forage crops, madam suggested to concentrate research on biomass-based bio-fuel production.

**Dr. M. Raveendran**, Director of Research highlighted the yield gaps and urged the Millet Scientists to identify suitable technologies for improving the millet cultivation. It was suggested to initiate research on development of bio-fortified sorghum varieties and varieties resistance to shoot fly. It was suggested to carry out the fractionate analysis for cellulose and hemi-cellulose content in Cumbu Napier hybrids for bio-fuel recovery.

**Dr.R. Ravikesavan**, Director, CPBG, **Dr. M. K. Kalarani**, Director, Crop Management, **Dr. P. Balasubramaniam**, Director, NRM and **Dr. M. Shanthi, Director, CPPS** presented the research highlights, action taken on previous Millets and Forage Crops Scientists Meet recommendations and Action Plan for the year 2023-24 for the respective disciplines.

The proceedings of the 41<sup>st</sup> Crop Scientists' Meet on Millets and Forage crops 2023 are furnished under the following headings:

**I. CROP IMPROVEMENT**

- A. Entries for variety release proposal/OFT/ART/MLT
- B. Action Plan Projects
- C. Research Projects and remarks

**II. CROP MANAGEMENT**

- A. Technologies for adoption/OFT
- B. Action Plan Projects
- C. Research Projects and remarks

**III. CROP PROTECTION**

- A. Technologies for adoption/OFT/Information
- B. Action Plan Projects
- C. Research Projects and remarks

**IV. REMARKS**

**V. LISTS OF PARTICIPANTS**

<b>I. CROP IMPROVEMENT</b>				
<b>MILLETS</b>				
<b>A. Entries identified for variety release/ART/OFT/MLT</b>				
<b>A1. Varieties / Hybrids identified for Release:</b>				
<b>1. Sorghum</b>				
<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>DFY (kg/ha)</b>	<b>Special features</b>
TNS 661	100-105	2850 (RF) 3330 (IR)	9430 (RF) 11170 (IR)	Dual purpose variety with yellow white grains. Rich in grain mineral content. High stover yield and IVDMD (50.5%). Non lodging type
<b>2. Sweet Sorghum</b>				
<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Fresh stalk yield</b>	<b>Special features</b>
TNSS 227	110-115	2240	37.0 t/ha	High Brix: 16.8 %, Increased Juice yield of 13020 L/ha, Stay green type, Resistant to anthracnose and stem borer. Suitable for grain, stover and industrial purpose.
<b>3. Maize Hybrid</b>				
<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Yield inc. over check (%)</b>	<b>Special features</b>
VaMH12013	95-100	6455	10.6% over CO6	Drought tolerant and suited for rainfed condition. Orange yellow semi-dent kernels. Moderately resistant to TLB
<b>4. Tenai</b>				
<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Yield inc. over check (%)</b>	<b>Special features</b>
TNSi 337	82-85	2205	ATL 1 (26.4)	High tillering, Tip sterility absent, moderately resistant to leaf blast, rust, brown spot and shoot fly
<b>5. Ragi</b>				
<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Yield inc. over check (%)</b>	<b>Special features</b>
TNEc 1310	130-135	3220	ATL1 (13.1)	High yielding, Compact earhead, Resistant to blast, leaf blast, brown spot and shoot fly
<b>A2. ADAPTIVE RESEARCH TRIALS</b>				
<b>1. Sorghum</b>				
<b>S. No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1.	TKSV 1146 (R)	100 -105	2650	Yellow white with bold grains, Tolerant to midge, Photo insensitive, Suitable for rainfed situation
2.	TNS 695	100-105	3115	High yielding, yellowish white grains, Resistant to stem borer, and Downy Mildew
Checks: CO 32, K12, K 13				
<b>Observations to be recorded:</b> Days to 50 % flowering, plant height, grain yield, straw yield, pest and disease incidence				

<b>2. Sweet Sorghum</b>					
<b>S.No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Stalk yield (t/ha)</b>	<b>Grain yld. (kg/ha)</b>	<b>Special attributes</b>
1	TNSS 227	110-115	37.0	2240	High Brix: 16.8 %, Increased Juice yield of 13020 L/ha, Resistant to anthracnose and stem borer. Stay green type, Suitable for grain, stover and industrial purpose.
Checks: CSV 24 SS					
<b>Observations to be recorded:</b> Days to 50% flowering, Plant height, Days to maturity, brix %, Fresh stalk yield and grain yield.					
Districts: Coimbatore, Namakkal, Erode, Karur, Dindigul, Theni, Pudukottai					

<b>3. Maize (Rainfed)</b>				
<b>S.No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1.	CMH 15-005 (R)	105-110	6350	Drought tolerant, Moderate resistance to Charcol Rot and TLB. Orange yellow semi dent kernels.
Checks: CO 6, S6668, COH(M) 8, COH(M) 11, Advanta PAC 751 elite				
<b>Observations to be recorded:</b> 50 % tasseling, 50% silking, grain yield (kg/ha), shelling percentage				
<b>4. Panivaragu</b>				
<b>S. No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1.	TNPm 247 (R)	65-70	2115	High yield with bold grains
Checks: ATL 1, ATL2				
<b>Observations to be recorded:</b> Days to maturity, grain yield kg/ha, straw yield kg/ha and pests and disease score if any.				

<b>5. Samai</b>				
<b>S. No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1.	TNPSu 223 (R)	85	1525	Open panicle, Bold and grey grain, Tolerant to shoot-fly Drought tolerant
2.	TNPSu 224 (R)	90	1540	Semi-compact panicle, yellow grains, High bulk density
Check: ATL 1				
<b>Observations to be recorded:</b> Days to maturity, grain yield (kg/ha), straw yield (kg/ha) and pests and disease score if any.				

<b>Distribution of ART 2023-24</b>			
<b>Sorghum</b>			
<b>Season</b>	<b>Kharif (Jun-Jul)</b>	<b>Rabi (Sep-Oct)</b>	<b>Summer (Feb-March)</b>
<b>Districts</b>	18 district-s, 36 locations Villupuram (2), Vellore (2) Tiruvallur (2), Thiruvannamalai (2), Cuddalore (2), Dharmapuri (2), Krishnagiri (2), Salem (2) Namakkal (2), Coimbatore (2) Tirupur (2), Erode (2), Trichy (2), Perambalur (2), Karur (2),	7 districts, 14 locations Madurai, Dindigul, Virudhunagar, Ramnad, Sivagangai, Thoothukudi and Thirunelveli	14 districts, 28 locations Dharmapuri, Krishnagiri, Salem, Namakkal, Coimbatore, Tirupur, Trichy, Perambalur, Karur, Pudukkottai, Madurai, Theni, Dindigul, Virudhunagar

	Madurai (2), Dindigul (2), Virudhunagar (2)		
<b>KVK</b>	6 KVKs, 12 trials, 2 trials/KVK Cuddalore, Trichy, Vellore, Villupuram, Salem, Madurai	8 KVKs, 16 trials, 2 trials/KVK Pudukottai, Cuddalore, Virudhunagar, Trichy, Vellore, Aruppukottai, Villupuram, Madurai	9 KVKs, 18 trials, 2 trials/KVK Pudukottai, Cuddalore, Trichy, Vellore, Thiruvallur, Villupuram, Salem, Madurai, Dharmapuri

<b>Maize</b>	
<b>Season</b>	<b>Rabi (Sep-Oct)</b>
<b>Rainfed</b>	Dindigul, Madurai, Thoothukudi, Virudhunagar, Thirunelveli (5 districts 25 trials)

<b>Small millets</b>	
<b>Panivaragu</b>	
<b>Season</b>	<b>Kharif</b>
<b>Districts</b>	Villupuram, Vellore, Thiruvanamalai, Salem, Namakkal, Madurai, Theni, Virudhunagar, Thoothukudi, Tirunelveli (Each district 5 locations) (10 districts - 50 locations)
<b>Samai</b>	
<b>Season</b>	<b>Kharif</b>
<b>Districts</b>	Villupuram, Vellore, Thiruvanamalai, Salem, Namakkal, Madurai, Theni, Virudhunagar, Thoothukudi, Tirunelveli (Each district 5 locations) (10 districts - 50 locations)

### **A3. ON FARM TRIALS**

#### **1. Sweet Sorghum (Kharif)**

<b>S.No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Stalk yield (t/ha)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1	TNSS 227	110-115	37.0	2240	High Brix: 16.8 %, Increased Juice yield of 13020 L/ha, Resistant to anthracnose and stem borer. Stay green type, Suitable for grain, stover and industrial purpose.

Checks: CSV 24 SS

Observations to be recorded: Days to 50% flowering, Plant height, Days to maturity, brix %, Fresh stalk yield and grain yield.

Districts: Coimbatore, Namakkal, Erode, Karur, Dindigul, Theni, Pudukottai

#### **2. Maize (Rainfed)**

<b>S. No.</b>	<b>Culture</b>	<b>Duration (days)</b>	<b>Grain yield (kg/ha)</b>	<b>Special attributes</b>
1.	CMH 15- 005 (R)	105-100	6350	Drought tolerant, Moderate resistance to Charcol Rot and TLB. Orange yellow semi dent kernels.

Checks: CO 6, COH (M) 8, COH (M) 11, S6668, Advanta PAC 751 elite

**Observations to be recorded:** 50 % tasseling, 50% silking, Grain yield (kg/ha), shelling percentage

**Districts:** Dindigul, Madurai, Thoothukudi, Virudhunagar, Thirunelveli (5 locations each)

## A4. MULTI LOCATION TRIALS

<b>1. Sorghum</b>			
Design: RBD		No. of replication: Four	
Plot size: 4 × 3 m <sup>2</sup>		Seed quantity: 100 g/entry/location	
Spacing: 45 × 15 cm		Season: Kharif, Rabi, Summer	
<b>Salient Features</b>			
<b>Culture</b>	<b>Duration (days)</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TNS 702	105-110	3210	Yellow white grains, Moderately resistant to Stem borer, Gall midge and downy mildew
TNS 704	105-110	3320	Yellow white grains, Resistant to Stem borer and downy mildew and moderately resistant to Gall midge
<b>Checks:</b> CO 32, K 13			
<i>Kharif</i> (4)	(June – July)	Coimbatore, Paiyur, Bhavanisagar, Athiyanthal	
<i>Rabi</i> (5)	(Sept-Oct)	Kovilpatti, Yethapur, Aruppukkottai, Paiyur, Vaigaidam	
Summer (3)	(Jan – Feb)	Coimbatore, Bhavanisagar and Vaigaidam	
Fertilizer dose		90:45:45 NPK kg/ha	
<b>Observations to be recorded:</b> Days to 50 % flowering, Days to maturity, grain yield kg/ha, straw yield kg/ha and pests and disease score if any			

<b>2. Forage Sorghum</b>			
Design: RBD		No. of replication: 4	
Plot size: 4 × 3 m <sup>2</sup>		Seed quantity: 100 g/entry/location	
Spacing: 45 × 15 cm		Season: <i>Kharif, Rabi</i> , Summer	
<b>Salient Features</b>			
<b>Culture</b>	<b>Duration (days)</b>	<b>Fodder yield (t/ha)</b>	<b>Special traits</b>
TNFS 230	65-70	34.5	High green fodder yield, Brix -10-12 %
TNFS 239	65-70	35.3	High green fodder yield, tall plants with brix -10-12 %
<b>Checks:</b> CO 27, K 11			
<i>Kharif</i> (4)	(June – July)	Coimbatore, Bhavanisagar, Paiyur, Virinjipuram	
<i>Rabi</i> (3)	(Sept-Oct)	Vaigaidam, Melalathur, Athiyanthal	
Summer (2)	(Jan – Feb)	Coimbatore, Bhavanisagar	
Fertilizer dose		80:40:40 NPK kg/ha	
<b>Observations to be recorded:</b> Days to 50% flowering, Plant height, green fodder yield.			
<b>2. Pearl Millet</b>			
Design: RBD		No. of replication: 4	
Plot size: 4 × 3 m <sup>2</sup>		Seed quantity: 100 g/entry/location	
Spacing: 50 × 15 cm		Season: <i>Kharif, Rabi</i> and Summer	
Fertilizer schedule: 80: 40:40 NPK Kg/ha			
<b>Salient Features</b>			
<b>Culture</b>	<b>Duration (days)</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TNBH 2022	85-90	4050	Bold seed, Compact earhead, DM resistance
<b>Checks:</b> Pearl millet Hybrid CO 10, 86M38, Ankur 045			
<b>Observations to be recorded:</b> Days to 50 % flowering, Days to maturity, seed set per cent, grain yield (kg/ha), straw yield (kg/ha), pests and disease score if any.			
<b>Seasons</b>			
Pearl millet MLT I	<i>Kharif</i> (June – July) (7)	Coimbatore, Paiyur, Yethapur, Bhavanisagar, Vridhachalam, Tindivanam and Athiyanthal	
Pearl millet MLT II	<i>Rabi</i> (Sep- Oct) (5)	Kovilpatti, Aruppukkottai, Paiyur Vaigaidam and Pudukottai	
Pearl millet MLT III	<i>Summer</i> (6) (February-March)	Coimbatore, Pattukkottai, Paiyur, Bhavanisagar, Vridhachalam and Vaigaidam	

<b>3. Maize (Irrigated)</b>			
Design: RBD		No. of replication: 3	
Plot size: 4 × 3.6 m <sup>2</sup>		Seed quantity: 200 g/entry/location	
Spacing: 60 × 25 cm		Season: <i>kharif, rabi</i> (irrigated)	
<b>Salient Features</b>			
Hybrids	Duration (days)	Yield (kg/ha)	Special traits
CMH 19015	100-105	9920	Medium maturity, Orange yellow semi dent kernels; Resistant to Charcol Rot
CMH 18027	105-110	9700	Late maturity, Orange yellow semi dent kernels, Resistant to Charcol Rot
CMBH 19011 (R)	105-110	8900	High beta carotene maize hybrid, β-Carotene content 9.60 (µg/g), 10 times higher β Carotene over CO6
<b>Checks</b>		CO6, COH(M) 11, S6668, Advanta PAC 751 elite	
<b>Seasons</b>			
Maize MLT	<i>Kharif</i> (June – July) (7)	Coimbatore, Vagarai, Paiyur, Bhavanisagar, Athiyanthal, Vaigaidam, Virinjipuram	
Maize MLT	<i>Rabi</i> (Dec – Jan) (6)	Coimbatore, Vagarai, Paiyur, Bhavanisagar, Vaigaidam, Virinjipuram	
Fertilizer schedule: 250: 75:75 NPK Kg/ha			
Observations to be recorded: Days to 50 % tasseling, Days to 50 % silking, Plant height (cm), Grain yield (kg/ha), pests and disease score if any			
<b>4. Maize (Rainfed)</b>			
Design: RBD		No. of replication: 4	
Plot size: 4 × 3.6 m <sup>2</sup>		Seed quantity: 200 g/entry/location	
Spacing: 60 × 25 cm		Season: <i>Rabi</i> (Rainfed)	
<b>Salient features</b>			
Hybrids	Duration	Yield (kg/ha)	Special traits
VaMH 20001 (R)	100-105	5870	Suitable for rainfed conditions, Moderately Resistant to TLB Yellowish orange semi-dent kernels
<b>Checks:</b> CO 6, COH(M) 11, S6668, Advanta PAC 751 elite			
<b>Seasons</b>			
Maize MLT	Rabi (Sept-Oct) (5)	Aruppukkottai, Kovilpatti, Yethapur, Veppanthattai, Vagarai	
Fertilizer schedule: 250:75:75 NPK Kg/ha			
<b>Observations to be recorded:</b> Days to 50 % tasseling, Days to 50 % silking, Plant height (cm), Grain yield (kg/ha), pests and disease score if any			
<b>5. Sweet corn</b>			
Design: RBD		No. of replication: 4	
Plot size: 4 × 3.6 m <sup>2</sup>		Seed quantity: 200 g/entry/location	
Spacing: 60 × 25 cm		Season: <i>Rabi</i> (Rainfed)	
<b>Salient features</b>			
Hybrids	Duration (days)	Cob Yield (kg/ha)	Special traits
CSCH 18006	75	14920	11.6 % yield increase over Misthi
CSCH 19013	75	15425	12.7 % yield increase over Misthi
<b>Checks:</b> Misthi, Sugar 75			
<b>Seasons</b>			
<i>Kharif</i>	Irrigated (June – July) (7)	Coimbatore, Vagarai, Paiyur, Bhavanisagar, Athiyanthal, Vaigaidam, Virinjipuram	
Fertilizer schedule: 250:75:75 NPK Kg/ha			
<b>Observations to be recorded:</b> Days to 50 % tasseling, Days to 50 % silking, Plant height (cm), Green cob yield (kg/ha), pests and disease score if any			

<b>Small Millets MLT</b>			
<b>6. Ragi</b>			
Design: RBD		No. of replications: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i>	
<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
PYR 20-5 (R)	125-130	2585	Compact ear head, Bold and white grains, Medium tall, Blast tolerant
Check: ATL 1, PYR 2, ML 365			
Fertilizer schedule: 60:30:30 kg of NPK /ha			
<b>Centres:</b> Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Aruppukottai, Kovilpatti, Athiyandal, Chettinadu			
<b>7. Varagu</b>			
Design: RBD		No. of replication: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i>	
<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TN <sub>Psc</sub> 323	120-125	2455	Compact panicle, Bold grains, Drought tolerant
Check: ATL 1, ATL 2			
Fertilizer schedule: 44:22:00 kg of NPK /ha			
<b>Centres:</b> Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Aruppukottai, Kovilpatti, Athiyandal, Chettinadu, Vriddachlam			
<b>8. Kudiraivali</b>			
Design: RBD		No. of replication: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i> (Rainfed)	
<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TNEf 329	90-95	2700	High yield, High milling out turn (68%)
TNEf 334	85-90	2720	Drought tolerance, Dense panicle, non lodging
Check: MDU 1, ATL1			
Fertilizer schedule: 44:22:00 kg of NPK /ha			
<b>Centres:</b> Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Aruppukottai, Kovilpatti, Athiyandal, Chettinadu, Madurai			
<b>9. Samai</b>			
Design: RBD		No. of replication: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i>	
<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TN <sub>Psu</sub> 244	80-85	1790	Open panicle, Tolerant to shoot-fly, Drought tolerant
TN <sub>Psu</sub> 241	85-90	1770	Semi-compact panicle, yellow grains, High bulk density
Check: ATL 1			
Fertilizer schedule: 44:22:00 kg of NPK /ha			
<b>Centres:</b> Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Aruppukottai, Kovilpatti, Athiyandal, Chettinadu			
<b>10. Tenai</b>			
Design: RBD		No. of replication: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i>	



