RESEARCH HIGHLIGHTS (2022-23)

1. INTRODUCTION

Agritech Startups are providing relevant and innovative solutions to a number of challenges faced all across the agricultural value chain. A new wave of budding entrepreneurs and emerging startups in the country are leading the way in disrupting the age old agriculture system with innovative ideas and affordable solutions. These startups have become the missing link between the farmers, input dealers, wholesalers, retailers and consumers connecting each of them to each other and providing strong marketing linkages and quality produce on time. During the year 2022-23, University had organized Krishimela, an agriculture exhibition with the theme on promoting Agritech startups.

Farmer Centric Research Programmes have been addressed by the Scientists located in 13 Agricultural Research Stations spread over in 10 Southern Districts of the State under the jurisdiction of University of Agricultural Sciences, Bengaluru. Research outcomes of the University for the year have wider dimension, ranging from developing climate smart ecofriendly technologies to the technologies that reduce drudgery of small farmers besides releasing the technologies that aim at water saving and integrated pest and disease management.

2. MoU's / MoA's SIGNED

A total of **10** MoU's / MoA's were signed with different institutions for conducting collaborative research of mutual interest and for commercialization of technologies.

MoU SIGNED:

No.	Title of MoU	MoU signed date	MoU Initiators Name with designation	Objectives	Contributors name for fulfilling objectives
1	Promote, enable and sustain the value chain of farmers, growers and processors in the health & nutrition food segment	25.08.22	AICRP on Potential crops, GKVK	Promote and develop value chain for nutri-rich potential crops namely Grain amaranth, Quinoa and Chia crops.	Nutri Planet Foods Pvt. Ltd., Bengaluru

No.	Title of MoU/ MoA	MoU signed date	MoU/ MoA Initiators Name with designation	Objectives	Contributors name for fulfilling objectives
2	Tripartite agreement to promote chia crop	25.08.22	AICRP on Potential crops, GKVK	Promote, enable and sustain the value chain of farmers, growers and processors in the super food segment	VRT Traders Trichi, Tamil Nadu; Ramapura Farmers Producers Company Ltd., Ramapura, Chamarajanagara
3	Technology Commercialization	15.02.23	Dr. K. B. Suresh, Assoc. Professor, Center of Excellence – Nutricereals, GKVK	Assigning the technology for commercialization ✓ Protein fortified foxtail millet flakes ✓ Protein fortified little millet flakes ✓ Protein fortified sorghum flakes ✓ Protein fortified white ragi flakes	NRDC, New Delhi
4	Working towards research, teaching and extension needs of Sericulture in southern Karnataka	25.02.23	Registrar, GKVK	Teaching, Research and extension collaboration	Central silk board, Bangalore

MoA SIGNED:

No.	Title of MoA	MoA signed date	MoA Initiators Name with designation	Objectives	Contributors name for fulfilling objectives
1	Technology Commercialization	07.04.22	AICRP on Women in Agriculture, GKVK	Train and share the procedure of preparing the product: High Fiber Food mix	Nutrisukan Biotech Pvt. Ltd.
2	Technology Commercialization	27.06.22	AICRP on Sunflower, GKVK and NSP, GKVK	Sparing the parental lines and hybrid seeds of sunflower KBSH-41 of UAS-B	National Dairy Development Board and Karnataka Cooperative Oilseeds Growers' Federation

No.	Title of MoA	MoA signed date	MoA Initiators Name with designation	Objectives	Contributors name for fulfilling objectives
3	Technology Commercialization	19.12.22	Dr. Mamatha. H.S., Assoc. Professor, Dept. of Food & Nutrition, CoA, GKVK	Training and sale of the technology: • Enriched gluten free cookies • Low fat little millet biscuit with Whey protein concentrate	Sri. Raghu, R. S., S/o Shivabasappa, R.B.,
4	Technology Commercialization	06.01.23	Dr. Usha Raveendra, Professor, Dept. of Food Science & Nutrition, CoA, GKVK	Train and share the procedure of preparing the product: • Moringa dark Chocolate • Moringa green Chocolate • Morinaga rosemary tea • Moringa tulsi green tea	State lead, Karnataka, Action Aid Association, Bangalore
5	Technology Commercialization	03.01.23	AICRP on Sunflower, GKVK, UASB and NSP, GKVK	Sparing the parental lines & hybrid seeds of notified sunflower hybrid KBSH 78	National Diary Development board and Karnataka cooperative oilseeds grower's federation
6	Technology Commercialization	25.02.23	Dr. Lohithaswa, Prof. & Scheme Head, AICRP on Pigeonpea, GKVK	Sparing the parental lines & hybrid seeds of Maize hybrid MAH -14-5	Univeg Seed Technologies Private Limited, Hyderabad

3. PATENT FOR INVENTION

Three patents has been granted to UAS, Bangalore during the year 2022-23

No.	Title of invention	Patent no.	Date of grant
1	A process for the preparation of Tomato bread and thereof	396430	9.5.2022
2	Sub-baric storage system	401836	22.7.2022
3	Rapid and accurate point –of –care lamp colorimetric based diagnostic dipstick	401825	22.7.2022

4. NEW CHEMICALS / VARIETIES / MOLECULES TESTED

The University has undertaken the testing of **747** new varieties /lines/ chemicals/molecules for control of pests /diseases / weeds / soil analysis and agricultural equipment and generated revenue of **Rs. 535.59 lakhs.**

5. NEW RESEARCH PROJECTS SANCTIONED

A total of **30** new research projects (AICRP Voluntary center: 1, Emeritus Scientist: 1, RKVY: 5, ICAR Ad-hoc project: 5, Government of India:7, Government of Karnataka:2 and Other funding agencies: 9) have been sanctioned to the University during 2022-23 by various funding agencies with a total outlay of **Rs. 6438.67 lakhs** (excluding AICRP center). University has sponsored **17** Research Projects [Varietal development &value addition-11 & Farmer centric-6] based on local problems with an outlay of **Rs. 50 lakhs.**

6. PROJECTS IN OPERATION AS ON 31-03-2023

In total, **237** research projects are in operation, of which 30 are All India Coordinated Research Projects, 5-Voluntary Centre's, 1 Project Coordinating Unit on small millets,1 Network unit on Agricultural Acarology, **17** RKVY projects, 5 Emeritus Scientists, 9 ICAR *Ad-hoc* projects; 67 Govt. of India Projects (DST/DBT); 29 Govt. of Karnataka Projects; 36 projects funded by other agencies and 37 Research projects (UAS Sponsored: 22 Projects on Varietal Development and Value-addition; 8 Farmer Centric & 7 Climate Smart Agriculture) sponsored by the University to tackle the problems of the farmers in the State in general

Projects in Operation as on March 31, 2023

No.	Particulars	Continued	New	Total
1	All India Coordinated Research Projects	30	0	30
2	Voluntary Centre	4	1	5
3	Project Coordinating / Network Unit	2	0	2
4	ICAR Adhoc	4	5	9
5	Emeritus Scientist	4	1	5
6	RKVY Projects	12	5	17
7	Government of India (DST / DBT)	60	7	67
8	Government of Karnataka	27	2	29
9	Other Funding Agencies	27	9	36
10	UAS Sponsored: Varietal Development	11	11	22
11	UAS Sponsored: Climate Smart Agriculture	7	0	7
12	UAS Sponsored: Demand driven & SC/ST	2	6	8
	Total	**190**	**47**	**237**

7. SEED PRODUCTION AND INCOME GENERATED FROM VARIOUS SOURCES DURING 2022-23

National Seed Project produced a total of 753.68 quintals of Breeder Seed and 15,815.91 quintals of Quality Seed in different crops during the year 2022-23.

1. Breeder Seeds and Quality Seeds Produced (in quintals) during 2022-23

No.	Crop	Breeder Seeds (q)	Quality Seeds (q)	Total (q)	Income (Rs.)
1.	Cereals	79.79	12,591.73	**12,671.50**	**3,13,65,170**
2.	Pulses	41.48	1,437.23	**1,478.71**	**62,24,868**
3.	Oilseeds	632.41	1,758.25	**2,390.66**	**2,87,11,168**
4.	Others	0	28.70	**28.70**	**6,81,385**
Total		**753.68**	**15,815.91**	**16,569.59**	**6,69,82,591**

2. PLANTING MATERIALS PRODUCED DURING 2022-23

a) Horticulture crops

Particulars	Unit	Quantity sold	Amount earned (Rs.)
Vegetables			
Vegetables	Kg	3,724.5	59,746
Green Leafy Vegetables	Bunch	116	20,350
Vegetable Seedlings	No.	10,852	54,310
Vegetable Seeds	Kg	2,569	128,685
Ornamental plants: Jasmine, Rose, Crossandra etc.	No.	29,506	525,809
Fruit plants			
Grafted Mango Seedlings	No.	1,863	243,700
Grafted Tamarind Seedlings	No.	819	70,460
Grafted Jamun Seedlings	No.	1,504	150,400
Moringa Seedlings	No.	6,476	129,520
Curry Leaves Seedlings	No.	1,123	22,460
Lemon Plants Seedlings	No.	1,601	160,100
Papaya Seedlings	No.	1,790	35,800
Guava Seedlings	No.	2,032	203,200
Sapota Seedlings	No.	1,526	152,600
Cinnamom, Grapes, Fig, Coffee, Amate etc…	No.	8,766	415,860
Medicinal and aromatic plants	No.	95,716	2302,756
Tissue culture plants			
G 9 banana	No.	17,143	171,430
Nanjundud rasbale	No.	7,850	235,645
Elaki bale	No.	5,668	141,800
Others			
Essential Oils	litre	674	21,290
Tubers	No.	2,320	116,200
Extraction Fees	No.	49	23,400
Incubation Charges	No.	1	50,000
		Total	**54,35,521**

b) Commercial / Other Crops

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Plantation Crops	No.	12020	7,77,790
Tissue Culture Sugarcane Saplings	No.	11911	83,377
Sugarcane setts	tons	239	8,58,518
Turmeric	tons	4.3	30,200
		Total	**17,49,885**

c) Fodder crops /Hybrid grass (Roots slips)

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Hybrid Napier Bajra (CO-3, CO-4, CO-5, BNH-10, BH-18, Super Napier)	No.	88,110	88,110
Guinea Grass (COGG-2, COGG-3, JHGG-08-1, Macuni, Hamil, Grazy guinea)	No.	12,200	12,200
Rhodes grass (Rhodes IGFRI, Rhodes Mutant, Rhodes Local)	No.	2,000	2,000
Others (Azolla, Cango signal, Pyaragrass, etc.,)	No.	30430	82,380
Seeds (Mucuna, agase, etc.,)	Kg	162	22,500
		Total	**2,07,190**

3. BIOFERTILIZER UNIT

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Carrier based	Kg	14298	14,29,850
Liquid based	litre	10803	21,60,600
Cocopeat	Kg	2698	40,560
		Total	**36,31,010**

4. BIO-ENERGY RESEARCH INFORMATION & DEMONSTRATION CENTRE

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Biodiesel	litre	1581	1,25,534
Pongamia cake	Kg	12982	5,13,426
Pongamia oil	litre	900	1,53,000
Neem cake	Kg	6336.9	2,91,486
Neem oil	litre	224.9	89,952
Biodiesel Seedlings	No.	291	4,820
Crude Glyrcerine	litre	242	3,630
		Total	**11,81,848**

5. AICRP ON HONEY BEES AND POLLINATORS

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Honey	litre	967	3,24,550
Bee Suit	No.	2	9,000
Honey Extractor	No.	12	60,000
Bee colonies	No.	92	1,89,000
Bee Hive	No.	94	1,88,000
Others (wax, gloves, smoker, veil, stand, pollen trap, plastic frame, face mask, roller, etc…)	No.	371	67,950
		Total	**8,38,500**

6. EQUIPMENTS

Particulars	Quantity Sold (Nos.)	Amount earned (Rs.)
Coconut Dehusker	50	40,000
Sapota harvester	100	19,000
Mango harvester	100	20,000
Total	**250**	**79,000**