<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TNS/ 394	85-90	2690	Large panicle, more biomass, Input responsive
TNS/ 390	80-85	2660	Drought tolerance, Dense panicle, non lodging
Checks: ATL 1			
Fertilizer schedule: 44:22:00 kg of NPK /ha			
<b>Centres:</b> Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Aruppukottai, Kovilpatti, Athiyandal, Chettinadu			
<b>11. Panivaragu</b>			
Design: RBD		No. of replication: 4	
No. of rows: 6 rows		Seed quantity: 100 g/entry/location	
Spacing: 22.5 × 10 cm		Season: <i>Kharif</i>	
<b>Salient features</b>			
<b>Culture</b>	<b>Duration</b>	<b>Yield (kg/ha)</b>	<b>Special traits</b>
TN <i>Pm</i> 291	70-75	2500	Open panicle, Tolerant to shoot-fly, Drought tolerant
Checks: ATL 1, ATL2			
Fertilizer schedule: 44: 22:00 kg of NPK /ha			
Centres: Coimbatore, Paiyur, Bhavanisagar, Vaigaidam, Kovilpatti, Athiyandal			

<b>Monitoring team to visit MLTs (2023-24)</b>	
<b>Monitoring team</b>	<b>Stations to be visited</b>
Dr. R. Chandirakala Dr. D. Kavithamani Dr. N. Kumari Vinodhana Dr. A. Sudha	Bhavanisagar, Vagarai
Dr. S. Sivakumar Dr. K. Iyanar Dr. I. Johnson Dr. S. Lakshmi Narayanan	Kovilpatti, Aruppukkottai, Vaigaidam, Chettinadu
Dr. K. R. V. Sathyasheela Dr. N. Ananthi	Coimbatore, Madurai, Pudukottai
Dr. M. Vaithiyalingan Dr. P. T. Sharavanan Dr. V. Paranitharan	Paiyur, Virinjipuram, Tindivanam
Dr. K. Iyanar Dr. T. Srinivasan Dr. I. Johnson	Athiyanthal, Vridhachalam
Dr. K. Geetha Dr. P. Suthamathi	Yethapur, Veppanthattai

## FORAGE CROPS

### I. Entries identified for variety release/ART/OFT/MLT (2023-2024)

I.1. Cultures identified for OFT				
a. Cumbu Napier Hybrid grass OFT				
Entry	Parentage	Duration	GFY (t/ha/yr)	Special features
TNCN 1534	IP 20379 x FD 434	Perennial	390.60	High biomass, More LS ratio
<b>Check</b>		: CO (BN) 5 and CO 6		
<b>Fertilizer</b>		: 150:50:40 kg/ha		
<b>Observations to be recorded</b> : Green fodder yield per plot				
<b>No. of OFTs to be conducted</b> : 20				

I.2. Cultures identified for MLT				
a. Cumbu Napier Hybrid grass				
Design : RBD		No. of replications: 5		
Plot size : 4 m × 3 m		No. of cuttings/plot:40 cuttings/entry/location		
Spacing : 60 cm × 50 cm		Season: <i>kharif</i> 2023		
Fertilizer: 150:50:40 kg/ha				
Entry	Parentage	Duration (days)	GFY (t/ha)	Special features
TNCN 2117	CO 8 x FD 453/1	Perennial	364.14	High biomass, Crude protein content -13.5%
<b>Check hybrids</b>		: CO (BN) 5 and CO 6		
<b>Observations to be recorded</b> : Green fodder yield per plot				
<b>2023-24</b> : Coimbatore, Bhavanisagar, Vagarai, Melalathur, Paiyur, Pongalur				
b. Fodder Maize				
Design : RBD		No. of replications : 5		
Plot size : 4 × 3 m <sup>2</sup>		Seed quantity : 250 g/entry/location		
Spacing : 30 × 15 cm		Season: <i>kharif</i> 2023		
Fertilizer: 30:40:20 kg/ha				
Entry	Parentage	Duration (days)	GFY (t/ha)	Special features
TNFMH 2125	UMI1201 x N 66	60-65	72	High green fodder yield, Crude protein -14.5%
<b>Check hybrids</b>		: COH (M) 8 and African Tall		
<b>Observations to be recorded</b> : Green fodder yield per plot				
<b>2023-24:</b> Coimbatore, Bhavanisagar, Vagarai, Melalathur, Paiyur, Pongalur, Veppanthattai,				
c. Fodder Cowpea				
Design : RBD		No. of replications : 4		
Plot size : 4 × 3 m <sup>2</sup>		Seed quantity : 250 g/entry/location		
Spacing : 30 × 15 cm		Season: <i>kharif</i> 2023		
Fertilizer: 25 : 40 : 20 kg/ha				
Salient features				
Entry	Parentage	Duration (days)	GFY (t/ha)	Special features
TNFC 1905	UPC 953 × CO 9	55-60	35.00	High green fodder yield Crude protein -19.5%
TNFC 1910	CL 350 x CO 9	55-60	33.50	High green fodder yield Crude protein – 19.8%
<b>Check hybrids:</b> CO 9 and TNFC 0926				
<b>Observations to be recorded:</b> Green fodder yield per plot				
<b>2023-24:</b> Coimbatore, Bhavanisagar, Vamban, Melalathur, Paiyur, Ramnad, Killikulam, Pongalur				

### Monitoring team to visit Cumbu Napier hybrid grass OFT/MLT 2023-24

Team	Stations to be visited
Dr. K. N. Ganesan Dr. T. Ezhilarasi	Coimbatore, Bhavanisagar, Vagarai, Melalathur, Veppanthattai, Paiyur, Pongalur, Vamban, Ramnad, Killikulam, Trichy, Chettinadu

## B. ACTION PLAN

### 1. ACTION PLAN – 2023-24

#### 1.1 Millets

S. No.	Details of action plan	Work plan for 2023-2024	Centre	Scientists
1	<b>Theme 1: Germplasm characterization in Millets</b>			
	Characterization of Sorghum accessions	Characterization of 100 Sorghum accessions	Coimbatore	Dr. D. Kavithamani, Asst. Prof. (PBG)
		Characterization of 100 Sorghum accessions	Kovilpatti	Dr. N. Ananthi, Assoc. Prof. (PBG)
	Characterization of Maize accessions	Characterization of 100 Maize accessions	Coimbatore	Dr. N. KumariVinodhana, AP. (PBG)
		Characterization of 100 Maize accessions	Vagarai	Dr. K.R.V. Sathyasheela, AP. (PBG)
2	<b>Theme No 2: Evolution of Shootfly and Midge resistant sorghum varieties</b>			
	<b>Theme Leader</b> Dr. R. Chandirakala, Professor (PBG), Department of Millets, Coimbatore			
		<ul style="list-style-type: none"> <li>Raising and evaluation of F<sub>6</sub> at Coimbatore for both pests</li> <li>Evaluation of stable genotypes under yield trials</li> </ul>	Coimbatore Kovilpatti	Dr. D. Kavithamani, Asst. Prof (PBG) Dr. N. Ananthi, Assoc. Prof (PBG) Dr. T. Srinivasan, Assoc. Prof. (Ento)
3	<b>Theme No 3: Evolution of high yielding single cut forage sorghum varieties with improved quality traits</b>			
	<b>Theme Leader</b> Dr. D. Kavithamani, Asst. Prof (PBG), Department of Millets, Coimbatore			
		<ul style="list-style-type: none"> <li>Seed multiplication of the promising lines</li> <li>Evaluation of stable genotypes in yield trials</li> </ul>	Coimbatore	Dr. R. Chandirakala, Professor (PBG)
4	<b>Theme No 4: Development of biofortified Pearl millet hybrids for high Fe and Zn</b>			
	<b>Theme Leader</b> Dr. K. Iyanar, Professor (PBG), Department of Millets, Coimbatore			
		<ul style="list-style-type: none"> <li>Development of new crosses with identified donors</li> <li>Validation of Fe and Zn content</li> </ul>	Coimbatore	Dr. T. Chitdeshwari, Professor (SS&AC)
5	<b>Theme 5: Screening of maize inbreds and hybrids for drought tolerance</b>			
	<b>Theme Leader</b> Dr. S. Sivakumar, Professor and Head, Department of Millets, Coimbatore			
		<ul style="list-style-type: none"> <li>Crossing with identified drought tolerant inbreds.</li> <li>Evaluation of new crosses and advanced hybrids under drought</li> </ul>	Coimbatore Vagarai Veppanthattai	Dr. N. KumariVinodhana, AP (PBG) Dr. A. Senthil, Prof. & Head (CRP), Dr. K.R.V. SathyaSheela, AP (PBG) Dr. P. Anantharaju, Asst. Prof. (PBG)
6	<b>Theme 6: Introgression of <i>crtRB1/ lcyE</i> allele using marker-aided selection in to the elite inbreds of maize</b>			
	<b>Theme Leader</b> Dr. S. Sivakumar, Professor and Head, Department of Millets, Coimbatore			
		<ul style="list-style-type: none"> <li>Quantification of the beta carotene</li> <li>Seed multiplication of the introgressed lines</li> </ul>	Coimbatore	Dr. R. Ravikesavan, Director (CPBG) Dr. N. KumariVinodhana, AP (PBG) Dr. N. Senthil, Director (CPMB)

7	<b>Theme 7: Development of FAW tolerant / resistant maize hybrids</b>		
	<b>Theme Leader Dr. S. Sivakumar, Professor and Head, Department of Millets, Coimbatore</b>		
	<ul style="list-style-type: none"> <li>Evaluation of crosses developed from new donors</li> <li>Development of back crosses with elite inbreds</li> </ul>	Coimbatore Vagarai Madurai	Dr. N. KumariVinodhana, AP (PBG) Dr. T. Srinivasan, Assoc. Prof. (Ento) Dr. K.R.V. Sathyasheela, AP (PBG) Dr. Zadda Kavitha, Assoc. Prof. (Ento)

## 1.2. Action Plan

### Action Plan 2021-24

<b>Theme: Utilization of High Biomass Yielding Forage Crops and Sweet Sorghum for Biofuel Production</b>			
<b>Theme Leader: Dr. K. N. Ganesan</b> , Professor and Head, Dept of Forage Crops and <b>Dr. D. Ramesh</b> , Professor and Head, Dept of Renewable Energy Engineering, TNAU, Coimbatore			
S. No.	Work Plan for 2023-24	Centre	Scientists
1.	<ul style="list-style-type: none"> <li>Mass multiplication of high biomass and high biogas yielding forage crops and sweet sorghum.</li> <li>Demonstration and field trials on high biomass yielding forage crops.</li> <li>Public private partnership build up</li> </ul>	Dept. of Forage Crops Dept. of Millets	Dr. T. Ezhilarasi Dr. S. Sivakumar Dr. R. Chandirakala Dr. D. Kavithamani
	<ul style="list-style-type: none"> <li>Evaluation of briquetted solid biofuel derived from high biomass forage crops and sweet sorghum and their fuel quality.</li> <li>Optimization of process conditions for bioethanol from the identified high biomass forage crops and sweet sorghum</li> </ul>	Dept. of Renewable Energy Engineering.	Dr. P. Vijayakumary Dr. R. Parimala devi Dr. D. Ramesh

### Action Plan 2022 -25

<b>Theme: Development of high biomass yielding genotypes of forage maize</b>			
<b>Theme Leader: Dr. K. N. Ganesan</b> , Prof & Head, Dept of Forage Crops			
S. No.	Work Plan for 2023-24	Centre	Scientist
1.	<ul style="list-style-type: none"> <li>Nomination of superior fodder maize culture in the AICRP/MLT.</li> <li>Evaluation of single cross fodder maize hybrids in station trial and MLT.</li> <li>Laboratory analysis of fodder quality traits for the superior performing single cross fodder maize hybrids.</li> </ul>	Dept. of Forage Crops	Dr. T. Ezhilarasi

## 2.1. Activities for New Action Plan 2023 – 2026 (Millets)

### New Action Plan 1

Theme	Development of maize hybrids suitable for high density planting		
Theme leaders	Dr. S. Sivakumar, Prof & Head, Dept of Millets, TNAU, Coimbatore.		
Theme members	2023-24	2024-25	2025-26
<b>Dept. of Millets, Coimbatore</b> 1. Dr. N. Kumari Vinodhana Asst. Prof (PBG) 2. Dr. P. Kathirvelan, Assoc. Prof. (Agron.) <b>MRS, Vagarai</b> 3. Dr. K.R.V. Sathyasheela, AP (PBG) 4. Dr. T. Selvakumar, Assoc. Prof. & Head	Identification of inbred lines with narrow leaf and dwarf stature suitable for high density planting Screening of promising maize inbred lines under varying plant density at both the locations (i). 45 x 25 cm ii). 60 x 25 cm	Effecting crosses among the identified inbred lines  Evaluation and identification of new crosses suitable for high density planting	Multiplication of promising crosses suitable for high density planting.  Evaluation of promising crosses in Multilocation trials under high density planting
New Action Plan 2			
Theme	Development of extra early varieties in finger millet		
Theme leaders	Dr. M. Vaidhiyalingan, Professor & Head (PBG), CEM, Athiyandal		
Theme members	2023-24	2024-25	2025-26
Dr. P. Suthamathi, Professor (PBG)	Promising extra early duration (<85 days) finger millet cultures will be evaluated for its duration and yield potential	Assessing the yield potential and extra early durations in different locations	Based on the performance, the culture will be nominated for ART

## 2.2. Activities for New Action Plan 2023 – 2026 (Forage Crops)

Theme	Development of superior Lucerne varieties through poly-cross breeding		
Theme leaders	Dr. K. N. Ganesan, Prof & Head, Dept of Forage crops, TNAU, Coimbatore.		
Theme members	2023-24	2024-25	2025-26
Dr. T. Ezhilarasi, Asst. Prof. (PBG), Dept of Forage Crops, TNAU, Coimbatore.	<ul style="list-style-type: none"> <li>Collection of seeds from polycross nursery designed (Honey Comb) with eight parents received across the nation.</li> <li>Raising of polycrossed progenies in augmented design.</li> <li>Selection of most promising individual plants.</li> </ul>	<ul style="list-style-type: none"> <li>Out of selected promising progenies, the best 20-25 progenies will be identified on the basis of one year data on green fodder yield and dry matter yield and pest / disease resistance.</li> <li>From selected progenies, most promising individual plants (40-50) will be identified, tagged and numbered.</li> </ul>	<ul style="list-style-type: none"> <li>The promising plants in selected progenies will be allowed to random mate by open pollination.</li> <li>The open pollinated seed of selected promising plants (40-50) will be harvested individually for progeny test.</li> </ul>

### C. Research Projects on Millets and Forage crops

A total number of 52 projects including URPs, AICRP and Externally funded projects of Millets and Forage crops, Seed science & technology and CPMB handled by 33 scientists were reviewed by the respective Directors of CPBG, SST and CPMB. The abstract of the projects reviewed is furnished below:

<b>Crops</b>	<b>Centres</b>	<b>URP</b>	<b>AICRP</b>	<b>EFP</b>	<b>Others</b>	<b>Total</b>	<b>Scientists</b>
Sorghum	Coimbatore	4	1	-	-	5	2
	Kovilpatti	3	-	-	-	3	1
	Madurai	1	-	-	-	1	1
	Virinjipuram	1	-	-	-	1	1
	<b>Sub total</b>	<b>9</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>5</b>
Pearl millet	Coimbatore	<b>2</b>	<b>1</b>	-	-	<b>3</b>	<b>1</b>
Maize	Coimbatore	3	1	-	-	4	2
	Vagarai	1	1	-	-	2	1
	<b>Sub total</b>	<b>4</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>6</b>	<b>3</b>
Small millets	Athiyandal	4	1	-	6	11	2
	Paiyur	2	-	-	-	2	1
	Madurai	2	-	-	-	2	1
	<b>Sub total</b>	<b>8</b>	<b>1</b>	<b>-</b>	<b>6</b>	<b>15</b>	<b>4</b>
PGR	Coimbatore	<b>2</b>	-	-	-	<b>2</b>	<b>1</b>
SST	Coimbatore	<b>2</b>	-	-	<b>2</b>	<b>4</b>	<b>12</b>
CPMB&B	Coimbatore	<b>1</b>	-	<b>2</b>	-	<b>3</b>	<b>3</b>
Forage Crops	Dept. of Forage Crops, TNAU	4	1	2	-	<b>7</b>	<b>2</b>
	Dept. of Genetics & Plant Breeding	1	-	-	-	<b>1</b>	<b>1</b>
	ADAC&RI, Trichy	1	-	-	-	<b>1</b>	<b>1</b>
	<b>Total</b>	<b>6</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>9</b>	<b>4</b>
<b>Grand total</b>		<b>34</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>52</b>	<b>33</b>

URP: University Research Project, AICRP: ICAR funded AICRP projects, EFP: Externally funded projects