7. MUSHROOM CULTIVATION LABORATORY

Particulars	Quantity Sold (Kg)	Amount earned (Rs.)
Mushroom	981	78,460
Total	**981**	**78,460**

8. AICRP ON WOMEN IN AGRICULTURE

Particulars	Quantity Sold (Kg)	Amount earned (Rs.)
Ragi malt	77.8	19,500
Pusti laddu	15	8100
Ragi fry powder	7	2100
	Total	**29,700**

9. CENTER OF EXCELLENCE ON NUTRI-CEREALS:

Particulars	Quantity Sold (Kg)	Amount earned (Rs.)
Dehulling of millets	2,087	10,435
Cleaning /Destoning of Millets	304	912
Pulveriser of millets	171	855
Pasta Making Machine	118	2950
Flaking Machine	15	300
Pearling/polishing Machine	71	284
Total	**2766**	**15,736**

10. INLAND FISHERIES UNIT

Particulars	Unit	Quantity Sold	Amount earned (Rs.)
Aquarium fishes	Pairs	61	7525
Aquarium plants	Pairs	7	175
Fish Seeds	No.	0.1	50
Thilapia Fish	Kg	18.6	3,472
Fish Feed	Kg	1.65	660
Oxygen fish packing charges		1	25
		Total	**11,907**

INCOME GENERATED FROM VARIOUS SOURCES DURING 2022-23

Particulars	Amount earned (Rs.)
1. Projects	64,38,67,000
2. Sale of Inputs	
✓ Seeds	6,69,82,000
✓ Planting Materials	73,92,596
✓ Biofertilizer Unit	36,31,010
✓ Bio-Energy Research Information & Demonstration Centre	11,81,848
✓ AICRP on Honey Bee	8,38,500
✓ AICRP on PHET	79,000
✓ Mushroom cultivation laboratory	78,460
✓ AICRP on Women in Agriculture	29,700
✓ Centre of Excellence on Nutri-cereals	15,736
✓ Inland Fisheries Unit	11,907
3. Testing Trials	5,35,58,732
4. Commercialization of Technologies	25,78,000
Total (Rs.)	**78,02,44,489**

8. RESEARCH HIGHLIGHTS

8.1 NEW VARIETIES RECOMMENDED FOR RELEASE

One hybrid in sunflower and **four** varieties viz., 1 each in ragi, little millet, proso millet and jackfruit have been recommended for release in different zones during 2022-23.

No.	Crop	Variety	Zone Recommended
1	Finger millet	ML-322	5
2	Little Millet	GPUL-11	5 and 6
3	Proso Millet	GPUP-32	5 and 6
4	Sunflower	KBSH-85	5 and 6
5	Jackfruit	GKVK Red Jack	5

8.2 NEW TECHNOLOGIES RECOMMENDED FOR INCLUSION IN PACKAGE OF PRACTICES

A total of 32 new technologies on various crops on different aspects have been recommended for inclusion in the package of practices in different zones.

8.2.1 Crop Production (15)

Agronomy (8)

- Weed management with post-emergence herbicides in kodomillet
- Suitable spacing for enhance yield in browntop millet
- Suitable sowing windows in foxtail millet in the context of climate change
- Suitable sowing windows in browntop millet in the context of climate change
- Fertigation in aerobic rice
- Post-emergence chemical weed control in paddy wet nursery
- Post-emergence chemical weed control in paddy dry nursery
- Weed management with post-emergence herbicides in sunflower

Soil Science & Agricultural Chemistry (3)

- Utilization of slag based gypsum for sustainable yield in maize
- Utilization of slag based gypsum for sustainable yield in paddy
- Mechanized drum composter – a simple method of composting waste

Agricultural Microbiology (2)

- Acetic acid for increasing the storage life of oyster mushroom (*Pleurotus eos*)
- Application of liquid biofertilizers through drip irrigation in sugarcane

Horticulture (2)

- Apical Rooted Cuttings of potato for seed tuber production
- Mechanization in potato cultivation

8.2.2 Crop Protection (15)

Entomology (10)

- Management of rice yellow stem borer in paddy
- Management of paddy brown planthopper
- Management of ear head bug in rice crop
- Management of pod fly in pigeonpea
- Management of mirid bug in cotton
- Management of diamond backmoth in cabbage
- Management of Invasive thrips in chilli
- Management of fruit fly in ridgegourd
- Management of storage pests in pulses
- Management of peafowl in agricultural crops

Plant Pathology (5)

- Management of bacterial blight in paddy

- Management of rust disease in foxtail millet
- Integrated management of leaf curl virus disease in chilli
- Management of anthracnose in chilli
- Management of early blight in tomato

8.2.3 Agricultural Engineering (2)

- Sugarcane deskinner tool
- Improved hand weeder for row crops

8.3 NEW FARM TRIALS

A total of 18 new farm trials including 5 varietal trials in crops viz., maize, cowpea, sunflower, black turmeric and turmeric and 13 crop production technologies have been recommended for testing on farmers' fields in different zones.

Crop production technologies (13)

No.	Technology proposed	Zone Recommended
Agronomy (12)		
1	Revalidation of fertilizers dose for different duration of rice varieties	6
2	Chemical weed management in drill sown finger millet	5
3	Response of proso millet to microbial consortia and their mode of application	6
4	Response of barnyard millet to microbial consortia and their mode of application	6
5	Response of little millet to microbial consortia and their mode of application	6
6	Sensor based irrigation management in maize	5
7	Sensor based irrigation management in babycorn	5
8	Studies on planting geometry of pigeonpea and suitable intercrops under eastern dry zone of Karnataka	5
9	Evaluation of pre and post emergence herbicides in field bean	5
10	Evaluation of pre and post emergence herbicides in soybean	5
11	Efficacy of herbicides on complex weed flora of sugarcane	6
12	Revisiting nutrient management practices to achieve balanced nutrition in castor	5
Soil Science and Agricultural chemistry (1)		
1	Studies on recycling of mulberry stalk into biochar on growth and yield of mulberry	6

Varietal Trials (5)

No.	Crop	Variety	Zone Recommended
1	Maize	MAH-15-84	5 and 6
2	Cowpea	KBC-12	5 and 6
3	Sunflower	KBSH-90	5 and 6
4	Black Turmeric	CHNBT-1	6
5	Turmeric	IISR Pratibha	6

8.4 TECHNOLOGIES RECOMMENDED FOR COMMERCIALIZATION

Six Value added products have been recommended for commercialization

- Millet ginger biscuit
- Millet cinnamon biscuit
- Gluten free cake
- Millet nutri bite premix
- Ready to prepare instant dosa mix
- Millet beverage premix

9 DETAILS OF RESEARCH HIGHLIGHTS

A. BREAK THROUGH RESEARCH

❖ **Discovery of genes regulating constituent physiological traits of Water Use Efficiency in paddy:** Automated mini-lysimeter and imaging technologies were used to identify the genes responsible for water use efficiency in paddy. Four genes *viz.*, *OsRLK5*, *OsHXK4*, *OsGSTU12* and *OsYUCCA4* were identified and they can be used to improve WUE in paddy through molecular breeding and/or genetic engineering.

❖ **Multigene approach for the control of fungal disease Turcicum Leaf Blight of Maize (*Zea mays*):** Three antifungal genes *Glucanase* and *RACK1* gene from Maize and *Chitinase* from Bittergourd were isolated, cloned into cloning and transformation vectors and sequenced. Multigene construct with these 3 antifungal genes was successfully developed using gateway cloning technology were transformed into maize using in planta transformation method. Expression of chitinase protein of ~44.0 KDa, RACK1 protein of ~37 KDa and glucanase protein of ~38 KDa was confirmed by the SDS-PAGE analysis. Initial in-vitro evaluation of efficacy of three antifungal proteins against turcicum leaf blight fungus was done. The highest percentage of inhibition of fungus growth recorded in multigene construct (>70 %) proteins followed by individual antifungal protein inhibition of fungus viz., RACK 1(41.66 %), Glucanase (44.4 %) and Chitinase (54.44 %).

9.2 DETAILS OF NEW VARIETIES RECOMMENDED FOR RELEASE (5)

9.2.1 FINGER MILLET (RAGI): ML-322

1	Crop	:	Finger millet (Ragi)
2	Variety	:	ML-322
3	Pedigree	:	IE-1012 x Indaf-5
4	IC Number	:	IC -648947
5	Year of Release	:	2023
6	Duration	:	105-110 days
7	Grain Yield	:	Rainfed: 10-12 q/acre Irrigated: 15-20 q/acre
8	Straw Yield	:	2.0-2.2 t/acre
9	Special Features	:	➢ Medium height (100-105 cm) variety ➢ Possess stiff stalk that resists lodging ➢ More number of tillers (6-7) ➢ Resistant to neck and finger blast and is drought tolerant ➢ Releases less chaff dust during threshing
10	Developed Centre	:	Dept. of Genetics and Plant Breeding
11	Recommended Zone	:	Zone - 5

9.2.2 LITTLE MILLET: GPUL-11

1	Crop	:	Little millet
2	Variety	:	GPUL – 11
3	Pedigree	:	CO-4 x TNPSU-221-4
4	IC Number	:	IC-645428
5	Year of Release	:	2023
6	Duration	:	90-95 days
7	Grain Yield	:	6.1-8.1 q/acre
8	Straw yield	:	1.2-1.5 t/acre
9	Special Features	:	➢ Arched shaped inflorescence with intermediate compact panicle. ➢ Oval shaped grain with dark grey colour ➢ Suitable for sowing in *kharif* season (June-July) ➢ Highly resistant to grain smut and leaf blight disease
10	Proposed Centre	:	AICRP on Small millets, GKVK
11	Recommended Zone	:	Zone – 5 & 6

9.2.3 PROSO MILLET: GPUP-32

1	Crop	:	Proso millet
2	Variety	:	GPUP – 32
3	Pedigree	:	CO-5 x TNPm255-1
4	IC Number	:	IC-645427
5	Year of Release	:	2023
6	Duration	:	80-85 days
7	Grain Yield	:	7.2-8.1 q/acre
8	Straw yield	:	1.2-1.5 t/acre
9	Special Features	:	➢ Intermediate compact with diffused shaped inflorescence ➢ Semi-tall variety ➢ Oval shaped golden yellow colour grain with higher test weight ➢ Suitable for sowing in *kharif* season (June-July) ➢ Highly resistant to grain smut and brown spot disease
10	Proposed Centre	:	AICRP on Small millets, GKVK
11	Recommended Zone	:	Zone – 5 & 6

9.2.4 SUNFLOWER: KBSH-85

1	Crop	:	Sunflower
2	Hybrid	:	KBSH-85
3	Pedigree	:	COS-903 A X GKVK-756
4	IC Number	:	IC644835
5	Year of Release	:	2023
6	Duration	:	95-98 days
7	Seed Yield	:	8.9-10.5 q/acre
8	Oil Yield	:	3.6-4.0 q/acre
9	Special Features	:	➢ Medium height and ➢ Sturdy stem plant type category. ➢ Resistant to downy mildew
10	Developed Centre	:	AICRP on Sunflower
11	Recommended Zone	:	Zone – 5 & 6

9.2.5 JACKFRUIT: GKVK RED JACK

1	Crop	:	Jackfruit
2	Variety	:	GKVK Red Jack
3	Year of Release	:	2023
4	Yield (10 year old tree)	:	120 to 150 fruits /tree/year 600-700 g flake weight per kg fruit
5	Special Features	:	➢ Early bearing (3.5 years from planting) ➢ Flakes: medium size, coppery red colour, crisp, oblong with excellent taste, each weighing 25 to 35 g ➢ Fruit: Oblong shape, medium sized (5.5-10 kg /fruit), small central core, outer green rind is thin (<1.50 cm) weighing 300-400g per kg fruit weight ➢ Highly preferred for table purpose and processing into squash ➢ Flake to fruit ratio is good (0.63) ➢ TSS: 25 to 30° Brix ➢ Small seeds with 20 seed weight about 100-130g ➢ Suitable for commercial cultivation for its red colour flakes with excellent taste and gum less trait in ripe fruits ➢ Total carotenoid (604.75 µg/100g), lycopene (4.30µg/100g) and lutein (20.68 µg/100g) content is higher compared to other red flake types