## D. Remarks of the Ongoing URPs/ AICRPs/Externally Funded Projects in Crop Improvement

### I. University Research Projects

Project No and Title	Period	Investigators	Remarks
<b>Sorghum</b>			
CPBG/CBE/PBG/SOR/2018/001 Collection and characterization of sorghum germplasm	April 2018 to March 2023	Dr. D. Kavithamani Asst. Professor (PBG) Dept. of Millets	Genotypes with economically important traits shall be identified and used in the crop improvement programme. The project may be closed and new Project may be proposed.
CPBG/CBE/PBG/SOR/2018/002 Development of dual-purpose varieties of sorghum resistant to major pests (Shoot fly/Stem borer/ Midge)	June 2018 to May 2023	Dr. R. Chandirakala Professor (PBG) Dept. of Millets	Marker assisted selection shall be applied for pest screening. The project may be closed and new Project may be proposed.
CPBG/CBE/PBG/SOR/2019/001 Development of high yielding fodder sorghum varieties with improved quality traits	Feb' 2019 to June 2022	Dr. D. Kavithamani Asst. Professor (PBG) Dept. of Millets	The project may be closed and new Project may be proposed. The promising forage sorghum lines may be evaluated under yield trials
CPBG/CBE/PBG/SOR/2020/001: Evolution of red sorghum varieties suited for Tamil Nadu	September 2020 to August 2025	Dr. R. Chandirakala Professor (PBG) Dept. of Millets	Promising red sorghum entries may be evaluated in yield trials. New red sorghum collections may be included as parents in crossing programme.
CPBG/ KPT/ PBG/SOR/2019/New Collection and characterization of sorghum germplasm	Oct' 2019 to Sep' 2022	Dr. N. Aananthi Assoc. Professor (PBG) ARS, Kovilpatti	Genotypes with economically important traits shall be used in the crop improvement programme. The project may be closed and new Project may be proposed.
CPBG/KPT/PBG/SOR/2020/003 Evolution of high yielding, drought tolerant sorghum varieties suitable for rainfed condition in southern districts of Tamil Nadu.	Oct. 2020 to Sep.2025	Dr. N. Aananthi Assoc. Professor (PBG) ARS, Kovilpatti	TKSV 1146 culture may be screened for pest and disease incidence.
CPBG/ KPT/ PBG/ SOR/ 2020/ 002 Nucleus and Breeder Seed Production of Sorghum varieties of Tamil Nadu	Oct. 2020 to Sep. 2023	Dr. N. Aananthi Assoc. Professor (PBG) ARS, Kovilpatti	The allotted indent must be produced without any short fall.
CPBG/MDU/PBG/SOR/2019/001 Evolution of high yielding red sorghum ( <i>Sorghum bicolor</i> ) varieties suitable for industrial utilities	Feb. 2019 to Jan. 2024	Dr. S. Lakshmi Narayanan Professor (PB&G) AC&RI, Madurai	A portion of the seeds of the selected entries may be tested at Coimbatore
CPBG/VRM/MIL/2023/001 Developing high yield with early maturity and photo insensitive version of thalaivirichan sorghum through induced mutagenesis	Dec. 2021 to Nov. 2024	Dr. A. Gopikrishnan., Asst. Professor (PBG) ARS, Virinjipuram	The performance of identified early homozygous lines may be tested with control and ruling varieties. Seeds of M <sub>5</sub> generation may be shared with Coimbatore and Kovilpatti

<b>Pearl millet</b>			
CPBG/CBE/PBG/SMM/2020/002 Evolution of high yielding hybrids/varieties in pearl millet ( <i>Pennisetum glaucum</i> (L.) Br.R.)	April 2021 to March 2025	Dr. K. Iyanar, Professor (PBG) Department of Millets	Hybrids with different cytoplasmic background may be studied. Action should be initiated to develop OPV.
CPBG/CBE/PBG/SMM/2020/001 Maintenance of genetic purity and production of nucleus seeds of parental lines of hybrids and open pollinated varieties (OPV) in pearl millet	July 2021 to June 2025	Dr. K. Iyanar, Professor (PBG) Department of Millets	Efforts may be taken to maintain the vigour and uniformity of released OPVs/Composites.
<b>Maize</b>			
CPBG/CBE/PBG/MAZ/2018/001 Development of high yielding sweet corn hybrids suitable for Tamil Nadu	June 2018 to May 2023	Dr. S. Sivakumar Professor (PBG) & Head	The promising cultures shall be tested under MLT and nominated for AICRP trials. The project may be closed and new project may be proposed
CPBG/CBE/PBG/MAZ/2018/002 Development of high yielding single cross maize hybrids in late (> 95 d) and medium (> 85-95 d) maturity suitable for irrigated ecosystems.	June 2018 to May 2023	Dr. N. Kumari Vinodhana, Asst. Professor (PBG)	The maize culture CMH 15-005 shall be tested for second year of OFT/ART. The project may be closed and new project may be proposed
CPBG/CBE/PBG/MAZ/2018/003 Germplasm maintenance and Breeder seed production in Maize	June 2018 to May 2023	Dr. N. Kumari Vinodhana, Asst. Professor (PBG)	Nucleus/breeder seed production may be programmed as per the indents communicated by the DCPBG. The project may be closed and new project may be proposed
CPBG/VGI/PBG/MAZ/2020/002 Development of high yielding single cross maize hybrids suitable for rainfed ecosystems	April 2020 to March 2025	Dr. K.R.V. Sathya Sheela Asst. Professor (PBG)	The advanced maize hybrids may be tested under high density planting.
<b>SMALL MILLETS</b>			
CPBG/ATL/PBG/SMM/2020/001: Development of high yielding varieties in Small Millets suitable for Tamil Nadu	August, 2019 to July, 2024	Dr. P. Suthamathi Professor (PBG)	Recently released varieties shall be added as checks
CPBG/ATL/PBG/SMM/2020/002: Induced mutation in Kodo millet for earliness, non-lodging and non-shattering variations	August, 2020 to July, 2023	Dr. M. Vaithiyalingan Professor & Head (PBG)	The non lodging trait of the identified mutant in varagu may be evaluated for its stability. The project may be closed and new project may be proposed
CPBG/ATL/PBG/BSP/2020/003: Maintenance Breeding in Small Millets Varieties	Oct, 2020 to Sep, 2023	Dr. M. Vaithiyalingan Professor (PBG)	Nucleus/breeder seed production may be programmed as per the indents communicated by the DCPBG.
CPGB/AYL/PBG/SMM/2022/001 Characterization and utilization of small millets germplasm	Jan, 2022 to Dec, 2027	Dr. P. Suthamathi Professor (PBG)	Mini core analysis may be done for the germplasm accessions in the small millet crops.
<b>AC&amp;RI, Madurai</b>			



CPBG/MDU/PBG/SMM/2019-001 Evolution of high yielding, high nutritive value and problem soil tolerant barnyard millet variety better than MDU 1	June 2019 to May 2024	Dr. G. Anand Assoc. Professor (PBG)	The project may be continued. The promising cultures may be nominated for MLT.
CPBG/MDU/PBG/BSP/2020/001 Nucleus and Breeder seed production of Madurai varieties of rice, Barnyard millet and black gram	Sep, 2019 to Aug, 2022	Dr. G. Anand Assoc. Professor (PBG)	The project may be closed and new project may be proposed. Nucleus/breeder seed production may be programmed as per the indents communicated by the DCPBG.
<b>RRS, Paiyur</b>			
CPBG/PAI/PBG/SMM/2022: Development of high yielding long duration ragi varieties suitable for rainfed areas of North Western Zone	Nov, 2022 to Nov, 2027	Dr. K. Geetha, Professor (PBG) RRS, Paiyur	PYR 20-05 may be repeated for second year of MLT.
DRES/PAI/PBG/BSP/2018/001: Maintenance and production of nucleus and breeder seeds of rice, horsegram and millet varieties released from RRS, Paiyur.	Dec, 2018 to Dec, 2023	Dr. K. Geetha, Prof. (PBG) RRS, Paiyur	Nucleus/breeder seed production may be programmed as per the indents communicated by the DCPBG.
<b>PGR</b>			
CPBG/CBE/PBG/MIL/2023/001: <i>Ex-situ</i> conservation of germplasm in cereals, millets and forage crops and its management in seed gene bank	Nov, 2022 to Oct, 2025	Dr. R. Saraswathi, Professor and Head, Department of PGR	New germplasm lines may be explored and included in the gene bank.
CPBG/CBE/PBG/NON/ 2023 -001 Optimization of cryopreservation techniques for orthodox and non-orthodox seeds for different crops	Nov, 2022 to Oct, 2025	Dr. R. Saraswathi, Professor and Head, Department of PGR	Suitable cryopreservation techniques may be standardised.
<b>Seed Technology</b>			
<b>Action Plan Project</b>			
SEC/CBE/SST/MIL/2022/001 Seed pelleting for mechanized sowing in small millets	2019 to 2022	Dr. P.R. Renganayaki Professor (SST) Dept. of PGR, TNAU, CBE Dr. S. Lakshmi, Prof. (SST) DODL, TNAU, CBE	The project may be closed and completion report may be submitted.
SEC/CBE/MIL/2023/001 Evaluation of efficacy of seed planter and drone for sowing of pelleted seeds in small millets	March 2023 to February 2025	Dr. C. Vanitha Assoc. Prof. (SST) Seed Centre, TNAU, CBE Dr. K. Nelson Navamaniraj Asst. Prof. (SST)	The project may be continued.

		Seed Centre, TNAU, CBE Dr. K. Malarkodi Professor (SST) DSST, TNAU, CBE Dr. V. Vakeswaran Assoc. Prof. (SST) ARS, Bhavanisagar Dr. K. Sathya Assoc. Prof. (Agron.) Dr. M. Vaithiyalingam Professor and Head CEM, Athiyandal Dr. M. Kathiravan Assoc. Prof. (SST) AC&RI, Vazhavachanur Dr. P. Ayyadurai Asst. Prof. (AGR), AC&RI, Vazhavachanur	
<b>University Research Projects</b>			
SEC/AYD/MIL/2023/001 Assessment of seed storage potential of TNAU released small millet varieties in seed supply chain	February 2023 to January 2025	Dr. C. Vanitha Associate Prof. (SST) CEM, Athiyandal, Thiruvannamalai	The project may be continued
SEC/VAZ/MIL/2023/001 Micronutrient seed priming and coating technology to enhance nursery establishment, seedling vigour and yield potential in Ragi	February 2023 to January 2025	Dr. M. Kathiravan Associate Prof. (SST) AC&RI, Vazhavachanur, Thiruvannamalai	The project may be continued
<b>OFT</b>			
Mitigating the impact of terminal heat stress to improve seed yield in maize	2022-2023	Dr. K. Malakodi Professor (SST) DSST, TNAU, CBE Dr. V. Manonmani Professor and Head DSST, TNAU, CBE Dr. G. Sasthri Professor (SST) ARS, Bhavanisagar	Recommended for adoption

		Dr. B. Venudevan Asst. Professor (SST) KVK, Aruppukottai Dr. V. Vijayalakshmi Asst. Professor (SST) KVK, Vamban Dr. R. Jegathambal Programme Co-ordinator KVK, Sandhiyur	
<b>CPMB &amp; B</b>			
CPMB/CBE/DPB/MIL/001: Genetic mapping of nutritional and novel agronomic traits in sorghum	Nov' 2021 to Oct' 2023	Dr. M. Raveendran Professor (Biotechnology) & Director of Research	The project may be continued
<b>Externally Funded Projects</b>			
CPMBB/DPB/2021/R001 Incorporation of crtRB1 allele into a sweet corn inbreds and north eastern land races for development of biofortified sweet corn	Feb 2022 to Feb 2025	Dr. N. Senthil Director, CPMB & B	The project may be continued
ICAR-CRP/CPBG/CBE/PGR/2015/ R001: TNAU Coimbatore Center of Consortia Research Platform (CRP) of ICAR on Bio-fortification in selected crops for Nutritional Security-Low phytate maize	April' 2020 to Mar' 2025	Dr. A. John Joel Professor (DPB)	The project may be continued
<b>Forage Crops</b>			
CPBG/CBE/PBG/ FRG/2021/001 Evolving superior single cross fodder maize hybrid with desirable forage attributes.	Nov, 2020 to Oct, 2025	Dr. K.N. Ganesan Prof. & Head (Forages)	The project may be continued
CPBG/CBE/PBG/FRG/2020/001 Evolution of forage grass for high biomass and quality	April 2020 to March 2025	Dr. T. Ezhilarasi Asst. Prof. (PBG)	The project may be continued.
CPBG/CBE/PBG/FRG/2020/002 Evolving leguminous forage crops for high green fodder yield and quality	June 2020 to May 2025	Dr. T. Ezhilarasi Asst. Prof. (PBG)	The project may be continued.
CPBG/CBE/PBG/FRG/2020/003 Maintenance breeding in Forage Crops	Oct, 2020 to Sep, 2025	Dr. T. Ezhilarasi Asst. Prof. (PBG)	Nucleus/breeder seed production may be programmed as per the indents communicated by the DCPBG.

CPBG/CBE/PBG/MIL/2021/001 Evolving high green fodder yielding pearl millet varieties with enhanced crude protein	July, 2021 to June, 2026	Dr. Asish K Binodh Assoc. Prof. (PBG) Dr. K.N. Ganesan Prof. & Head (Forages)	Advanced progenies may be evaluated for fodder quality. The project may be continued.
CPBG/TRY/PBG/BUF/ 2020/001 Development of high yielding Buffel grass ( <i>Cenchrus</i> sp.)	September 2020 to August 2025	Dr. A. Thanga Hemavathy Assoc. Prof. (PBG) ADAC&RI, Trichy	The project may be continued. The promising <i>Cenchrus</i> culture TRC 20-007 may be registered with NPBGR and documented.
<b>II. AICRP Projects – 06</b>			
<b>Sorghum</b>			
AICRIP/PBG/CBE/SOR/006- ICAR – All India Coordinated Research Project on Sorghum (Grain and Forage)	Continuous Project	Dr. R. Chandirakala Professr (PBG) Dr. D. Kavithamani Asst. Prof. (PBG)	The Coordinated trials may be laid out and promising entries have to be utilized in the crossing programme.
<b>Pearl millet</b>			
AICRP /PBG/CBE/PEM/009- ICAR- All India Coordinated Research Project on pearl millet	Continuous Project	Dr. K. Iyanar Professor (PBG) Dept. of Millets	Efforts may be taken to identify the potential of AICRP nominated entries and utilization for improvement of yield plateau.
<b>Maize</b>			
AICRP/PBG/CBE/MAZ/004- Evaluation of hybrids and composites from All India Coordinated Research Project on Maize	Continuous Project	Dr. S. Sivakumar Prof. and Head (Millets) Dr.N. KumariVinodhana Asst. Professor (PBG)	Hybrids with high yielding potential may be identified and evaluated for its suitability to Tamil Nadu and nominated for AICRP trials
AICRP/PBG/VGI/MAZ/005 ICAR – AICRP on Maize	Continuous Project	Dr.K.R.V. Sathya Sheela Asst.Professor (PBG) MRS, Vagarai	Hybrids with high yielding potential may be identified and evaluated for its suitability to rainfed situation in Tamil Nadu and nominated for AICRP trials
<b>SMALL MILLETS</b>			
AICRP/PBG/ATL/SMM/008 All India Co-ordinated Research Project on Small Millets (D32 BA)	Continuous Project from 2015	Dr. M. Vaithiyalingan Professor and Head CEM, Athiyanthal	The Coordinated trials may be laid out and promising entries have to be utilized in the crossing programme.
<b>Forage crops</b>			
<b>AICRP/PBG/CBE/FCR/026</b> AICRP on Forage Crops	August 2020 to March 2022	Dr. K.N. Ganesan Prof.& Head (Forages)	The elite cultures identified from breeding programmes may be nominated for AICRP evaluation. AICRP Trials may be laid out as per the technical programme

## II. CROP MANAGEMENT

### A. Technologies for adoption and OFT Adoption

#### 1. Studies on the production potential of foxtail millet + oilseed intercropping systems in Tamil Nadu

Foxtail millet + Sesame at 4:1 ratio recorded Foxtail millet Equivalent yield (FEY) of 2344 kg ha<sup>-1</sup> with benefit cost ratio of 2.99. This inter cropping system is recommended for cultivation of foxtail millet in plains. Foxtail millet + Niger at 4:1 ratio, performed better with less pest & disease incidence with BCR of 2.91. This type of inter cropping system is recommended for hilly areas.

#### 2. Farmer's participatory validation of TNAU organic package of practices in finger millet

TNAU organic package of practices comprised of FYM @ 3 t ha<sup>-1</sup> during last ploughing, *Azophos* @ 2 kg ha<sup>-1</sup> and *Trichoderma viride* @ 2.5 kg ha<sup>-1</sup>, Vermicompost at 1.5 t ha<sup>-1</sup> in two equal splits at basal and 30 DAS, Panchagavya 3% at vegetative, flowering and grain filling stage and need based application of NSKE 5% and *Bacillus subtilis* at 0.5% is recommended for obtaining higher grain yield (2700kg ha<sup>-1</sup>) with BCR of 1.79.

#### 3. Evaluation of organic production systems in pearl millet, barnyard millet, finger millet

##### Pearlmillet

Organic nutrient management (50 % N requirement through organic manures (FYM @ 3.5 t ha<sup>-1</sup> + vermicompost @ 1.5 t/ha) + seed/seedling treatment with beejamrith + ghanajeevamrith @ 250 kg ha<sup>-1</sup>, jeevamrith @ 500 litres/ha/time twice a month with irrigation water is recommended for organic production of pearl millet.

##### Finger millet

Organic nutrient management (50% N requirement through organic manures (FYM @ 3.0 t ha<sup>-1</sup> + vermicompost at 1.5 t ha<sup>-1</sup>) + seed/seedling treatment with beejamrith + ghanajeevamrith @ 250 kg ha<sup>-1</sup>, jeevamrith @ 500 litres/ha/time twice a month with irrigation water is recommended for organic production of finger millet.

##### Barnyard millet

Organic nutrient management (50 % N requirement through organic manures (FYM @ 2.0 t ha<sup>-1</sup> + vermicompost at 1.0 t ha<sup>-1</sup>) + seed/seedling treatment with beejamrith + ghanajeevamrith @ 250 kg ha<sup>-1</sup>, jeevamrith @ 500 litres/ha/time twice a month with irrigation water is recommended for organic production of barnyard millet.

#### 4. Grain cum fodder production in maize under irrigated condition

Sowing of dual purpose (Grain + Green Fodder) maize at 30 cm x 25 cm spacing against 60 cm x 25 cm on both side of ridges and harvested alternate rows at tasseling (50 DAS) stage for green fodder purpose recorded higher green fodder yield of 16.6 t/ha and grain yield of 6636 kg ha<sup>-1</sup> with net returns of Rs. 76,510 ha<sup>-1</sup> and BCR of 1.97.

## **5. Development of foliar formulation for yield enhancement in Finger millet**

Application of Foliar formulation @1.5% at flower initiation stage improved the partitioning efficiency and grain yield (18%) in finger millet under irrigated and 19 % under rainfed condition with maximum Harvest Index of 3.7.

### **On Farm Trial (OFT)**

#### **1. Integrated weed management approaches for irrigated Finger millet**

##### **Objective**

- ❖ To evaluate the effectiveness of different weed control methods on finger millet productivity and cost effectiveness under irrigated condition.

##### **Treatments**

T<sub>1</sub> Conventional

T<sub>2</sub> Oxyfluorfen 0.05 kg/ha as pre-emergence followed by Power weeder on 30 DAT

**Coordinating Centre:** Dr. C. Sivakumar, RRS, Paiyur

**Sub Centres:** Dr. V. Vasuki, Dept. of Millets, TNAU, Coimbatore

Dr. K. Sathiya, CEM, Athiyandal

##### **Observations to be recorded**

Weed density, WCE, yield parameters, grain yield and economics of finger millet.

#### **2. Cost effective farm mechanization for Finger millet**

##### **Objectives**

- ❖ To study the effect of different mechanized practices like sowing, weeding, drone and harvester on productivity, cost economics, drudgery reduction and energy use efficiency.