6	Developed Centre	:	Dept. of Biotechnology, GKVK
7	Recommended Zone	:	Zone - 5

9.3 DETAILS OF NEW TECHNOLOGIES RECOMMENDED FOR INCLUSION IN PACKAGE OF PRACTICES (32)

9.3.1 Crop Production (15)

Agronomy (8)

- **Weed management with post-emergence herbicides in kodomillet:** Spraying of metsulfuron methyl (10%) + chlorimuron ethyl (10%) WP-20 WP (2+2) powder 8g/acre as post-emergence herbicide or 2,4-D, sodium salt 80 percent powder (375 g/acre) mixed in 200 ls of water when weeds are at two to four leaf stage reduced the weed density by 97.96 and 63.27 % respectively compared to unweeded control with increase in yield by 92.75 and 60.87 % and B:C by 2.13 and 1.79 respectively.
- **Suitable spacing for enhance yield in browntop millet:** Sowing seed in rows with 18 inch row to row spacing and 4 inch plant to plant spacing compared to current recommendation (12 inch spacing: grain: 11.7 q/ha and fodder: 2.3 ton/ha) resulted in 20.6% higher grain yield (14.1 q/ha) and fodder yield (17.9%, 2.7t/ha) with B:C ratio (2.74:1).
- **Suitable sowing windows in foxtail millet in the context of climate change:** Sowing foxtail millet in the first fortnight of July compared to the current recommendation (August: grain: 11.8 q/ha; fodder: 2.2 t/ha) recorded 19.5% higher grain yield (14.1q/ha), 20% higher fodder yield (2.6 t/ha) with B:C ratio of 2.35:1.
- **Suitable sowing windows in browntop millet in the context of climate change:** Sowing browntop millet in the first fortnight of July compared to current recommendation (June: grain: 9.7 q/ha & fodder: 2.1 t/ha) recorded 18.6% higher grain yield (11.5 q/ha), 16.5% higher fodder yield (2.4 t/ha) with B:C ratio of 2.3:1.
- **Fertigation in aerobic rice:** Recommended nitrogen (100kg/ha) and potash (50 kg/ha) fertilizers are divided into 12 equal proportions and applied once a week starting from sowing to grain filling stage through fertigation enhances the fertilizer utilization efficiency (from 40% to 75%), yield (58q/ha to 68 q/ha) and B:C ratio (2.58:1 to 3.11:1).
- **Post-emergence chemical weed control in paddy wet nursery:** Spraying of bispyribac sodium (10% SC) @ 7.5 ml in 15 l of water as post-emergence herbicide on 12th day after sowing in 3 gunta area of wet nursery bed when weeds are at 2-4 leaf stage reduces weed count by 99% and dependency on laborers for weeding.
- **Post-emergence chemical weed control in paddy dry nursery**: Spraying of bispyribac sodium (10% SC) @ 7.50 ml in 15 lit. of water as post-emergence herbicide on 12th day after sowing in 3 gunta area of dry nursery bed when weeds are at 2-4 leaf stage reduces weed count by 95-99 per cent and dependency on laborers for weeding.

- **Weed management with post-emergence herbicides in sunflower:** Whenever pre-emergence herbicides cannot be used, apply post-emergence herbicide, quizalofop-p-ethyl 5% EC @ 1.5ml/l at 15-20 days after sowing (when weeds are at two to three leaf stage) and one intercultural operation @ 30 DAS reduced the weed density by 75% and increased the yield by13 % with reduction in cost of weed management by 60% as compared to manual hand weeding (B:C ratio of 2.43:1).

Soil Science & Agricultural Chemistry (3)

- **Utilization of Slag Based Gypsum for sustainable yield in maize:** Along with the recommended dose of fertilizer, application of slag-based gypsum @ 180 kg/acre enhances the yield by 16.5% with B:C ratio of 2.38:1 or application of commercially available gypsum @ 180 kg per acre once a year in maize crop before sowing enhances the yield by 12.1% with B:C ratio of 2.33:1.
- **Utilization of Slag Based Gypsum for sustainable yield in paddy:** Along with the recommended dose of fertilizer, application of slag-based gypsum @ 180 kg/acre enhances the yield by 14.7% with B:C ratio of 1.88:1 or application of commercially available gypsum @ 180 kg per acre once a year in paddy crop before transplanting enhances the yield by 9.9% with B:C ratio of 1.83:1.
- **Mechanized Drum Composter– A simple method of composting waste:** In this method, wet and dry organic waste materials generated should be mixed in 1:3 ratio all the time. At the time of filling the waste material into the drums, it should be mixed with microbial consortia or cow dung slurry to speed up the decomposition and 60 percent moisture should be maintained. Later, 15-20 rotations of the drums twice a day with a hand-rotating device will speed up the decomposition process by facilitating aeration. By doing this, compost will be ready in about 75 days. While, if the drums are mechanically motored and rotated 2-3 times a day for 5 minutes, compost will be ready in about four weeks duration. In this system, the liquid waste produced during the decomposition can be collected in trays below the drums and could be sprayed to the crops in 1:10 ratio of liquid and water. Mechanized drum composter of 50 liter capacity can produce about 30 kg of compost in about 30-35 days.

Agricultural Microbiology (2)

- **Acetic acid for increasing the storage life of oyster mushroom (*Pleurotus eous*):** Treating 1 kg of oyster mushroom with 480 ml of 1% acetic acid for 10 minutes then air dry for 2 minutes and packed in tight High Density Polyethylene (HDPE) bags and storing in refrigerator at 4°C enhances the shelf life of oyster mushroom by 6 days with an expenditure of Rs. 3.70 per kg mushroom.
- **Application of liquid biofertilizers through drip irrigation in sugarcane:** Apply liquid biofertilizers microbial consortia (Azotobacter + Azospirillum + Pseudomonas + Bacillus) mixed in 200 ls of water @ 2 l/acre at 30 and 60 days after planting along with

recommended 75% fertilizers through drip irrigation. This increases the nutrient availability and microorganisms in the soil and reduces the fertilizer requirement by 25%. Recommendation in the PoP yields 155 t/ha with 2.18:1 B:C ratio while present technology yields 168 t/ha with 2.36:1 B:C ratio.