##### **Treatments**

T<sub>1</sub> Conventional

T<sub>2</sub> Seed drill sowing with 40 cm spacing + Pre emergence herbicide application with drone + Foliar formulation (1.5 %) through drone + Power weeder + Combine harvester

**Coordinating Centre:** Dr. P. Parasuraman, Prof and Head, Dept. of Agronomy, TNAU, Coimbatore and Dr. C. Sivakumar, RRS, Paiyur

**Sub Centres:** Dr. P. Kathirvelan, Dept. of Millets, TNAU, Coimbatore

Dr. K. Sathiya, CEM, Athiyandal

##### **Observations to be recorded**

Yield attributes and yield, energy use efficiency, labour utilization and economics.

#### **3. Finger millet intercropping with blackgram under irrigated ecosystem**

##### **Objective**

- ❖ To evaluate finger millet + blackgram intercropping system for enhancing the cropping system productivity *vis-a-vis* sustaining the soil fertility under irrigated ecosystem

##### **Treatments**

T<sub>1</sub> : Sole crop

T<sub>2</sub> : Finger millet intercropping with black gram (4:1)

**Coordinating Centre:** Dr. K. Sathiya, CEM, Athiyandal

**Sub Centres:** Dr. C. Sivakumar, RRS, Paiyur

Dr. R. Karthikeyan, Directorate of CM, TNAU, Coimbatore

Dr. K. Ayyadurai, AC&RI, Vazhavachanur

**Observations to be recorded**

Yield attributes and yield, system productivity and economics

**4. Improving terminal drought tolerance of sorghum through foliar spray of nanoceria**

**Objective:** To study the effects of nanoceria in sorghum

Season: *Kharif / Rabi*, 2023

Design: RBD

Treatments	Mode of application and stage of stress	Stage of application
T <sub>1</sub> - Water spray	Hand spray	Two sprays: (1) One week after flowering and (2) 1 week thereafter
T <sub>2</sub> - Nanoceria @ 25 mg L <sup>-1</sup> spray*		

**Duration of stress:** 21 days

\*Nanoceria will be provided by the Department of Crop Physiology, TNAU, CBE

**Replications:** 4

**Variety:** Preferred variety at your station / KVK/region

**Scientist in charge**

S. No.	Name and designation	Place of work
1.	Dr. M. Djanaguiraman, Associate Professor	Dept. of Crop Physiology, TNAU, Cbe
2.	Dr. K. Ananthi, Assistant Professor	AC&RI, Vazhavachanur
3.	Dr. S. Srinivasan, Professor	AC&RI, Killikulam
4.	Dr. K. Krishna Surendar, Assistant Professor	RRS, Arupukottai
5.	Dr. E. Subramanian, Associate Professor	KVK, Madurai
6.	Dr. S. Manoharan, Assistant Professor	ARS, Kovilpatti

**For Information**

**1. Effect of leaf extract on weed management of little millet (*Panicum sumatrense*)**

Pre emergence application (PE) leaf extracts did not affect the germination, growth and yield of little millet. PE Teak leaf extract @ 30% reduced the broad-leaved weed density with weed control efficiency of 65.32 % and higher seed yield of 3983 kg/ha while, castor and papaya @ 30% reduced the grasses weed density in little millet.

**2. Maximization grain nutrient content in proso millet**

Application of humic acid 20 kg ha<sup>-1</sup> along with RDF and ZnSO<sub>4</sub> registered higher grain yield of 1312 kg ha<sup>-1</sup>, B:C ratio of 2.81.

**3. Understanding drought tolerance mechanism in sorghum**

Drought stress decreased the chlorophyll index (26%), seed set percentage (40%), individual seed weight (11%), and seed yield (47%) compared to irrigated control. Among the traits, the grain size is strongly associated with stay green

score. Stay green lines had a deeper and an extensive root system, and lower transpiration rate under drought than senescent lines

#### **4. Effect of different nitrogen sources on growth, yield and quality of fodder maize**

RDF for fodder maize 60:40:20 kg NPK ha<sup>-1</sup>, in which 30:40:20 kg NPK ha<sup>-1</sup> is applied as basal and remaining 30 kg N is top dressed through Nano Urea (725 ml ha<sup>-1</sup>) as foliar application recorded highest green fodder yield of 58 t ha<sup>-1</sup> (12% increase) than top dressing through soil application.

#### **5. Integrated nutrient management approaches under different land configuration methods for sustainable rainfed maize productivity in vertisol**

Higher maize grain yield of 5800 ha<sup>-1</sup>, rain water use efficiency of 19.41 kg /ha mm and benefit cost ratio of 2.27 recorded under Broad Bed Furrow with 20 kg N (vermicompost) + 20 kg N/ha (Urea) + 3%, Panchakavya spray on 25-35 DAS.

#### **6. Nutrition enhancement (Fe & Zn) of Pearl millet through Agronomic fortification**

Application of 100 % recommended dose of NPK and Zn as Zn SO<sub>4</sub> @ 25 kg/ha through soil and foliar application of Zn SO<sub>4</sub> @ 0.5 % + FeSO<sub>4</sub> @ 0.5 % + Nano urea @ 5 ml/litre of water recorded higher yield of 3245 kg/ha and net returns of Rs.42155/ha with BCR of 2.18.

### **New Action Plan (2023)**

#### **1. Assessing dry fodder yield and quality parameters of promising maize hybrid as influenced by preservation technique (Hay)**

##### **Objective**

- ❖ To study the suitability of promising maize hybrids on fodder preservation techniques for higher palatability and milk yield

##### **Treatments**

##### **Main plot- Hybrids**

- M<sub>1</sub> –TNAU Maize hybrid CO 6
- M<sub>2</sub> - TNAU Maize hybrid CO H (M) 8
- M<sub>3</sub> - TNAU Maize hybrid CO H (M) 11

##### **Sub plots- Preservative methods**

- S<sub>1</sub> –Control (Dry stover)
- S<sub>2</sub> - Stover block
- S<sub>3</sub> - Dry stover fortified with 1% salt + 2% mineral mixture
- S<sub>4</sub> - Stover block fortified with 1% salt + 2% mineral mixture

**Design:** Split Plot Design, **Replication:** Three, **Period:** 2023-24

**Coordinating Centre:** Department of Agronomy, TNAU, Coimbatore

Dr. R. Karthikeyan, Dr. P. Kathirvelan, and Dr. M. Thirunavukkarasu

**Sub Centres:** MRS, Vagarai: Dr. T. Selvakumar and Dr. N. Satheeshkumar

ARS, Bhavanisagar: Dr. K. Ramah

#### **1. Quantifying the efficacy of liquid maize maxim formulation on maize yield applied through drone**

##### **Objective**

To quantify the efficacy of maize maxim liquid formulation applied through drone.

##### **Treatments**

- T<sub>1</sub> - Control - Water spray



- T<sub>2</sub>- Control - TNAU Maize maxim spray (powder form @ 1.5%)
- T<sub>3</sub>- Control - TNAU Maize maxim (powder form @ 3%)
- T<sub>4</sub>- 3% Liquid maize maxim formulation
- T<sub>5</sub>- 4% Liquid maize maxim formulation
- T<sub>6</sub>- 5% Liquid maize maxim formulation

**Design:** RBD, **Replication:** Three, **Season:** *Kharif*, **Period:** 2023-24

**Coordinating Centre:** Dept. of Crop Physiology, TNAU, Coimbatore

Dr. M. Djanaguiraman

**Sub Centres:**

RRS, Aruppukottai : Dr. V. Rajababu

AC&RI, Vazhavachanur : Dr. K. Ananthi

MRS, Vagarai : Dr. T. Selvakumar

**3. Standardization of detopping techniques on grain and fodder yield of newly released maize hybrid COH (M)11**

**Objective:**

To study the effect of different stages of detopping on grain and fodder yield of maize hybrid COH(M) 11

**Treatments**

Factor I (Time of detopping)

T<sub>1</sub>. 80 DAS

T<sub>2</sub>. 85 DAS

T<sub>3</sub>. 90 DAS

Factor II (Level of detopping)

T<sub>1</sub>. Detopping upto 2 leaves

T<sub>2</sub>. Detopping upto 4 leaves

T<sub>3</sub>. Detopping upto 6 leaves

T<sub>4</sub>. Control (No detopping)

Design: FRBD, Replication: Three

Period: 2023-2024

\*Detopped green foliage will be preserved as silage in poly bags and utilized during lean period.

**Coordinating Centre:** Dept. of Agronomy, TNAU, Coimbatore: Dr. P. Kathirvelan

**Sub Centre:** MRS, Vagarai: Dr. T. Selvakumar

**Remarks of the Ongoing URPs/AICRPs/Externally Funded Projects in Crop Management**

S. No.	Project No. and Title	Project leaders	Remarks
<b>Sorghum</b>			
1.	DCM/KPT/AGR/SOR/2020/001: Conservation Agriculture for Rainfed Sorghum under Vertisols	Dr. G. Guru Assoc. Prof. (Agronomy) Dr. V. Sanjivkumar Asst. Professor (SS&AC)	Project to be continued and the results given for information
2.	Action Plan Project: Understanding drought tolerance mechanism in sorghum	Dr. M. Djanaguiraman Assoc. Professor (CRP)	Project to be continued

3.	AICRP/PBG/CBE/SOR/006 Boron nutrition in <i>rabi</i> grain sorghum	Dr. S. Natarajan Asst. Prof. (Agronomy)	Project may be continued
4.	AICRP/PBG/CBE/SOR/006 Organic <i>rabi</i> sorghum production	Dr. S. Natarajan Asst. Prof. (Agronomy)	Project may be continued
5.	AICRP/PBG/CBE/SOR/006 Foliar nutrition for boosting of <i>rabi</i> sorghum productivity	Dr. S. Natarajan Asst. Prof. (Agronomy)	Project may be continued
6.	AICRP/PBG/CBE/SOR/006 Performance of pre-released sweet sorghum and high biomass bio fuel genotypes under rain fed environments	Dr. S. Natarajan Asst. Prof. (Agronomy)	Project may be continued
7.	ICAR/DCM/CBE/SOA/2015/R001 Network Project on Organic Farming: Evaluation and validation of natural farming ecosystem in sorghum-based cropping system	Dr. S. Krishnan Prof. & Head (NOFRC) Dr. M. Suganthi Prof. (AEN)	Project may be continued
8.	AICRP/ DCM/ KPT/ AGR/003 Response of sorghum varieties to sowing windows	Dr. J. Bhuvaneswari, Asst. Prof (Agronomy) ARS, Kovilpatti	Project may be continued
<b>Pearlmillet</b>			
9.	DCM/ KVK MDU/ MIL/ 2022 entitled "Nutrition enhancement (Fe &Zn) of Pearlmillet through Agronomic fortification"	Dr. S. Vallal Kannan, Assoc.Prof.(Agronomy) CSRC, Ramnad Dr. R. Renuka Assoc. Prof. (Biotech.) AC&RI, Madurai Dr. S. Arokiyarnary Assoc.Professor (FSN), AEC & RI, Kumulur Dr. T. Sivakumar Professor (CRP) AC&RI, Madurai	Project to be continued and complete grain quality analysis to be done and reported
10.	AICRP/PBG/CBE/PEM/009 Moisture conservation through polymers and crop residues under rainfed conditions	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project to be closed and technology proposed for adoption at 58 <sup>th</sup> Online Annual Group Meeting of AICRP – PM
11.	AICRP/PBG/CBE/PEM/009 Enhancing bio-fortified pearl millet hybrid productivity and quality through micronutrients under irrigated situation	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project may be continued
12.	AICRP/PBG/CBE/PEM/009 Contribution of production factors to the yield and economics of pearl millet	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project may be continued
13.	AICRP/PBG/CBE/PEM/009 Effect of tillage and nutrient management systems on pearl millet productivity	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project closed and technology proposed for adoption at 58 <sup>th</sup> Online Annual Group Meeting of AICRP – PM
14.	AICRP/PBG/CBE/PEM/009 Response of pearl millet to split application of nitrogen at different growth stages under irrigated condition	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project may be continued
15.	AICRP/PBG/CBE/PEM/009 PMAT - 7 Productivity of pearl millet [ <i>Pennisetum glaucum</i> (L.) R. Br.	Dr. V. Vasuki Assoc. Prof. (Agron.)	Project may be continued

	Emend. Stuntz] – Mustard / Chick pea cropping sequence as influenced by organic and natural farming		
16.	ICAR/DCM/CBE/SOA/2015/R001 Network Project on Organic Farming: Evaluation of organic, inorganic and integrated production systems in Pearl millet	Dr. R. Krishnan Prof. & Head Dr. M. Suganthy Prof. (AEN)	Project to be continued The findings recommended for adoption
<b>Maize</b>			
17.	DCM/VGI/AGR/MAZ/2020/001 Grain cum fodder production in maize based intercropping system under irrigated condition	Dr. T. Selvakumar Assoc. Prof. (AGR) & Head, MRS, Vagarai Dr. G. Sudhagar Asst. Prof. (Agron.) ARS, Vaigai Dam Dr. K. Ramah Assoc. Prof. (Agron.) ARS, Bhavanisagar	The findings recommended for adoption and large-scale demonstration may be conducted
18.	DCM/KPT/MIL/2022/001: Integrated nutrient management approaches under different land configuration methods for sustainable rainfed maize productivity in Vertisol	Dr. G. Guru Assoc. Prof. (Agron.) Dr. K. Baskar Professor (SS&AC)	Project to be continued and the results given for information
19.	AICRP/PBG/CBE/MAZ/004 Performance of pre release genotypes under varying planting density and nutrient levels in <i>Kharif</i> season (2022)	Dr. P. Kathirvelan Assoc. Prof. (Agron.)	Project may be continued
20.	AICRP/PBG/CBE/MAZ/004 Long term trial on integrated nutrient management in maize system	Dr. P. Kathirvelan Assoc. Prof. (Agron.)	Project may be continued
21.	AICRP/PBG/CBE/MAZ/004 Efficacy of nano urea in maize systems in sole maize	Dr. P. Kathirvelan Assoc. Prof. (Agron.)	Project may be continued
22.	AICRP/PBG/CBE/MAZ/004 Performance of pre-release genotypes under varying planting density and nutrient levels in <i>Rabi</i> season (2023)	Dr. P. Kathirvelan Assoc. Prof. (Agronomy)	Project may be continued
23.	AICRP/PBG/VGI/MAZ/005 (Agronomy)- Performance of pre-release genotypes under varying planting density and nutrient levels in <i>kharif</i> season	Dr. T. Selvakumar Assoc. Prof. (Agron.)	Project may be continued
24.	AICRP/PBG/VGI/MAZ/005 (Agronomy)- Efficacy of nano urea in maize	Dr. T. Selvakumar Assoc. Prof. (Agron.)	Project may be continued
25.	AICRP/PBG/VGI/MAZ/005 (Agronomy)- Performance of pre-release genotypes under varying planting density and nutrient levels in <i>Rabi</i> season	Dr. T. Selvakumar Assoc. Prof. (Agron.)	Project may be continued
26.	AICRP/ DCM/ KPT/ AGR/003. All India Coordinated Research Project on Agrometeorology - Effect of micro environments on phenology, thermal requirements and grain yield of prominent <i>rabi</i> maize hybrids under rainfed condition.	Dr. S. Kokilavani, Asst. Prof. (Agrl. Meteorology)	Project may be continued

<b>Sweet Corn Hybrid</b>			
27.	Action Plan 2022: Optimizing spacing and nutrient levels for pre-release sweet corn hybrids	Dr. S. Sivakumar, Professor & Head Dr. P. Kathirvelan, Assoc. Prof. (Agronomy), Dept. of Millets Dr. C. Bharathi, Assoc. Prof. (SS & AC)	New pipe line hybrids may be included in the treatment and project to be continued.
<b>Small millets</b>			
28.	Action Plan 2022: Optimizing Technology Package for Tenai	Coordinating Centre Dr. P. Kathirvelan, Asst. Prof. (Agron.) Dept. of Millets Dr. S. Kavitha, Asst. Prof. (SST), Dept. of SST Dr. C. Sivakumar, Prof (Agron), RRS, Paiyur Dr. K. Sathya, Asst. Prof. (AGR), CEM, Athiyandal	Project to be continued
29.	Action Plan 2022: Grain nutritional maximization in Proso Millet	Dr. K. Sathya Assoc. Prof. (Agronomy) CEM, Athiyandal	Project to be continued and complete grain quality analysis to be done and reported
30.	DCM/PAI/AGR/SMM/2020/001: Evaluation of cost-effective mechanization in Finger Millet ( <i>Eleusine coracana</i> L.) cultivation	Dr. P. Parasuraman Prof & Head, Dept. of Agronomy, Dr. C. Sivakumar Prof. (Agron), RRS, Paiyur Dr. R. Thiyagarajan Assoc. Prof. (Farm Machi.), AEC&RI, Kumalur	The findings recommended for adoption and project to be closed
31.	DCM/ATL/CRP/SMM/2020/001 Physiological evaluation of Tenai and Panivaragu genotypes for low temperature tolerance	Dr. K. Ananthi Asst. Prof. (CRP)	Project to be closed and results given for information
32.	ICAR/DCM/CBE/SOA/2015/R001 Network Project on Organic Farming: Evaluation of organic, inorganic and integrated production systems in finger millet	Dr. R. Krishnan, Prof and Head Dr. M. Suganthy, Prof. (Agrl. Ento.)	Project to be continued
33.	AICRP/PBG/ATL/SMM/008 Response of pre-released Kodomillet varieties to different levels of fertilizer under rainfed conditions	Dr. K. Sathya Assoc. Prof. (Agron.) CEM, Athiyandal	Project to be continued
34.	AICRP/PBG/ATL/SMM/008 Response of Kodomillet to liquid bio fertilizers and their mode of application	Dr. K. Sathya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
35.	AICRP/PBG/ATL/SMM/008 Response of Brown top millet to liquid biofertilizers and their mode of application	Dr. K. Sathya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued

36.	AICRP/PBG/ATL/SMM/008 Response of millets to different doses of potassium nutrient	Dr. K. Sathiya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
37.	AICRP/PBG/ATL/SMM/008 Effect of mulching and hydrogel on the productivity of Banyard millet under rainfed conditions	Dr. K. Sathiya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
38.	AICRP/PBG/ATL/SMM/008 Effect of foliar application of water-soluble fertilizer (WSF) on growth, yield and nutrient uptake of kodomillet	Dr. K. Sathiya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
39.	AICRP/PBG/ATL/SMM/008 Intensification of rain-fed small millet production	Dr. K. Sathiya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
40.	AICRP/PBG/ATL/SMM/008 Assessing the performance and yielding ability of millets in Rice fallows	Dr. K. Sathiya Assoc. Prof. (Agron.) CEM, Athiyandal	Project may be continued
<b>Forage Crops</b>			
41.	DCM/CBE/FC/AGR/MIL/2022/001 Effect of different nitrogen sources on growth, yield and quality of fodder maize	Dr. S. Rani, Asst. Professor (AGR) Dept. of Forage Crops Dr.N. Satheeshkumar Assoc. Prof (Agron.) MRS, Vagarai	Project may be continued and drone application may be carried out to reduce the application (spraying) cost of Nano Urea
42.	AICRP/PBG/CBE/FCR/026 Studies on organic source of nutrient on green forage yield and quality of fodder Cowpea - Fodder maize under irrigated situation.	Dr. S. Rani Asst. Professor (AGR)	Project may be continued
43.	AICRP/PBG/CBE/FCR/026 Yield maximization in fodder maize through micro-nutrients and bio-fertilizers	Dr.S. Rani Asst. Professor (AGR)	Project may be continued

### Large Scale Demonstrations in Farmers' field during 2023 - 2024

S. No.	Title of the technology	Location and Demonstrations (Nos.)	Scientists In-charge
<b>AGRONOMY</b>			
1.	System of Finger millet Intensification (SFI) for rainfed agro ecosystem.	Dept. of Agronomy, Coimbatore (5)	Dr. V. Vasuki
		CEM, Athiyandal (5)	Dr. K. Sathiya
		RRS, Paiyur (5)	Dr. C. Sivakumar
		AC&RI, Vazhavachanur (5)	Dr. P. Ayyadurai
2.	Enhancing the productivity of Nutri-Cereals through supplemental irrigation and moisture conservation	KVK, Tirur (5)	Dr. K. Sivagami
		Dept. of Agronomy, Coimbatore (5)	Dr. S. Natarajan
		ARS, Kovilpatti (5)	Dr. B. Arthi Rani
		DARS, Chettinad (5)	Dr. R. Babu
3.	Grain cum fodder production in maize under irrigated condition	CEM, Athiyandal (5)	Dr. K. Sathiya
		KVK, Tirur (5)	Dr. K. Sivagami
		Dept. of Agronomy, Coimbatore (5)	Dr. P. Kathirvelan
		MRS, Vagarai (10)	Dr. T. Selvakumar
4.		CRS, Veppanthattai (5)	Dr. S. Somasundaram
		ORS, Tindivanam (5)	Dr. S. Thiruvassan
4.		Dept. of Agronomy, Coimbatore (5)	Dr. P. Kathirvelan

	Weed management for irrigated maize	MRS, Vagarai (5)	Dr. T. Selvakumar
		CRS, Veppanthattai (5)	Dr. S. Somasundaram
		RRS, Aruppukottai (5)	Dr. Chelvi Ramesh
		ARS, Kovilpatti (5)	Dr. S. Manoharan
5.	Biofortification of pearl millet hybrid with iron and zinc application through soil and foliar	Dept. of Agronomy, Coimbatore (3)	Dr. V. Vasuki
		RRS, Aruppukottai (7)	Dr. Chelvi Ramesh
		AC&RI, Vazhavachanur (5)	Dr. P. Ayyadurai
		ORS, Tindivanam (10)	Dr. S. Thiruvarassan
		ARS, Kovilpatti (5)	Dr. J. Bhuvaneshwari
6.	Optimizing the feedstuffs for air evacuating method of silage production in polybags	Dept. of Agronomy, Coimbatore (5)	Dr. S. Rani
		MRS, Vagarai (5)	Dr. N. Satheeskumar
<b>CROP PHYSIOLOGY</b>			
7.	Ragi booster	AC&RI, Vazhavachanur (10)	Dr. K. Anandhi
		ADAC&RI, Trichy (10)	Dr. R. Amutha
		KVK, Trichy (10)	Dr. S. Nithila
		MRS, Vagarai (10)	Dr. T. Selvakumar
<b>ORGANIC FARMING</b>			
8.	Organic production technology for barnyard millet	NOFRC, Coimbatore (5)	Dr. M. Suganthy Dr. P. Kathirvelan
		CEM, Athiyandhal (5)	Dr. K. Sathiya
		RRS, Paiyur (5)	Dr. C. Sivakumar
9.	Organic production technology for finger millet	NOFRC, Coimbatore (5)	Dr. M. Suganthy Dr. P. Kathirvelan
		CEM, Athiyandhal (5)	Dr. K. Sathiya
		RRS, Paiyur (5)	Dr. C. Sivakumar

## DIRECTORATE OF NATURAL RESOURCE MANAGEMENT

### Projects reviewed

Department	OFT	Action Plan	Research Projects	Student Thesis	Total	Scientists involved
Soil Science & Agrl. Chemistry	4	1	6	2	13	17
Agricultural Microbiology	-	3	2	2	7	6

### I. Technologies for Adoption/OFT

#### A. Adoption

##### 1. STCR-IPNS based Fertiliser Prescriptions

###### a. Hybrid Maize under Drip Fertigation

Results of the six validation experiments conducted at farmers' holdings proved the validity of the fertiliser prescriptions for hybrid maize grown on Palaviduthi soil series under drip fertigation. STCR-IPNS-10 t ha<sup>-1</sup> is ideal and recorded the highest grain yield of maize (9.57 t ha<sup>-1</sup>), response ratio (14.6 kg kg<sup>-1</sup>) and BCR (2.38) with the yield increase of 29.7 & 15.7% over blanket & blanket + FYM @ 12.5 t ha<sup>-1</sup> respectively. For a soil test value of 144:27.5:185 kg NPK ha<sup>-1</sup>, the fertiliser saving was 81: 7: 10 kg NPK ha<sup>-1</sup> respectively under drip fertigation over soil application. Therefore, it can be recommended for Hybrid Maize under Drip Fertigation for achieving higher yield, RR & BCR on Palaviduthi soil series.

###### b. Barnyard millet

The results of the on-farm trials conducted at three locations (Veerapandi, Coimbatore Dt., Palavadi, Dharmapuri Dt. and Devankottai, Sivagangai Dt.) proved the validity of the STCR-IPNS based Fertiliser Prescriptions for Barnyard millet on Mixed black calcareous soils (Periyanaickenpalayam soil series). Among the treatments, STCR – IPNS - 3 t ha<sup>-1</sup> recorded the highest grain yield (2.80 t ha<sup>-1</sup>), response ratio (15.75 kg kg<sup>-1</sup>) and BCR (1.91) as compared to blanket and farmer's fertilisation practice with soil fertility maintenance. The increase in grain yield due to STCR-IPNS 3 t ha<sup>-1</sup> over blanket (RDF + 12.5 t ha<sup>-1</sup>) and farmer's practice was 16.2 and 48.9 per cent respectively. Fertiliser saving was 19: 3 kg ha<sup>-1</sup> of FN: FP<sub>2</sub>O<sub>5</sub> respectively for Barnyard millet on Periyanaickenpalayam series, if SN: SP is 201:26 kg ha<sup>-1</sup>. Therefore, STCR-IPNS based Fertiliser Prescriptions for Barnyard millet can be recommended to Periyanaickenpalayam soil series of Tamil Nadu.

###### c. Foxtail millet

The results of five validation experiments conducted at farmers' holdings indicated that the fertiliser prescriptions of foxtail millet on mixed black calcareous sandy clay loam soil (Periyanaickenpalayam series) recorded the highest mean grain yield (2.22 t ha<sup>-1</sup>), response ratio (12.22 kg kg<sup>-1</sup>) and BCR (2.01) with STCR - IPNS - 2.25 t ha<sup>-1</sup>. The mean increase in yield due to STCR - IPNS - 2.25 t ha<sup>-1</sup> was 19.3 per cent over blanket + FYM. The increase in RR and BCR was 3.56 kg kg<sup>-1</sup> and 0.19 respectively. Fertiliser saving was 5.5:3 kg ha<sup>-1</sup> of FN: FP<sub>2</sub>O<sub>5</sub> respectively for foxtail

millet on Periyanaickenpalayam series, if SN: SP is 203:28 kg ha<sup>-1</sup>. Therefore, it can be recommended for achieving higher yield, RR & BCR for foxtail millet on Periyanaickenpalayam soil series.

## **2. Evaluation of amendments and microbial consortia for improving the productivity of Maize and Groundnut on Calcareous soils**

The results of ten OFTs conducted at various locations for improving the yield of hybrid maize on calcareous soils revealed that basal soil application of STCR - NPK + 40 kg sulphur as elemental sulphur + 12.5 t FYM + 500 ml calcite dissolving microbial consortia ha<sup>-1</sup> (*Acinetobacter calcoaceticus*, *A. pittii* and *Bacillus subtilis*) recorded higher grain (27.2%) and stover yield over farmer's practice. The improved yield was ascribed to the reduction in soil pH (10-15%), free CaCO<sub>3</sub> (20-30%) and increased nutrient availability (23.5 - 32.5%). Two field days and exhibitions were organized to the farmers of Namakkal and Coimbatore districts and about 81 farmers participated and benefitted.

## **3. Economizing Phosphorus use in Maize - Groundnut sequence**

Results of the on farm trials conducted with maize (hybrid CO 6) and groundnut (*var.*VRI 8) at three locations (Bhavanisagar, Coimbatore and Kumulur) in soils of medium phosphorus status showed that application of 75% RDP as Chitosan coated DAP to maize and groundnut recorded higher mean grain / pod yield (6870 kg ha<sup>-1</sup> in maize and 2377 kg ha<sup>-1</sup> in groundnut), B: C ratio (2.77), per cent phosphorus recovery (49.35) and partial factor productivity (16.93 kg grain / kg nutrient applied) when compared to the treatments *viz.*, 100% RDP as SSP to maize and groundnut and 75% RDP as Chitosan coated DAP to maize and 100 % RDP as SSP to groundnut.

## **4. Evaluation of sorghum varieties for their tolerance to sodicity**

The results of the on-farm trials conducted at four locations (ADAC&RI, Trichy; AC&RI, Kudumiyamalai; KVK, Villupuram and RRS, Paiyur) revealed that among the sorghum varieties (CO 30, K12 & Red *Cholam*) tolerance to sodicity, CO 30 sorghum variety is best suited for getting higher productivity in sodic soils having the ESP up to 32% and K12 recorded higher yield in sodic soil only upto the ESP of 24%.

### **B. For Information**

#### **Long Term Fertilizer Experiment (LTFE), Coimbatore: Finger Millet-Maize sequence**

After 50 years of continuous cropping, INM practice of 100 % NPK +FYM @10 t ha<sup>-1</sup> increased the grain yield of finger millet 2673 kg ha<sup>-1</sup> and maize 6396 kg ha<sup>-1</sup>. Yield increase in INM was 19.9 % and 16.2% over 100% NPK in Finger millet (112<sup>th</sup> crop) & Maize (113<sup>th</sup> crop). Organic carbon increased from 3.0 g kg<sup>-1</sup> (1972-76) to 7.27 g kg<sup>-1</sup> (2022-23) in INM. Imbalanced nutrient application recorded significantly lower Sustainable Yield Index (SYI) values. INM registered high SYI both in maize (0.31) and finger millet (0.54).

#### **Permanent Manurial Experiment, Coimbatore: Maize – Sunflower sequence**

**Maize:** STCR-IPNS recorded the highest grain yield (8223 kg ha<sup>-1</sup>) followed by 100% NPK+FYM @ 12.5 t ha<sup>-1</sup> (7625 kg ha<sup>-1</sup>)



**Sunflower:** STCR–IPNS recorded the highest seed yield (2390 kg ha<sup>-1</sup>) followed by 100% NPK + FYM @ 12.5 t ha<sup>-1</sup> (2327 kg ha<sup>-1</sup>) besides sustained yield over years

**Soil organic Carbon built up {3.2 g kg<sup>-1</sup> during 1909}:** 4.23 g kg<sup>-1</sup> (control); 9.10 g kg<sup>-1</sup> (INM) and 9.06 g kg<sup>-1</sup> (STCR-IPNS) and 6.30 g kg<sup>-1</sup> (100% NPK alone) during 2022. Significant increase of active pool of microbial biomass carbon (339 mg kg<sup>-1</sup>) and microbial biomass nitrogen (52.7 mg kg<sup>-1</sup>) was recorded in INM.

### **Permanent Manurial Experiment, Kovilpatti: Cotton-Maize rotation (rainfed Vertisols)**

The results of 40 years PME experiment on Cotton – Maize rotation under rainfed *Vertisol* revealed that 100% RDF (40:20:40 N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O kg ha<sup>-1</sup>) + 25 kg ZnSO<sub>4</sub> ha<sup>-1</sup> recorded the highest grain yield (4832 kg ha<sup>-1</sup>) than sub optimal doses of 50 % Inorganic N + 50 % organic N (FYM) + 50 % P + 50 % K (4688 kg ha<sup>-1</sup>) under rainfed *Vertisol*. Declining trend of SOC was recorded from 4.3 to 3.6 g kg<sup>-1</sup> after 40 years (1982-2022) of continuous cropping on *Vertisol*. Regarding soil nutrients, built up of KMnO<sub>4</sub>-N (80 to 168 kg ha<sup>-1</sup>), Olsen-P (10 to 17.8 kg ha<sup>-1</sup>) and NH<sub>4</sub>OAc-K (586 to 620 kg ha<sup>-1</sup>) was recorded over four decades.

### **Modeling and Predicting Soil Carbon Sequestration of Semi - arid Alfisols as influenced by Nutrient Management**

Roth C and DSSAT models were used to predict the soil carbon sequestration potential and yield productivity (2008 - 2023) of Sunflower – Maize sequence. Roth C predicted the soil carbon sequestration potential of 147 kg ha<sup>-1</sup> yr<sup>-1</sup> during 2032 and it showed an improvement in the future years under 100% NPK + FYM plots. The model output revealed that INM practices showed better in terms of yield and sustained soil health.

### **Zinc nutrition for improving yield and quality of Barnyard millet**

Application of Soil test based NPK + 20 kg ZnSO<sub>4</sub> ha<sup>-1</sup> recorded the higher grain yield (2606 kg ha<sup>-1</sup>) and BCR (2.43) with a yield increase of 27.1% over NPK alone in barnyard millet. Similarly grain quality parameters *viz.*, higher protein, starch, amylose, amino acids, crude protein and crude fibre recorded higher with 20 kg ZnSO<sub>4</sub> ha<sup>-1</sup> along with soil test based NPK in clay loam soil. Positive effect was observed with foliar spraying upto 0.75% ZnSO<sub>4</sub> spray twice at vegetative and flowering stages (12.9% BCR:2.18)

## **I. Action Plan proposed for 2023-2024**

### **Action Plan 1: Evaluation of TNAU – WSF in Hybrid Maize through fertigation**

#### **Rationale**

✓ Economizing the NUE of TNAU - WSF on Hybrid Maize through fertigation

#### **Objectives**

To assess the effect of TNAU-WSF on growth, yield and NUE of hybrid maize and its effect on soil quality through fertigation

**Test Crop: Hybrid maize; Duration:** 1 Year (2023-2024)

#### **Treatments**

T<sub>1</sub>: RDF (as per CPG 2020) soil application

T<sub>2</sub>: 75 % RDF for fertigation (188:56:56 N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O) (as per CPG 2020)  
 T<sub>3</sub>: 100 kg TNAU-WSF & Balance of N & K through fertigation  
 T<sub>4</sub>: 80 kg TNAU-WSF & Balance of N & K through fertigation  
 T<sub>5</sub>: 60 kg TNAU-WSF & Balance of N & K through fertigation  
 T<sub>6</sub>: 100 kg TNAU-WSF & Balance of N & K through fertigation + TNAU-WSF (2% spray thrice at critical growth stages)  
 T<sub>7</sub>: 80 kg TNAU-WSF & Balance of N & K through fertigation + TNAU-WSF (2% spray thrice at critical growth stages)  
 T<sub>8</sub>: 60 kg TNAU-WSF & Balance of N & K through fertigation + TNAU-WSF (2% spray thrice at critical growth stages)  
 T<sub>9</sub>: 100 kg TNAU-WSF & Balance of N & K through fertigation + Nano urea spray thrice at critical growth stages  
 T<sub>10</sub>: 80 kg TNAU-WSF & Balance of N & K through fertigation + Nano urea spray thrice at critical growth stages  
 T<sub>11</sub>: 60 kg TNAU-WSF & Balance of N & K through fertigation + Nano urea spray thrice at critical growth stages

**Lead Centre:** Dept. of SS & AC, Coimbatore  
 Coordinating Scientist: Dr. S. Thiyageshwari, Professor (SS & AC)  
**Centre II – Maize Research Station, Vagarai**  
 Scientist: Dr. T. Selvakumar, Associate Professor (AGR) & Head

### Observations and Analysis

- Biometric observations
- Soil available nutrients at critical stages of plant growth
- Yield and yield attributes
- Nutrient use efficiency
- Irrigation use efficiency
- Economics

### Action Plan 2: Optimization of fertilizer levels for hybrid maize under rainfed *Vertisols* tract of Southern Tamil Nadu

#### Rationale

- ✓ 72% area of maize production accounted by Thoothukudi, Dindigul, Perambalur, Salem, Virudhunagar, Tiruppur & Erode.
- ✓ Precise use of nutrient management of N fertilizer in Maize is needed for both economic and environmental reasons.
- ✓ No specific fertilizer recommendation is available for rainfed hybrid maize in the *Vertisol* tracts of Southern Tamil Nadu.