Horticulture (2)

- **Apical Rooted Cuttings (ARC) of potato for seed tuber production:** Disease-free saplings grown in Tissue Culture bottles (TC bottles) are selected and carefully separated roots from culture media. Dip the saplings in 2% fungicide and then transplant to mother bed (a bed prepared with coco-peat). 21 days after transplantation, the first apicals are available to cut. The cut apicals are again transplanted to the mother bed for further multiplication up to two months. Where, each tissue culture sapling produces 100 saplings by the end of two months. After two months and based on the farmers need, apicals are cut and transplanted to protrays. After fourteen days of nourishment, rooted saplings are ready for transplantation in open field conditions. Later, saplings are transplanted by following 60X20 cm spacing and other cultivation practices mentioned in the Package of Practices. Harvesting can be done at 90-110 days and harvested potato tubers are used as G-0 seed material for sowing. This can be used as seed material for three generations. While using rooted cuttings for planting provide recommended chemical fertilizer in four splits at ten days interval in raised beds with need based plant protection measures as in PoP.
- **Mechanization in Potato Cultivation:**
  - **Tractor operated potato planter** - In modern mechanized potato farming, whole tubers can be planted with a tractor-driven potato planter. About 1 quintal of sowing tubers can be stored in this planter and it forms one feet raised beds. Two people can sit behind the planter and put the tuber into the measuring wheel where tubers will be placed at a depth of 10-12 cm by covering the tuber with the soil about 4-5 cm, simultaneously using soil cover plate. Through this, sowing of 1 acre area can be done in 2 hours. Germination to the extent of 88% and tuber yield of about 12.6 t/ha can be obtained through this planter while germination to the extent of 72% and tuber yield of about 8.52 t/ha can be obtained through manual sowing.
  - **Boom sprayer** - Plant protection chemicals can be sprayed in less than 1 hour/acre there by controlling pest and diseases.

9.3.2 Crop Protection (15)

Entomology (10)

- **Management of yellow stem borer in paddy:** Broadcasting of granular insecticide, chlorantraniliprole 0.4% GR @ 4 kg per acre at 20 days after planting reduces the incidence by 93% while enhances the yield (53.2 q/ha) by 75% over control with B:C

ratio of 2.02:1. The granular formulation listed in the PoP *viz*., carbofuran 3%G has been enlisted to be banned.

- **Management of brown plant hopper in paddy:** Foliar spray of triflumezopyrim 10 SC @ 0.40 ml/l when we observe 5-10 grasshoppers per stem @ 94 ml in 225 ls of water per acre reduces the pest incidence to the extent of 99% with B:C ratio of 2.87:1 and 6% to 15% higher grain yield (60 q/ha) than currently recommended insecticides (B:C ratio- 2.23:1, grain yield: 50 q/ha and incidence reduction: 72%).
- **Management of ear head bug in paddy:** Foliar spray of fipronil 5% SC insecticide at 2 ml per l of water when we observe 1-2 bugs per plant during milk filling stage @ 200-250 ls of solution per acre reduces the incidence by 96% while enhances the yield (60.6 q/ha) by 64% with B:C ratio of 3.09:1. Pesticides listed in the PoP viz., Malathion is highly toxic and is enlisted to be banned.
- **Management of pod fly in pigeonpea:** Spraying of lufenuron 5.4 EC @ 1ml per l of water, twice at an interval of 15 days at pod setting and pod development stages reduces the pod damage by 56% and seed damage by 77% with B:C ratio of 3.63:1. Yield levels are on par with the pesticides listed in the PoP viz., Thiamethoxam (enlisted to be banned).
- **Management of mirid bug in cotton:** Spraying dinotefuran 20 SG @ 0.3 g/l of water when we observe mirid bugs at bud setting and fruit development stage @ 200 ls of solution per acre reduces the mired count to the extent of 87 percent and enhances the yield by 60% (24.4 q/ha) with B:C ratio of 3.41:1. At present there is no recommendation in PoP.
- **Management of diamond backmoth in cabbage:** When the incidence of diamondback moth is noticed on cabbage, spraying of broflanilide 30% SC @ 0.08 ml per l of water reduces incidence by 97% and enhances yield (23 t/ha) by 13% with B:C ratio of 3.3:1 or Spraying fluxametamide 10% EC @ 0.8 ml per l of water when we observe the diamond backmoth in cabbage reduces incidence by 96% and enhances yield (21 t/ha) by 12% with B:C ratio of 3.1:1. These chemicals are effective over the present recommendations viz., chlorantraniliprole (B:C ratio- 2.5:1, grain yield: 17 t/ha and pest incidence reduction: 39%) and emamectin benzoate (B:C ratio- 2.8:1, grain yield: 19t/ha and pest incidence reduction: 54%).
- **Management of Invasive thrips in chilli:** When the infestation of invasive thrips, *Thrips parvispinus* is detected on chilli, spraying of broflanilide 30% SC @ 0.16 ml per l of water (B:C ratio- 3.31:1 and pest incidence reduction: 92.7%) or fluxametamide 10% EC @ 0.8 ml per l of water (B:C ratio- 3.22:1 and pest incidence reduction: 87.2%) or spinetoram 11.7% SC @ 1 ml per l of water (B:C ratio- 3.01:1 and pest incidence reduction: 84.9%) or tolfenpyrad 15% EC @ 2ml per l of water (B:C ratio- 2.96:1 and pest incidence reduction: 83.6%) is found effective in minimizing the damage. It is

suggested not to use any of the above-mentioned pesticides for a second application on the same crop. Currently, there are no recommended management practices available in package of practices.