#### Objectives

- ✓ To optimize the fertilizer dose for higher productivity of rainfed hybrid maize
- ✓ To quantify the nutrient budgeting in rainfed hybrid maize under *Vertisol* condition

#### Treatments

T<sub>1</sub> : Absolute control  
 T<sub>2</sub> : 40:20:0 N:P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O kg ha<sup>-1</sup> (RDF for *Vertisol*)  
 T<sub>3</sub> : 188:56:56 (75% RDF of Irrigated hybrid maize)  
 T<sub>4</sub> : 125:38:38 N:P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O kg ha<sup>-1</sup> (50% RDF of Irrigated hybrid maize)  
 T<sub>5</sub> : T<sub>3</sub> + Nano N spray two times (at critical stages)

**Project Period:** Two years (Sep. 2023 - Aug. 2025)

**Centre & Scientist In-charge**

Dr. K. Baskar, Professor and Head & Chief Scientist AICRPDA

Dr. V. Sanjivkumar, Asst. Professor (SS&AC), ARS, Kovilpatti

**Action Plan 3: Effect of Long-term irrigation of dairy soiled water on fodder production soil quality and economising nutrient usage**

**Rationale**

- ✓ Long term use of dairy soiled water for fodder production is a traditional practice
- ✓ No scientific information on its effect on fodder quality, yield, soil quality

**Objectives**

- ✓ Characterization of dairy soiled water of TNAU, Veterinary unit
- ✓ Assessment of its long-term effect on fodder production, quality, nutrition and soil quality

**Work Plan**

- ✓ Collection, quantification and characterization of dairy soiled water at intervals by analyzing OC, oxygen demand, N, P, K, Ca, Mg, S and MNs
- ✓ Assessment of fodder quality, yield and soil quality at different cutting intervals
- ✓ Determination of Seasonal flux in chemical composition of DSW, quality of soil and fodder, nutrient budgeting

**Period:** Two Years (2023 to 2025)

**Scientists In-charge:**

Dr. K. Sathiya Bama, Professor (SS&AC), Dept. of SS&AC, TNAU, Coimbatore

Dr. K. N. Ganesan, Prof. & Head, Dept. of Forage Crops, TNAU, Coimbatore

Dr. M. Thirunavukkarasu, Asst. Prof. (VAS), Dept. of Agronomy, TNAU, Cbe

**III. Remarks on the ongoing University Research Projects/AICRP/EFPs**

S. No.	Project details	Remarks
<b>I.</b>	<b>Department of Soil Science and Agrl. Chemistry</b>	
<b>A.</b>	<b>University Research Project on Maize</b>	
1.	<b>NRM/CBE/SAC/PME/2019/001:</b> Permanent Manurial Experiment of Coimbatore Under irrigated Tropical Agro Ecosystem (Nov. 2018 to March 2024) Dr. S. Thenmozhi, Asst. Professor (SS&AC) - PL Dr. G. Sridevi, Asst. Professor (SS&AC) - Co-PL	• Findings may be given for information. To be continued.
<b>B.</b>	<b>AICRP Projects</b>	
1.	<b>AICRP/NRM/CBE/SAC/002: AICRP on Soil Test Crop Response</b> - Soil Test Crop Response Correlation Studies under IPNS for Foxtail millet (Project period-2019-2023) Dr. S. Maragatham, Professor (SS&AC) Dr. R. Santhi, Professor & Head (SS&AC) Dr. M. Gopalakrishnan, ASP (SS&AC), HC&RI, Jeenuur Dr. R. Rajeswari, Asst. Prof. (SS&AC) Dr. P. Malathi, Assoc. Professor (SS&AC)	• Technology recommended for Adoption

	Dept. of SS&AC, TNAU, Coimbatore.	
2.	<b>AICRP/NRM/CBE/SAC/002: AICRP on Long Term Fertilizer Experiments</b> - Soil Quality, Crop Productivity and Sustainability as influenced by Long Term Fertilizer Application and Continuous Cropping of Finger Millet - Maize sequence in Swell - Shrink Soil (Continuous project 2022-2023) Dr. G. Sridevi, Asst. Professor (SS&AC) (PL) Dr. S. Thenmozhi, Asst. Prof. (SS&AC) (Co- PL)	<ul style="list-style-type: none"> <li>Findings may be given for information</li> <li>Data generated from LTFE to be published in high NAAS rated journal</li> </ul>
3.	<b>AICRP/DCM/KPT/SAC/AGR/1971/004:</b> Real time monitoring and management of drought in major rainfed crops (continuous project) Dr. K. Baskar, Prof. (SS&AC), ARS, Kovilpatti	<ul style="list-style-type: none"> <li>May be continued as per the technical programme</li> </ul>
4.	<b>AICRP- PME on cotton-maize rotation under rainfed deep black soils</b> Dr. K. Baskar, Prof & Head cum Chief Scientist (SS&AC), Dr. V. Sanjiv Kumar, Asst. Prof. (SS&AC), ARS, Kovilpatti	<ul style="list-style-type: none"> <li>Findings may be given for information</li> <li>Data generated from PME to be published in high NAAS rating journal</li> </ul>
5.	<b>AICRP- Satellite Experiment on effect of integrated nutrient management in cotton- maize rotation</b> Dr. V. Sanjiv Kumar, Asst. Prof. (SS&AC), ARS, Kovilpatti	<ul style="list-style-type: none"> <li>To be continued as per the technical programme</li> </ul>
C.	<b>Externally Funded Projects</b>	
1.	<b>DBT/NRM/CBE/SSAC/2019/R009:</b> Exploiting Plant-Microbial interactions to unlock the fixed nutrients in calcareous soils for increasing the crop productivity and soil fertility (Sept.2019 -March 2023) Dr. T. Chitdeshwari, Prof. (SS&AC) Dr. U. Sivakumar, Prof. (AGM), TNAU, Coimbatore <b>On Farm Trial:</b> Evaluation of amendments and microbial consortia for improving the productivity of Maize and Groundnut on Calcareous soils Period- One year (2022 - 2023) <b>Lead Centre &amp; Scientists In-charge of the centres</b> Dr. T. Chitdeshwari, Professor (SS&AC), TNAU, CBE Dr. U. Sivakumar, Prof. & Head (AGM), TNAU, CBE <b>Co-ordinating Centre &amp; Scientist In-charge</b> Dr. S. K. Raj Kishore, Asst. Prof. (ENS), ARS, Bhavanisagar	<ul style="list-style-type: none"> <li>Recommended for Adoption</li> <li>Technology for adoption to be given for maize in millet meet 2023 and groundnut in oilseed meet 2023.</li> </ul>
D.	<b>On Farm Trials</b>	
1.	<b>Economizing Phosphorus use in Maize - Groundnut sequence</b> Period: June 2021 – March,2023 <b>Centres &amp; Scientist in charge</b> Dr. S. Meena, Prof. (SS&AC) & Project Director (CSSH) ADAC&RI, Trichy ADAC & RI, Tiruchirapalli Dr.M. Baskar, Prof. and Head (SS&AC), ADAC&RI, Trichy Dr. D. Muthumanickam, Prof. and Head, RS&GIS, TNAU, Cbe Dr.K. P. Rangunath, Assoc. Prof. (SS&AC), CWGS, TNAU, Cbe	<ul style="list-style-type: none"> <li>Recommended for Adoption</li> </ul>
2.	<b>OFT on Validation of STCR - IPNS based Fertiliser Prescriptions for Barnyard millet</b> <b>Lead Centre &amp; Scientists In-charge</b> Dr. R. Santhi, Prof & Head (SS&AC), TNAU, Coimbatore Dr. S. Maragatham, Prof. (SS&AC), TNAU, Coimbatore <b>Co-ordinating Centres &amp; Scientists In-charge</b> Dr. M. Gopalakrishnan, Assoc.Prof (SSAC), HC&RI, Jeenur Dr. P. Kannan, Assoc. Professor (SS&AC), AC&RI, Madurai	<ul style="list-style-type: none"> <li>Recommended for Adoption</li> </ul>
3.	<b>Evaluation of sorghum varieties for their tolerance to sodicity</b> Dr. M. Baskar, Professor & Head (SS&AC), ADAC&RI, Trichy	<ul style="list-style-type: none"> <li>Recommended for Adoption</li> </ul>

	Dr. S. Rathika, Assc. Prof. (Agron.), ADAC&RI, Trichy Dr. M. Vijayakumar, AP (SS&AC), Kudimanmalai Dr. G. Gomadhi, Associate Professor (SS&AC), Trichy Dr. P.C. Prabu, AP (ENS), TNAU, Coimbatore	
<b>E.</b>	<b>Action Plan Projects</b>	
1.	<b>Validation of STCR – IPNS based Fertilizer Prescriptions for hybrid maize under drip fertigation</b> Project period-2 years (2021 – 2023) Dr. P. Malathi, Assoc. Professor (SS&AC) Dr. M. Gopalakrishnan ASP (SS&AC), HC&RI, Jeenur Dr. R. Santhi, Professor & Head (SS&AC) Dr. S. Maragatham, Professor (SS&AC) Dr. R. Rajeswari, AP (SS&AC), Dept. of SS&AC, TNAU, Cbe	• Recommended for Adoption
<b>F</b>	<b>Student Thesis</b>	
1.	<b>Modeling and Predicting Soil Carbon Sequestration of Semi - arid Alfisols as influenced by Nutrient Management</b> <b>Year: 2022</b> <b>Student: M. S. Sabeena</b> , Dept. of SS&AC, TNAU, Cbe <b>Chairman: Dr. G. Sridevi</b> , Asst. Prof. (SS&AC), TNAU, Coimbatore - 3	• Findings may be given for information
2.	<b>Improving the Yield and Quality of Barnyard Millet (<i>Echinochola frumentacea</i> L.)</b> <b>Year: 2022</b> <b>Student: Ms. R. Gajalakshmi</b> I.D. No. 2020520005, Dept. of SS&AC, TNAU, CBE <b>Chairman: Dr. T. Chitdeshwari</b> , Professor (SS&AC) Department of SS & AC, DNRM, TNAU, Coimbatore	• Findings may be given for information

## DEPARTMENT OF AGRICULTURAL MICROBIOLOGY

### A. Technologies for Adoption

#### 1. AM fungal inoculants for improved production of finger millet

Seed coating of ragi with native *Rhizophagus irregularis* and *Funneliformis* sp along with 75% N & K and 50% P significantly improved yield increase of 29.5% (2685kg/ha) over control (1893kg/ha) with BCR (3.4 & 1.9) and save 25 % P in finger millet

### B. Technologies for Information

#### 1. Development of an efficient plant probiotics to combat moisture deficit stress and yield increase in finger millet (outcome from Univ PDF-CE-Millet)

Endophytic strains (*Bacillus albus* LRS2, *Alcaligenes fecalis* LSB6, *Bacillus amylooliuefaciens* LAB6, *Bacillus velezensis* LLB10 and consortium of above strains (LRS2+LSB6+LAB6+LLAB10) showed PGP traits with higher potentials for nutrients solubilization (P- 218.91  $\mu\text{g mL}^{-1}$ ; Zn-31  $\mu\text{g mL}^{-1}$ ), ACC deaminase production (153.61 n moles  $\alpha$ - ketobutyrate  $\text{mg}^{-1}\text{h}^{-1}$ ), Siderophore production (59.43% units) and EPS production (121.72 $\mu\text{g mL}^{-1}$ ) under induced drought stress conditions. These strains alone and in consortia mode (LRS2+LSB6+LAB6+LLAB10) were able to grow under minimum water potential of -3.6MPa induced with PEG (6000). Metabolic profiling of all the drought tolerant strains revealed the production of compounds responsible for drought tolerance including proline, ascorbic acid, gibberelic acid, oleic acid under induced stress condition (-3.6MPa). Interestingly metabolic profiling of consortium exhibited more amounts of quercetin, proline, oleic acid, styrene and amino acids (leucine, glycine) under induced drought condition than non-stress

#### 2. Eliciting the effect of seed coating of bioinoculants consortia (NPK &NPKZn) in maize through classical & molecular approaches

NPK and NPKZn biofertilizer consortia coated maize seeds maintained the population of individual strain upto 3 months of storage. Consortia application increased plant height root length, shoot length, biomass and chlorophyll content of maize seedlings but no significant difference in germination percentage and vigour was noticed both under paper towel method and gonobiotic study. Similarly, rhizosphere soil of seed coated treatment recorded more organic carbon, microbial biomass, soil dehydrogenase, acid and alkaline phosphatase activities.

#### 3. Effect of arbuscular mycorrhizal fungi (AMF) and plant growth promoting endophytic bacteria (PGPB) on eliciting defence responses in maize (*Zea mays*) against fall armyworm (*Spodoptera frugiperda*)

Lead feeding capacity of second instar larvae of *Spodoptera frugiperda* on maize seedlings treated with plant growth promoting (mineral solubilizer, phytohormones producer, siderophore, HCN, chitinase, lipase, protease and cellulases) maize leaf apoplastic fluid endophytic bacterium (*Bacillus amyloliquefaciens*) and *Glomus* sp was found to be lesser over microbial uninoculated control. Induction of both SAR and ISR mediated defence against *S. litura* was also evidence in microbial treated plants

through metabolic analysis. Further, this endophytic bacterium was identified through 16S rRNA analysis and confirmed through whole genome sequencing. Many genes coding for nonribosomal proteins and polyketide synthesis were observed confirming bioprotective potential of the bacterium.

### C. For On Farm Trial (New)

#### Field evaluation of efficient plant probiotics to combat moisture deficit stress and yield increase in finger millet

##### Objectives:

To evaluate the efficiency of the consortium to combat moisture stress and yield increase

##### Treatment details

T<sub>1</sub>- STCR-based RDF

T<sub>2</sub>- STCR based RDF + Liquid formulation of *Rhizobium esperanzae* CRB6 + *Bacillus subtilis* CRB7 + Yeast SA8+ AMF

T<sub>3</sub>- STCR based RDF + Nano-formulation of above inoculants

##### Observations to be recorded:

Biometrics & Yield attributes

S. No.	Centers	Scientist associated
1.	<u>Coordinating centre</u> TNAU, Coimbatore	Dr. U. Sivakumar, P&H, Dept. of Ag. Microbiology; Dr. R. Ravikesavan, Director (CPBG), Dr. A. Nirmala Kumari, Fr. P&H (PBG), CEM, Athiyandhal, Dr. P. Parasuraman P & H (Agron), Dr. TCK. Sugitha (Fr. PDF, CEM, Athiyandhal),
2.	Sub Centres TNAU, Coimbatore	Dr. A. Ramalakshmi, Assoc.Prof. (Agrl.Microbiology)
3.	ORS, Tindivanam	Dr. R. Brindavathy, Prof. (Agrl.Microbiology)
4.	CEM, Athiyandal	Dr. K. Sathiya, Assoc. Prof. (Agronomy)
5.	RRS, Paiyur	Dr. C. Sivakumar, Professor (Agronomy)
6.	ADAC&RI, Trichy	Dr. R. Uma Maheswari, Assoc.Prof. (Agrl.Microbio.)

#### Remarks on the on-going Action Plans/URPs/Core/AICRPs/ EFPs

S. No.	Title of the Project	Investigator	Period	Remarks
<b>University Research Project – 2</b>				
1.	Multifunctional bacterium, arbuscular mycorrhizal fungi (AMF) and <i>Azospirillum brasilense</i> mediated effect on the growth of maize in calcareous soil	Dr.T. Kalaiselvi, Professor (Agrl. Micro.)  Dr. M.R. Latha Professor (SS&AC)	Sep. 2020 to Aug 2023	Project may be continued Extended for one year and extension proposal has to be submitted ROS generation may be studied
2.	DNRM/CBE/AGM/RIC/2021 /001- Delivery of indigenous AM fungal inoculants as seed coating for improved minor millet production under dry land condition	A. Ramalakshmi Assoc. Professor	Aug.2021 to July 2023	Closure proposal may be submitted. Research outcome should be published in high impact factor journals

<b>Action Plan -2</b>				
3.	Action Plan:1 AM fungal inoculants for improved production of finger millet	<b>Coimbatore centre:</b> Dr.A. Ramalakshmi, Assoc. Prof. (AGM) Dr. U. Sivakumar, Professor and Head Dr. R. Karthikeyan Asst. Prof. (Agronomy) <b>Madurai centre</b> Dr. K. Kumutha, Professor and Head <b>Vazhavachanur, Centre</b> Dr. E. Jamuna, Assoc. Prof. (AGM) <b>KVK, Paparappati</b> Dr. Vennila, Assoc. Prof. (Ext) Dr. Srividya Assoc. Prof. (Hort)		Recommended for Adoption
4.	Action Plan 2: Dissecting the microbiome of little millet ( <i>Panicum sumatransae</i> L.) and their mechanism of stress tolerance towards crop growth and fitness	Dr. U. Sivakumar Professor Dept. of Agrl. Microbiology	2019-2021	Extended for one year
5.	Action Plan 3: Development of an efficient plant probiotics to combat moisture deficit stress and yield increase in finger millet (outcome from Univ PDF-CE-Millet)	<b>Main centre PI:</b> Dr.U. Sivakumar P&H (Agrl.Micro.) <b>Other centres</b> 1. Dr.M. Vaithiyalingam (P&H) Athiyandhal 2. Dr. K. Sathiya, Athiyandhal 3. Dr. R. Brindhavathy ORS, Tindivanam 4. Dr.C. Sivakumar, RRS, Paiyur 4. Dr. R. Uma Maheswari ADAC& RI, Trichy 5. Dr. R. Ravikesavan (Director, CPBG) 6. Dr. A. Ramalakshmi Assoc. Prof. (Micro.)	2021-2023	Recommended for Information  On Farm Trials (OFT) may be conducted
<b>Student's Thesis</b>				
<b>PG</b>				
6.	Eliciting the effect of seed coating of bioinoculants consortia (NPK &NPKZn) in maize through classical & molecular approaches	Name of the student: C. Priyadharshini ID.No.: 2020511006 M.Sc.in Agrl. Micro., Name of the chairperson: Dr. Dr. M. Gnanachitra Prof. (Microbiology)		Recommended for Information  Studies may be continued to develop SCAR Markers Studies on cell viability and extended storage may be taken up



7.	Effect of arbuscular mycorrhizal fungi (AMF) and plant growth promoting endophytic bacteria (PGPB) on eliciting defence responses in maize ( <i>Zea mays</i> ) against fall armyworm ( <i>Spodoptera frugiperda</i> )"	Name of the student: S. Ranjith ID.No.: 2018801107 Ph. D. in Agrl. Micro., Name of the chairperson: Dr. T. Kalaiselvi Prof. (Micro.)	Recommended for Information Studies may be continued on following aspects. Olfactometer may be used to analyse volatiles Nursery and laboratory studies may be taken up to confirm feeding deterrence capacity of endophytes mediated defence. Identified metabolites may be used to test induction of resistance Article may be published with whole genome sequence data of <i>Bacillus amyloliquefaciens</i>
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### III. CENTRE FOR PLANT PROTECTION STUDIES

#### List of URP/AICRP/EFP

Type of project	AEN	PAT	Total
University Research Projects	2	6	8
AICRP projects	3	4	7
<b>Total</b>	<b>5</b>	<b>10</b>	<b>15</b>

#### A. Technologies for Adoption/OFT/Information

##### 1. FOR ADOPTION

##### 1. Insect pest complex of sorghum earhead bug and their management

- Application of Thiamethoxam 25 WG @ 0.4g/l at milky stage is recommended for the management of earhead bug, stink bug and grain midge of sorghum.

##### 2. FOR ON FARM TRIAL

##### OFT 1: Field evaluation of Chitosan-O-Arginine against maize fall armyworm Treatments (to be imposed during milky stage of the crop)

- T1 - CS – O Arginine @ 5 g/lit
- T2 - CS – O Arginine @ 10 g/lit
- T3 - Azadirachtin 1500 ppm @ 5 ml/lit
- T4 - Emamectin benzoate 5 SG @ 0.5 g/lit
- T5 - Untreated check

Design: RBD

Replication: Four

##### Observations to be recorded:

- Per cent infestation & FAW score at 5 & 10 DAT
- Yield (kg/ha)
- BC ratio
- Phytotoxicity for CS-O-Arg

##### Centres to be involved:

TNAU, Coimbatore (Team Leader)	:	Dr. M. Shanthi, Director, CPPS
<b>Coordinating Centres</b>	:	
AC&RI, Coimbatore	:	Dr. T. Srinivasan, Assoc. Prof. (Ento.)
AC&RI, Madurai	:	Dr. Zadda Kavitha, Assoc. Prof. (Ento.)
AC&RI, Killikulam	:	Dr. K. Elanchezhiyan, Assoc. Prof. (Ento.)
ADAC&RI, Trichy	:	Dr. A. Kalyanasundaram, Prof. (Ento.)

##### OFT 2: Management of sorghum downy mildew in sorghum

##### Treatments:

- Seed treatment with *Bacillus subtilis* (Bbv 57) @ 5ml/kg + spraying of metalaxyl 4% + mancozeb 64% WP @ 2.5g/litre on 30<sup>th</sup> and 45<sup>th</sup> day
- Spraying of mancozeb 75% WP @ 2.5g/litre (1 kg/ha)
- Farmer's practice

Replication: 7

Design: Randomised Block design

**Observations:**

- Percent Disease Incidence (before application and 15 days after every application)
- Yield (kg/ha)
- BC ratio

**Centres to be involved:**

TNAU, Coimbatore (Team Leader)	:	Dr. A. Sudha, Assoc. Prof (Pl. Path.)
<b>Coordinating Centres</b>	:	
AC&RI, Vazhavachanur	:	Dr. P. Mareeswari, Prof. (Pl. Path.)
ADAC&RI, Trichy	:	Dr. M. Rajesh, Asst. Prof. (Pl. Path.)
Salem District	:	Dr. A. Sudha, Assoc. Prof (Pl. Path.)

**3. For information****a. Agricultural Entomology****i. Sorghum**

- Maize fall armyworm was recorded to an extent of 13.7 per cent in sorghum while sorghum stem borer was in the range of 5.0 – 8.7 in Coimbatore and Virudhunagar districts.
- The shoot fly species in sorghum and pearl millet was confirmed as *Atherigona soccata* through molecular characterization and the sequence was submitted to NCBI database (OQ030716).

**ii. Maize**

- Maize fall armyworm has been recorded in Coimbatore, Tiruppur, Tiruvannamalai, Trichy and Virudhunagar district with infestation levels varying from 9.8 to 27.6 per cent. FAW has also been recorded in sorghum, pearl millet and barnyard millet to an extent of 13.7, 21.2 and 4.5 per cent, respectively.
- The maize inbred lines viz., UMI 1331-1, UMI 504, UMI 298-2-2, UMI 1003-2-3, UMI 406, UMI 29-2, UMI 692-2 and UMI 1153 were identified as resistant to FAW under preliminary screening and it will be validated during kharif 2023.
- The second instar larvae of *S. frugiperda* larva exposed to different doses of Chitosan O Arginine (CS O Arg) recorded an LC<sub>50</sub> value of 1438.54 ppm at 72 hours after treatment.
- The entomopathogenic fungi, *Metarhizium anisopliae* (GDU) talc formulation was compatible with recommended insecticides viz., chlorantraniliprole 18.5 SC @ 0.4 ml/lit and flubendamide 480 SC 0.5g/lit and *Telenomus remus* @ 50000 parasitized eggs/acre
- Moreover, *M. anisopliae* was safer to *Telenomus remus* and *Trichogramma mwanzai* (> 80 % emergence observed upon treatment).
- Garlic oil (125 µl/ kg grain) caused significant mortality (85-90%) of maize weevil, *Sitophilus oryzae* at 5 days after treatment. As the concentration of essential oils increased adult emergence was reduced.
- A pheromone blend developed by mixing 90:10 mixture sex pheromone + host plant volatiles showed more *S. frugiperda* moth catches than commercially available lures. The sex pheromone was 85:5:10 mixture of (Z)-9-14: Ac, (Z)-9-12: Ac and (Z)-7-12: Ac while the host plant volatile was a 50:50 mixture of heptanoic acid and 2,5-Di-tert-butyl-1,4-benzoquinone. However, the mixture exhibited limited durability and was costly.

- Based on pest fall armyworm infestation data of three years (2019-22) and weather parameters, a prediction model for FAW has been developed ( $Y = 57.5 - 2.00 X_2 + 0.17 X_3$ ) where Y = FAW infestation (%),  $X_2 = T_{min}$ ;  $X_3 = RH_{am}$  and  $T_{min}$  & RH (eve) had significant correlation with FAW infestation.

### iii. Pearl millet

- Maize fall armyworm was recorded to an extent of 21.25 per cent in sorghum in Virudhunagar district.

### iv. Small millets

- Maize fall armyworm was recorded to an extent of 4.5 per cent in barnyard millet in Virudhunagar district.

### v. Lucerne

- Planting of banker crops like marigold as a border crop (1 row) in lucerne increased the coccinellid population (10.1/ plant) in main crop and enhanced natural biosuppression of aphid population.

## b. Plant Pathology

### i. Sorghum

- Spraying of *Streptomyces rochei* @ 0.2% at 30 DAS + *Bacillus subtilis* (Bbv 57) @ 0.2% at 45DAS showed low rust incidence (9.85%), high grain (1879 kg/ha), straw (3950 kg/ha) yield and BC ratio (2.0) with 56 per cent reduction in sorghum rust incidence, 28.77 per cent and 19.9 per cent increase in grain and straw yield, respectively compared to the control.
- The sorghum entries viz., TKS 18013, TNS 698, 699, 700, 701, 702, 703, 704, TKS1801 and TKS1707 were found to be resistant to anthracnose and leaf blight while, TNS 698, 695, TNS 702, 701, 709, 700, 699, 712, 718, 719, 707, 717, 716, 713, 714, TKS1801 and TKS1707 were found to be resistant to ergot and grain mold.
- Development of downy mildew and anthracnose diseases were positively correlated with minimum temperature, rainfall and wind speed while, maximum temperature, morning and evening relative humidity and sunshine hours were negatively correlated.
- Regression equation was developed for both downy mildew and anthracnose diseases. For downy mildew:  $y = 143.29 + 0.276x_1 - 3.073x_2 - 0.351x_3 - 0.713x_4 + 0.48x_5 + 1.061x_6 - 0.354x_7$ ; For Anthracnose:  $y = 49.479 - 0.467x_1 - 1.452x_2 - 0.054x_3 + 0.011x_4 - 0.201x_5 + 1.2x_6 - 0.429x_7$  where  $x_1 = T_{max}$ ;  $x_2 = T_{min}$ ;  $x_3 = RH$  (morning);  $x_4 = RH$  (evening);  $x_5 =$  rainfall;  $x_6 =$  Wind speed;  $x_7 =$  sunshine hours

### ii. Maize

- Seed treatment with *Bacillus subtilis* (Bbv57) @ 10 g/kg of seeds and soil application of *B. subtilis* (Bbv57) @ 2.5 kg/ha at the time of sowing and *T. viride* @ 2.5 kg/ha during tasselling stage recorded low incidence of charcoal rot (7.67%) with a yield of 6612 kg/ha and BC ratio of 2.26.

- Powdered maize shank with *T. viride* inoculum @ 10 gram/300 g of shank powder with 40% of moisture served as effective substrate by supporting maximum colonisation (86.67%) of *T. viride*
- For aflatoxin degradation, a total of 78 botanicals were collected from Western Ghats of which, 10% extract of botanical 1 and 2 showed maximum aflatoxin degrading ability of above 90%.

### iii. Pearl millet

- Spraying of *Streptomyces rochei* @ 0.2% at 30 DAS + *Bacillus subtilis* (Bbv 57) @ 0.2% at 45 DAS showed low rust incidence (7.9%), high grain (2878 kg/ha), straw (6347 kg/ha) yield and BC ratio (2.03) with 58.8 per cent reduction in rust incidence, 11.72 per cent and 5.06 per cent increase in grain and straw yield, respectively compared to the control.
- Sixteen TNAU entries viz., PT - 6029, 6067, 6303, 6476, 6676, 6679, 3832, PT - RPT 2DMR PURPLE, ICMB – 89111, 93222, 94333, 99666, 02111, 02444 and 02777 were found to be free from downy mildew incidence even at 60 DAS under sick plot condition.
- Three TNAU entries viz., PT – 6300, ICMB – 02444 and ICMB 02777 were found to be totally free from blast incidence.
- Development of rust disease was positively correlated with evening relative humidity and rainfall while, maximum and minimum temperature and morning relative humidity were negatively correlated. ( $Y = 98.04 - 2.23 X_1 - 0.607 X_2 + 0.17 X_3 - 0.34 X_4 + 0.3 X_5$  Where:  $x_1 = T_{max}$ ;  $x_2 = T_{min}$ ;  $x_3 = RH$  (morning);  $x_4 = RH$  (evening);  $x_5 = rainfall$ ).
- Among various machine learning algorithms tested, the customized CNN model has achieved the maximum level of accuracy (98.86%), precision (98.33%), recall (98.33%) and F1 score (98.66%) values

### iv. Small millets

- Early sowing of barnyard millet during first week of August reduced blast and leaf blight disease incidences (1.89 and 26.3%, respectively) than the late sown (3rd week of August) crop (4.82 and 30.24%, respectively)
- In ragi, mixed sowing of pre-released composite (TNEc 1285 + TNEc 1294 + TNEc 1310) along with GE4449 at 1:1 ratio recorded the less blast incidence and compensated the yield loss and the yield (2291 kg/ha) was statistically on par with spraying of tricyclozole @ 0.2% on disease appearance (2304kg/ha).
- Spraying of *Streptomyces rochei* @ 0.2% at 30 DAS + *Bacillus subtilis* (Bbv 57) @ 0.2% at 45 DAS showed low rust incidence (6.12%), high grain (1782 kg/ha), straw (2875 kg/ha) yield and BC ratio (1.64) with 68.2 per cent reduction in rust incidence, 10.5 per cent and 1.21 per cent increase in grain and straw yield, respectively compared to the control.
- Seed treatment with *B. subtilis* @10g/kg of seed + foliar spray of Propiconazole 25 % EC @ 1ml/l at tillering and boot leaf stage recorded 90.1, 89.4 and 92.5 per cent decrease in incidences of blast (1.5%), brown spot (1.82%) and rust (0.95%) with a yield of 863 kg/ha (26% increase over the control) and high B:C ratio (1.53) compared to the control (1.27).

- The CEM cultures *viz.*, TNSi 387 and TNSi 386 of foxtail millet and TNEf 325 and TNEf 326 of barnyard millet were showing low incidences of leaf blast and leaf blight incidences, respectively.

## **B. Action Plan (2022-2023)**

### **a. Agricultural Entomology**

1. Monitoring major pests on millets & forages and development of prediction models (Contd.)
2. Estimation of yield losses due to insect pests in fodder sorghum (Contd.)
3. Management of shootfly in sorghum and pearl millet using newer insecticides (NEW)

### **b. Plant Pathology**

4. Monitoring of major diseases of millets and collection of high-resolution images to develop artificial intelligence system for rapid detection of plant diseases
5. Validation of weather driven forewarning model for the management of maize leaf blight (Contd.)
6. Host specific interaction and biological management of blast disease on nutricereals (Contd.)
7. Biological management of rust diseases (Contd.)

### Action Plan – 1: Monitoring major pests on millets & forages and development of prediction models (Contd...)

Theme Leader	Dr. T. Srinivasan, Assoc. Prof. (Ento.), TNAU. Coimbatore		
Activity	Scientist incharge and Centre	Observations	Deliverables
<p>Survey of major pests of millets and documentation</p> <p>i. On campus fixed plot survey</p> <p>ii. Roving survey will be undertaken by scientists identified for "Pest Monitoring" in different districts</p> <p>iii. *500 Nos. of photos on different stages of symptoms of major insect pests has to be submitted to the Director (CPPS)</p>	<p><b><u>FIXED PLOT SURVEY</u></b>  <b><u>AC&amp;RI, VVNR (Tiruvannamalai Dt.)</u></b>            Dr. P. Yasodha, Assoc. Prof. (Ento.) (Crop: Pearl millet, Ragi, Tenai, Samai)</p> <p><b><u>TNAU, CBE (Coimbatore District)</u></b>            Dr. T. Srinivasan, Assoc. Prof. (Ento.) (Crop: Maize, Sorghum, Pearl millet)</p> <p><b><u>AC&amp;RI, MDU (Madurai District)</u></b>            Dr. Zadda Kavitha, Assoc. Prof. (Ento.) (Crop: Sorghum, Maize)</p> <p><b><u>ROVING SURVEY</u></b>  <b><u>TNAU, CBE</u></b>            Dr. T. Srinivasan, Assoc. Prof. (Ento.) (Crop: Sorghum, Maize, Pearl millet)</p> <p><b><u>KVK, MDU (Madurai District)</u></b>            Dr. K. Suresh, Assoc. Prof. (Ento.) (Crop: Sorghum, Kudiraivali)</p> <p><b><u>KVK, APK (Virudhunagar District)</u></b>            Dr. B. Usharani, Assoc. Prof. (Ento.) (Crop: Sorghum, Pearl millet)</p>	<ul style="list-style-type: none"> <li>• Fixed plot on campus survey at weekly interval</li> <li>• The major pests pertaining to the crop alone to be included for developing prediction models.</li> <li>• Periodical recording of weather parameters</li> <li>• Correlation of pest population/ infestation with weather parameters.</li> <li>• Documentation of new/emerging pests.</li> </ul>	<ul style="list-style-type: none"> <li>• Documentation of pests of millets</li> <li>• Development of bulletin on pests of millets</li> </ul>

### Action Plan 2: Estimation of yield losses due to insect pests in sorghum (Contd...)

Theme Leader	Dr. K. Premalatha, Assoc. Professor (Entomology)		
Activity	Scientist incharge and Centre	Observations	Deliverables
<ul style="list-style-type: none"> <li>• Fodder sorghum to be raised in 20-25 cent plots</li> <li>• Treatments to be imposed as per the protocol for the management of shoot fly and fall armyworm</li> </ul> <p><b><u>Treatments</u></b>            T1 - Protected (Seed treatment with thiamethoxam 30 FS @ 2g/kg seed; Azadirachtin 3000 ppm @ 2ml/lit at 15 DAE; Emamectin benzoate 5 SG @ 0.5g/lit at 30 DAE            T2 – Unprotected  <b>Design:</b> Macroplot</p>	<p><b><u>TNAU, CBE</u></b>            Dr. K. Premalatha, Assoc. Professor (Entomology)</p> <p><b><u>KVK, Tirur</u></b>            Dr. V.A Vijayashanthi            Asst. Professor, (Agrl.Ento.)</p> <p><b><u>KVK, NDM</u></b>            Dr. V. Radhakrishnan,            Programme Co-ordinator</p>	<ul style="list-style-type: none"> <li>• Observations on shoot fly infestation at 15 and 21 days after emergence (DAE)</li> <li>• Observation of FAW infestation (% infestation &amp; TNAU 1-5 score) at 30 DAE (pre-treatment) and at 37 &amp; 44 DAE (post treatment)</li> <li>• Yield</li> <li>• B: C ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Management of major pests of fodder sorghum</li> </ul>

### Action Plan 3: Management of shootfly in sorghum and pearl millet using newer insecticides (NEW)

Theme Leader	Dr. G. Preetha, Assoc. Professor (Entomology)		
Activity	Scientist incharge and Centre	Observations	Deliverables
<b>Treatments</b> <ul style="list-style-type: none"> <li>• ST with imidacloprid 70WS @ 10 g/kg seed</li> <li>• ST with thiamethoxam @ 3 g/kg seed</li> <li>• ST with imidacloprid 70WS @ 10 g/kg seed followed by spray of acetamiprid 20SP @ 1.5 ml/lit at 10 DAE</li> <li>• ST with thiamethoxam @ 3 g/kg seed followed by spray of acetamiprid 20SP @ 1.5 ml/lit @ 10 DAE</li> <li>• Neem formulation 1500 ppm @ 5. ml/l @ 10 DAE</li> <li>• Untreated control</li> </ul> Replications: 3 <b>Design:</b> RBD	<b>TNAU, CBE</b> Dr. G. Preetha, Assoc. Prof. (Ento.) <b>AC&amp;RI, Madurai</b> Dr. Zadda Kavitha, Assoc. Prof. (Ento.) <b>KVK, APK (Virudhunagar District)</b> Dr. B. Usharani, Assoc. Prof. (Ento.)	<ul style="list-style-type: none"> <li>• Observations on shoot fly infestation at 15 and 21 days after emergence (DAE)</li> </ul>	<ul style="list-style-type: none"> <li>• Management of sorghum shootfly</li> </ul>

### Action Plan 4: Monitoring of major diseases of millets and collection of high-resolution images to develop artificial intelligence system for rapid detection of plant diseases

Theme leader	Dr. V. Paranitharan, Professor (Pl. Path.), Dept. of Millets, Coimbatore		
Activity	Centre	Observations	Deliverables
1. Fixed plot on/off campus 2. Roving survey in millet growing regions	<ul style="list-style-type: none"> <li>• Coimbatore, Erode, Tiruppur - Pearl millet, Sorghum, Maize (Dr. V. Paranitharan, Dr. I. Johnson &amp; Dr. A. Sudha, Dept. of Millets, TNAU, Cbe)</li> <li>• Madurai, Virudhunagar, Tuticorin – Maize, Sorghum &amp; Kudiraivali (Dr. R. Akila, RRS, APK)</li> <li>• Theni, Dindigul, – Maize, Sorghum, Pearl millet (Dr. R. Radhajejalakshmi – HC&amp;RI, PKM)</li> <li>• Krishnagiri, Dharmapuri, Salem, - Ragi, Tenai, Pearl millet, Samai (Dr. M. Deivamani, KVK, Pappalapatti)</li> <li>• Tiruvannamalai, Vellore, Kallakurichi - Ragi, Tenai, Pearl millet, Samai (Dr. P. T. Sharavanan, CEM, Athiyandal)</li> <li>• Perambalur, Villupuram, Cuddalore - Maize, Pearl millet, Ragi, Varagu, Tenai (Dr. A. Thangeshwari, SRS, Cuddalore)</li> <li>• Athiyandal – Fox tail Millet (Dr. P. T. Sharavanan, CEM, Athiyandal)</li> </ul>	<ul style="list-style-type: none"> <li>• Occurrence of major diseases in millets</li> <li>• A pool of infected and healthy plants with high resolution images (Min. 500 Nos.) will be acquired</li> </ul>	This early and accurate detection of disease will enable the farmer to precise disease management practice