- **Management of fruit fly in ridgegourd:** When fruit fly damage is found in ridge gourd, spraying the mixture of cyantraniliprole 10.26 OD @ 1.8 ml and 10 g jaggery per l of water, followed by need based second application with the mixture of spinosad 45 SC @ 0.3 ml and 10 g jaggery per l of water after 15 to 20 days of first spray reduces the incidence by 92% and enhances yield by 22% (81q/ha) with B:C ratio of 3.6:1. In comparison, 54% reduction in incidence with yield of 65 q/ha and B:C ratio- 2.12:1 was recorded when the present recommended pesticide malathion was sprayed.
- **Management of storage pests in pulses:** After threshing the pulses, dry them till the seed moisture is less than 10% and then apply 0.4 ml flupyradifurone 200 SL mixed in 50 ml of water. Later, dry them in shade for 3-4 hours and store in gunny bag. This seed treatment inhibits legume insect infestation for up to 9 months with B:C ratio of 4.5:1 and preserves the seed quality. Treatment with deltamethrin (present recommendation) preserves the seeds upto 9 months with B:C ratio of 3.8:1.
- **Management of peafowl in agricultural crops:**
  - ✓ Arranging the reflective ribbons of 2 inch width in grid format with a spacing of 6 ft x 6 ft with a twist towards north to south direction around crop area and 2 feet above the crop canopy significantly reduced the peafowl menace and enhanced the crop yield by 11.48 and 17.78 per cent in ragi and groundnut crop, respectively with the cost benefit ratio of 1:1.19 and 1:1.62.
  - ✓ Arranging the coconut fiber ropes in grid format with a spacing of 6 ft x 6 ft around crop area and 2 feet above the crop canopy significantly reduced the peafowl menace and enhanced the crop yield by 9.61 and 14.94 per cent in ragi and groundnut crop, respectively with the cost benefit ratio of 1:1.17 and 1:1.60.

Note: Ropes/ribbons must be placed immediately after sowing (up to 15-20 days) and during the grain formation stage till harvest, depending on the crop and infestation.

Plant Pathology (5)

- **Management of bacterial blight in paddy:** Seed treatment with 0.5 gm streptocycline + copper oxychloride 1 g/l of water (soak whole seeds overnight) along with present recommendation of spraying 0.2 gm streptocycline + 1gm of copper oxychloride per l of water as soon as the disease is observed will reduce disease by 79% with yield upto 38 q/ha and B:C ratio of 3.11:1.
- **Management of rust disease in foxtail millet:** Seed treatment with 10g *Pseudomonas fluorescens* talc based powder per kg of seed and spraying with azoxystrobin 23% SC @ 1ml per l of water at 40-45 days after sowing followed by spraying with *Pseudomonas*

fluorescens talc based powder 10g/l of water at 50-55 days after sowing will reduce the disease by 89% with yield upto 15.2 q/ha and B:C ratio of 2.86:1.

- **Management of anthracnose in chilli:** Spray tebuconazole (50%) + trefloxystrobin (25%) @ 0.4 gm per l of water as soon as the disease is observed and the second spray at an interval of 15 days reduces the disease incidence by 80% and yield of about 34.8 q/ha with B:C ratio of 2.35:1 while spraying the presently recommended carbondizime (yield: 29 q/ha, B:C ratio - 0.96:1) or mancozeb (yield: 26 q/ha, B:C ratio - 0.90:1) reduces disease severity by 59% and 51% respectively.
- **Integrated management of leaf curl virus disease in chilli:** Two rows of multi-harvest fodder maize should be grown before 45 days along the borders of the field. Chilli seedlings grown for 35 days under 50X nylon mesh net should be transplanted in the mid of the silver reflective mulch row cover. Spray Imidacloprid (17.8 % SL) @ 0.5 ml/l or Afidophyropen (50 g/L DC) @ 2 ml/ l of water at 15th and 70th day after planting. Sea plant biomolecule (*Kappapycus alviraizi)* LBD-12/ AGFORT/ TOMOTUFF) 1.5ml/l of water should be sprayed on 21st, 35th, 49th and 63rd day of transplanting. Neem oil (5000 ppm) @ 5 ml/l of water should be sprayed on 28th and 56th day of transplanting. Thiamethoxam (25 WG) @ 0.5 g/l water should be sprayed at 42 days after transplanting. There are no IPM measures for leaf curl virus disease in chilli in PoP. With adoption of this technology, the severity of the disease is between 3 to 7.3 % compared to control (44.29%) with record of highest yield (5.7 t/ha) with B:C ratio of 6.3:1 than untreated plots (1.2 t/ha and 2.4:1).
- **Management of early blight in tomato:** Spray azoxystrobin 18.2% + difenconazole 11.4% SC @ 1 ml per l of water as soon as the disease is observed and the second spray at an interval of 15 days reduces the disease incidence by 70% and yield of about 31.2 q/ha with B:C ratio of 2.26:1 while spraying mancozeb reduces the disease severity by 46.7% with yields of about 21.7 q/ha.

9.3.3 Agricultural Engineering (2)

- **Sugarcane deskinner tool:** Food grade SS 304 material is used for the fabrication of sugarcane deskinning tool. This deskinning tool consists of a cylindrical shaft, curved blade, frame, hinges, and handle. A cylindrical shaped shaft (5cm) is divided into three parts to accommodate the varying circumferences and joined by hinges and the height of the knives is 15 cm, 8 cm and 5 cm respectively. While operating the tool, it should hold by in right hand, as four fingers comes on the left side and a thumb on the right side. At present most of the automatic and semi-automatic deskinning machines are available, but they are very expensive and making it difficult for small scale roadside vendors and consumers to use. As compared to manual peeling with knife, the developed deskinner at different diameters showed reduction in deskinning time and increase in juice quantity and quality.