### Action plan 5: Validation of weather driven forewarning model for the management of maize leaf blight (Contd...)

Team leader: Dr. V. Sendhilvel, Assoc. Prof. (Pl. Path.), KVK, Virinjipuram			
Activity	Centre	Observations	Deliverables
Validation of the model  <b>Prediction Link:</b> <a href="https://weatmodel.dexterityconcepts.com/weathermodel.php">https://weatmodel.dexterityconcepts.com/weathermodel.php</a>	<b>Virinjipuram</b> Dr. V. Sendhilvel, KVK, Virinjipuram Dr. K. Senguttuvan, RRS, Vridhachalam <b>Trichy:</b> Dr. M. Rajesh, ADAC&RI, Trichy <b>Thiruvannamalai:</b> Dr. P. T. Sharavanan, CEM, Athiyandal, <b>Periyakulam:</b> Dr. R. Radhajeyalakshmi, HC&RI, PKM Dr. S. Kokilavani, ACRC, TNAU, Coimbatore	Observation to be recorded on <ul style="list-style-type: none"> <li>Validation of the model for the occurrence and forewarning message of the disease.</li> <li>Adoption at farmers level</li> </ul>	Disease forewarning model development for effective disease management
		Validation	

### Action plan 6: Host specific interaction and management of blast disease on nutricereals (Contd...)

Theme leader: Dr. P.T. Sharavanan, Asst. Professor (Plant Pathology), CEM, Athiyandal			
Activity	Centre	Activities and Observations	Deliverables
<ul style="list-style-type: none"> <li>Cross infectivity</li> <li>Exploitation of endophytes from rainfed small millets ecosystems</li> </ul>	Dr. P. T. Sharavanan, CEM, Athiyandal Dr. I. Johnson, TNAU, Cbe Dr. P. Mareeswari, AC&RI, VVNR	<ul style="list-style-type: none"> <li>Isolation of pathogen causing blast disease in millets.</li> <li>Confirmation of host specificity of <i>M. grisea</i> through cross infectivity in cumbu, ragi, tenai and other millets</li> <li>Isolation, characterization and evaluation of endophytes against <i>M. grisea</i></li> </ul>	<ol style="list-style-type: none"> <li>Host specificity of <i>Magnaporthe grisea</i> will be identified</li> <li>Non chemical methods of blast disease management</li> </ol>
<ul style="list-style-type: none"> <li>Management of blast on pearl millet T1 - Carbendazim 50WP @ 500 g/ha T2 - Tricyclazole 75 WP @ 500 g/ha T3 - Azoxystrobin 25 SC @ T4-Zineb68%+Hexaconazole 4% WP@1000 g/ha</li> </ul>	Dr. P. T. Sharavanan, CEM, Athiyandal Dr. R. Akila, RRS, APK Dr. P. Mareeswari, AC&RI, VVNR	<ul style="list-style-type: none"> <li>PDI on 15 days after last spray, grain and straw yield</li> </ul>	

<p>T5 - Azoxystrobin 16.7% + Tricyclazole 33.3% SC @ 500ml/ha  T6 –<i>Bacillus subtilis</i> (Bbv 57) – ST @ 10g/kg + SA @ 2.5kg/ha + FS @0.5% on appearance of disease and repeat after 15 days if necessary  T7 - Control  On appearance of blast symptoms and 15 days later based on necessity</p>	<p>Dr. I. Johnson (trial @ Vridhachalam)</p>		
<ul style="list-style-type: none"> <li>• The CEM, Athiyandal center will carry out the cross-infectivity studies, isolation, characterisation and <i>in vitro</i> evaluation of endophytes in collaboration with TNAU, Coimbatore centre.</li> <li>• The other centres will conduct only field evaluation of endophytes against blast diseases.</li> </ul>			

### Action plan 7: Biological management of rust diseases

Theme leader	Dr. I. Johnson, Assoc. Prof. (Pl. Path.), Dept. of Millets, Cbe		
Activity	Centre	Observations to be made	Deliverables
<p>Evaluation of bacterial and actinobacterial formulation (Talc) for rust disease management in Pearl millet, Sorghum, Foxtail millet</p> <p><b>Treatments</b></p> <ol style="list-style-type: none"> <li>1. <i>Streptomyces rochei</i> 0.5% (30DAS) + <i>Bacillus subtilis</i> (Bbv 57) 0.5% (45DAS)</li> <li>2. <i>B. subtilis</i> (Bbv 57) 0.5% (30DAS) + <i>S. rochei</i> 0.5% (45DAS)</li> <li>3. <i>S. rochei</i> 0.5% (30 &amp; 40 DAS)</li> <li>4. <i>B. subtilis</i> (Bbv 57) 0.5% (30 &amp; 40 DAS)</li> <li>5. Mancozeb 0.5% (30 &amp; 40 DAS)</li> <li>6. Control</li> </ol>	<p><b>Pearl millet</b>  Dr. I. Johnson, TNAU, Coimbatore  Dr. M. Paramasivam, RRS, Vridhachalam</p> <p><b>Sorghum</b>  Dr. A. Sudha, Dept. of Millets, TNAU, Cbe  Dr. R. Akila, RRS, Aruppukottai</p> <p><b>Pearl millet, Sorghum, Foxtail millet</b>  Dr. P.T Sharavanan, CEM, Athiyandal  Dr. M. Deivamani, KVK, Papparapatti</p>	<ol style="list-style-type: none"> <li>1. Recording of PDI (15 days after last spray), grain and straw yield</li> <li>2. Testing the compatibility of <i>Streptomyces rochei</i> and <i>Bacillus subtilis</i></li> </ol>	<p>Effective biocontrol strategy for rust management</p>

## C. Remarks on the Research Projects

### a. AGRICULTURAL ENTOMOLOGY

S. No.	Project details	Remarks
<b>I. Maize</b>		
1.	<b>CPPS/CBE/ENT/MAZ/2019/001</b> - Pest Succession and documentation of insect pests and natural enemies fauna in maize ecosystem <b>Dr. T. Srinivasan</b> , Asst. Professor (Agrl. Entomology) <b>Period:</b> Aug, 2019 – June, 2022	Project may be closed and a new URP may be proposed.
<b>II. Small Millets</b>		
1.	<b>CPPS / KDM / ENT / SMM / 2020 / 001</b> - Silica induced resistance against borer pests of barnyard and finger millets <b>Dr. P. Chandramani</b> , Prof. (Agrl. Entomology), AC&RI, MDU Period: July 2020 to June 2023	Publication with NAAS >7.0 may be brought out.
<b>AICRP Projects</b>		
1.	<b>AICRP/PBG/CBE/MAZ/004</b> - AICRP on Maize Improvement – Evaluation of maize lines against major pests of maize and development of management strategies <b>Dr. T. Srinivasan</b> , Assoc. Prof. (Entomology), Dept. of Millets, TNAU, Coimbatore (Continuous project)	The project may be continued.
2.	<b>AICRP on Forage Crops</b> – Evaluation of fodder crops germplasm against major pests and development of management strategies <b>Dr. K. Premalatha</b> , Assoc. Prof. (Entomology), Dept. of Forage Crops, TNAU, Coimbatore	The project may be continued.

### b. PLANT PATHOLOGY

S. No.	Project details	Remarks
<b>I. Sorghum</b>		
1.	<b>CPPS/CBE/MIL/MIL/2022/001</b> - Development of forewarning model for major diseases of sorghum in Correlation with meteorological parameters Dr. A. Sudha, Assoc. Prof. (Pl. Path.), Dept. of Millets, Cbe Period: June, 2022 to May, 2025	The project may be continued
<b>II. Maize</b>		
2.	<b>CPPS/CBE/PAT/MIL/2021/001</b> - Development of maize shank-based substrate for the multiplication of <i>Trichoderma viride</i> for charcoal rot disease management in maize Dr. V. Sendhilvel, Assoc. Prof. (Pl. Path.), ARS, Virinjipuram Period: March 2021 to April 2024	The project may be continued
3.	<b>CPPS/VGI/PAT/MAZ/2017/001</b> - Studies on the genetic diversity of maize downy mildews in Tamil Nadu Dr. R. Radhajejalakshmi, AP. (Pl. Path.), HC&RI, PKM Period: Jan', 2021 to Dec', 2024	The project may be continued
<b>III. Pearl Millet</b>		
4.	<b>CPPS/CBE/MILL/MILL/2021/001</b> - Development of a mobile-based diagnostic system for rust and downy mildew diseases of pearl millet using deep learning techniques	The project may be continued

	Dr. I. Johnson, Assoc. Prof. (Pl. Path.), Dept. of Millets, Cbe Period: August, 2021 to July, 2023	
<b>IV. Ragi and Small millet</b>		
5.	<b>NEW</b> - Management of foliar diseases of foxtail millet ( <i>Setaria italica</i> L.) Dr.P.T. Sharavanan, Assoc. Prof. (Pl. Path.), CEM, Athiyandal, Period: Sep, 2022 to Aug, 2025	The project may be continued
6.	<b>NEW</b> - Forewarning model for foliar diseases of barnyard millet ( <i>Echinochloa frumentacea</i> ) and its management Dr.P.T. Sharavanan, Assoc. Prof. (Pl. Path.), CEM, Athiyandal, Period: Sep, 2022 to Aug, 2025	Seasonal disease documentation and Host specificity studies may be included. The project may be continued

## All India Coordinated Research Projects

S. No.	Project details	Remarks
1.	<b>AICRP (Sorghum) - AICRP/PBG/CBE/SOR/006:</b> Evaluation of AICRP trials in sorghum Performance of sorghum entries against major diseases under sick plot conditions (Continuous project) Dr. A. Sudha, Assoc. Prof. (Pl. Path.), Dept. of Millets, TNAU, Cbe	The projects may be continued as per AICRP technical programme
2.	<b>AICRP (Maize) - AICRP/PBG/CBE/MAZ/004:</b> AICRP on Maize Improvement Performance of maize entries against major diseases under sick plot conditions (Continuous project) Dr. V. Paranidharan, Prof. (Pl. Path.), Dept. of Millets, TNAU, Cbe	
3.	<b>AICRP (Pearl millet) - AICRP/PBG/CBE/PEM/009:</b> Evaluation of AICRP trials in Pearl millet Performance of pearl millet entries against major diseases under downy mildew sick plot conditions and management of Pearl millet downy mildew (Continuous project) Dr. I. Johnson, Assoc. Prof. (Pl. Path.), Dept. of Millets, TNAU, Cbe	
4.	<b>AICRP (Small Millets) - AICRP/PBG/ATL/SMM/008:</b> AICRP on Small Millets (Continuous project) Dr. T. Sharavanan, Assoc. Prof. (Pl. Pathology), CEM, Athiyandal	

## IV. REMARKS

### a. General Recommendations

- Trend analysis may be carried out to assess the production factors and yield gap analysis comparing with global and national level (**Action:** DCARDS)
- Efforts may be taken to analyse the prevalence of cottage industries on millets and documented (**Action:** DCARDS)
- Capacity building programme may be organised for popularization of millets in identified Special Millet Zones (**Action:** DEE/DCPBG/DCM)
- Collaborative projects on advanced nutrient management techniques such as nano fertilizers, drip fertigation and drone application in fertilizer management may be initiated (**Action:** DNRM/CWGS)
- Research on bio-fortification, productivity enhancement and diversification may be focused in maize and millet crops (**Action:** DCPMB&B/DCM/DNRM)
- Estimation on essential nutrients other than common nutrients may be analysed for all millet crops (**Action:** Dean, CSC&RI, Madurai and Dean, AEC&RI, Cbe).

- Drone operated bird scarer and millets harvester may be brought into use (**Action:** Dean, AEC&RI, Cbe).
- Studies on consumption and supply chain management in millet crops to be intensified (**Action:** Dean, CSC&RI/DCARDS)
- Fractionate analysis for cellulose and hemi-cellulose content in Cumbu Napier hybrids for bio-fuel recovery may be carried out (**Action:** DCPBG & Dean, AEC&RI, Cbe).
- Technologies recommended for adoption may be demonstrated in the farmers holdings, research stations and KVKS. (**Action:** DCM/DNRM/CPSS/DEE).
- Scientists may be encouraged to publish their research findings in the peer reviewed journals having NAAS rating more than 7 (**Action:** All Scientists).
- Efforts may be made to obtain more externally sponsored schemes (**Action:** All Scientists).

#### **b. Crop Improvement**

- Efforts may be taken to initiate research on development of sorghum bio-fortified varieties (**Action:** DCPMB&B/DCPBG)
- High yielding sorghum varieties suitable for *kharif* and *rabi* seasons and industrial purpose may be developed (**Action:** DCPBG)
- Development of QPM hybrids in maize may be focused (**Action:** DCPBG/DCPMB&B).
- Development of small millet varieties with non shattering and non lodging type may be focused.
- Research on development of triploid fodder sorghum varieties may be initiated (**Action:** DCPBG)
- Improvement of yield potential, nutrient use efficiency and stress tolerance in small millets may be focused (**Action:** DCPBG/ DNRM/DCM/CPSS).
- Development of pearl millet varieties suitable for forage production may be studied (**Action:** DCPBG).

#### **c. Crop Management**

- Efforts may be taken to develop technologies for improving the yield potential of small millets (**Action:** DCM/DNRM)
- Quality parameters on micro nutrients may be studied for all bio-fortification experiments (**Action:** DCM/DNRM)
- Efforts may be taken to develop new technologies to improve yield and quality of millet crops (**Action:** DCM/DNRM/DCPSS)
- Panivaragu may be utilized in cropping system studies to develop new models (**Action:** DCM/DNRM)
- Efforts may be taken to study the combined effect of application of WSF and Nanofertilizers in millets (**Action:** DCM/DNRM)

- Crop models/systems comprising of all improved forage varieties for adoption by the farmers ensuring balanced nutrition to animals may be developed and popularized (**Action:** DCM)
- Influence of seasonal specific weather parameters on major millets may be analysed for enhancing productivity (**Action:** DCM).
- New fertilizer dose and application methods may be assessed for different millet crops and recommended (**Action:** DCM).
- Suitable new generation weedicides may be evaluated and recommended (**Action:** DCM).

#### d. Crop Protection

- Screening of wild species for imparting resistance to FAW in maize may be intensified. Artificial screening may be attempted in three to four locations in different seasons (**Action:** DCPPS)
- The maize entries found resistance to FAW may be studied critically (**Action:** DCPPS)
- Efforts may be taken to develop suitable control measures for Maize Aflatoxin through multi-disciplinary approach (**Action:** DCPPS/DCM/DNRM).
- Resistant donors for sorghum shootfly resistance may be identified and suitable control measures to contain the pest incidence may be developed (**Action:** DCPPS)
- All the Plant Protection Scientists are instructed to monitor the insect pests and diseases of Millets in their districts regularly and disseminate the Integrated Management strategies of major pests and diseases of millets (**Action:** All Scientists).

### V. List of Participants

S. No.	Name	Designation and Department
1.	Dr. M. Raveendaran	Director of Research, TNAU, Coimbatore
2.	Dr. R. Ravikesavan	Director, CPBG, TNAU, Coimbatore
3.	Dr. N. Senthil	Director, CPMB&B, TNAU, Coimbatore
4.	Dr. R. Umarani	Director, Seed Centre, TNAU, Coimbatore
5.	Dr. M. Shanthi	Director, CPPS, TNAU, Coimbatore
6.	Dr. M.K. Kalarani	Director, DCM, TNAU, Coimbatore
7.	Dr. P. Balasubramaniam	Director, NRM, TNAU, Coimbatore
8.	Dr. R. Santhi	Professor and Head, SS&AC, TNAU, Coimbatore
9.	Dr. M. Maheswari	Professor and Head, ENS, TNAU, Coimbatore
10.	Dr. U. Sivakumar	Professor and Head, Agri.Microbiology, Coimbatore
11.	Dr. M. Prasanthrajan	Professor and Head, NST, Coimbatore
12.	Dr. K.N. Ganesan	Professor and Head, Forage Crops, Coimbatore
13.	Dr. S. Sivakumar	Professor and Head, Millets, Coimbatore
14.	Dr. D. Ramesh	Professor and Head, REE, AEC&RI, Coimbatore
15.	Dr. M. Balakrishnan	Professor and Head, FPE, AEC&RI, Coimbatore
16.	Dr. E. Kokilavani	Professor and Head, CPMB&B, Coimbatore
17.	Dr. R. Chandirakala	Professor (PBG), Millets, Coimbatore
18.	Dr. V. Paranidharan	Professor (Pl. Pathology), Millets, Coimbatore

19.	Dr. K. Iyanar	Professor (PBG), Millets, Coimbatore
20.	Dr. M. Suganthi	Professor (Ento), NOFRC, TNAU, Coimbatore
21.	Dr. A. Senthil	Professor (CRP), CRP, Coimbatore
22.	Dr. C. Babu	Professor (PBG), Directorate of Research, Coimbatore
23.	Dr. N.K. Sathyamoorthy	Professor (Agro.), ACRC, TNAU, Coimbatore
24.	Dr. A. John Joel	Professor (Biotech.), Biotechnology, Coimbatore
25.	Dr. Asish K Binoth	Assoc. Professor (PBG), CPBG, TANU, Coimbatore
26.	Dr. P. Kathirvelan	Assoc. Professor (Agron), Millets, Coimbatore
27.	Dr. T. Srinivasan	Assoc. Professor (Ento.), Millets, TNAU, Coimbatore
28.	Dr. I. Johnson	Assoc. Professor (DPB), Millets, TNAU, Coimbatore
29.	Dr. T. Ezhilarasi	Asst. Professor (PBG), Forage Crops, Coimbatore
30.	Dr. D. Kavithamani	Asst. Professor (PBG), Millets, Coimbatore
31.	Dr. N. Kumarivinodhana	Asst. Professor (PBG), Millets, Coimbatore

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