- **Improved hand weeder for row crops:** This tool is designed for one-foot(30 cm) row spacing crops. It has a total of five tynes, three in front and two in back so it is suitable for all types of soil and crops. Its shovels are made of high carbonated iron and each shovel is 4 cm wide. Working width between the rows is 20 cm, where in simultaneous removal of weeds, loosening the top soil and opening the small furrows between the rows can be done. This tool is pulled by rope by one person in the front and another person holds it with both hands from behind. Weeding efficiency of the improved hand weeder is around 95% and efficiency of cycle weeder is around 80%. Cost of the hand weeder is around Rs.3,300/-

10. PUBLICATION & EXTENSION ACTIVITIES

The Research Scientists of different zones have brought out several publications and are involved in extension activities as detailed below:

A)	**Research Papers**	**No.**
	Full length papers in refereed journals	422
	Abstract / research notes in refereed journals	10
	Full length papers / abstract in Conferences / Seminars / Symposium	60
B)	**Other Publications**	**No.**
	Folders / Broachers / Leaflets/ Bulletins	44
	Popular articles	45
	Books	28
	Chapter in books	5
	Training Manuals	7
C)	**Extension Activities**	**No.**
	Front Line Demonstrations (340 hectares)	926
	Problematic field visits	1
	Participation in training programmes as resource person	188
	Radio talks	5
	TV programmes	20

11. CONFERENCES / SEMINARS / CAPACITY BUILDING PROGRAMMES

Particulars	Organized	Attended
Training Programmes (Including TSP / SCSP)	56	20
Conferences / Seminars / Workshops / Other Meetings	3	86
Winter / summer school	-	1
Krishimela / Exhibitions and Field days	10	7

12. FARM TRIALS & ZONAL TECHNICAL PROGRAMME (2022-23)

36 Farm Trials (New: 20 & Continued: 16) and Technical Programme consisting of 794 experiments (New: 79 & Continued: 715) in Agricultural crops covering different disciplines were implemented during the year 2022-23 as detailed below:

On-going and New Farm Trials of different divisions during 2022 - 23

Division	Zone 5			Zone 6			Total		
	New	Continued	Total	New	Continued	Total	New	Continued	Total
Plant Breeding	3	2	5	5	3	8	8	5	13
Agronomy	7	5	12	4	6	10	11	11	22
Soil Science	1	0	1	0	0	0	1	0	1
Total	11	7	18	9	9	18	20	16	36

On-going and New Technical programme of different divisions during 2022-23

No	Division	Department	Zone-5			Zone-6			Total
			Ongoing	New	Total	Ongoing	New	Total	
1.	Crop Improvement	Genetics and Plant Breeding	115	8	123	120	0	120	243
2		Crop Physiology	10	1	11	0	0	0	11
3		Seed Science & Technology	23	3	26	0	0	0	26
4		Plant Biotechnology	11	3	14	0	0	0	14
				Total	174		Total	120	294

5	Crop Production	Agronomy	84	3	**87**	36	7	**43**	130
6		Soil Science and Agricultural Chemistry	11	10	**21**	10	1	**11**	32
7		Agricultural Microbiology	4	0	**4**	0	0	**0**	4
				Total	**112**		**Total**	**54**	**166**
8	Sericulture	Sericulture	**4**	**0**	**4**	**3**	**0**	**3**	7

No	Division	Department	Zone-5			Zone-6			Total
			Ongoing	New	Total	Ongoing	New	Total	
9	Crop Protection	Agricultural Entomology	73	2	**75**	24	2	**26**	101
10		Plant Pathology	73	4	**77**	55	8	**63**	140
11		Apiculture	10	1	**11**	0	0	**0**	11
					Total **167**			**Total** **92**	**252**
12	Horticulture	Horticulture	8	2	**10**	0	0	**0**	10
					Total **10**			**Total** **0**	**10**
13	Forestry & Environmental Science	Forestry & Environmental Science	1	2	**3**	0	0	**0**	3
					Total **3**			**Total** **0**	**3**
14	Agriculture Engineering	Agriculture Engineering	10	5	**15**	1	2	**3**	18
					Total **15**			**Total** **3**	**18**
15	Food Sc. & Nutrition	Food Sc. & Nutrition	6	0	**6**	9	4	**13**	19
					Total **6**			**Total** **13**	**19**
16	Social Sciences	Agricultural Extension	2	2	**4**	0	0	**0**	4
17		Agricultural Economics	4	6	**10**	0	0	**0**	10
18		Agricultural Marketing & Cooperation	2	0	**2**	0	0	**0**	2

19		**Agricultural Stats., Maths. & Comp. Science**	1	0	**1**	0	0	**0**	1
				Total	**17**		**Total**	**0**	**17**
20	**Animal Science**	**Animal Science and Fisheries**	3	3	**6**	2	0	**2**	8
				Total	**6**		**Total**	**2**	**8**
		TOTAL	**455**	**55**	**510**	**260**	**24**	**284**	**794**

13. ABSTRACT OF CROP VARIETIES / HYBRIDS AND ANIMAL BREEDS RELEASED SINCE INCEPTION (UPTO 2023)

Crop	No.	Crop	No.
I. Cereals & Millets		**V. Commercial crops**	
Paddy	67	Sugarcane	16
Ragi	29	Cotton	13
Jowar	11	Tobacco	5
Wheat	10	**Total**	**34**
Maize	14	**VI. Horticulture crops**	
Foxtail millet	3		
Little millet	2	Cashew	7
Proso-millet	3	Tomato	4
Brown top millet	1	Chilli	3
Total	**140**	Cardamom	3
II. Potential crops		Jack fruit	4
Grain Amaranth	4	Pomegranate	1
Ricebean	1	Mango	1
Total	**5**	Banana	1
III. Pulse crops		Tamarind	1
Cowpea	16	Jamun	1
Redgram	10	Pomello	1
Soybean	9	Potato	1
Chickpea	7	Sweet potato	1
Field Bean	4	Brinjal	1
Blackgram	3	Turmeric	1
Greengram	3	Medicinal coleus	1
Horsegram	2	Chrysanthemum	1
Total	**54**	Stevia	1
IV. Oilseed crops		**Total**	**34**
Groundnut	14	**VII. Fodder**	**14**
Sunflower	11	**Crop Varieties Total**	**321**
Sesamum	5	**VIII. Animal Breeds**	
Castor	4	Sheep	1
Niger	3	Pouly	6
Safflower	2	**Animal Breeds Total**	**7**
Linseed	1	**Grand Total**	**328**
Total	**40**		

14. LIST OF CROP VARIETIES / HYBRIDS RELEASED BY UAS, BANGALORE DURING LAST TEN YEARS (2013-14 TO 2022-23)

Sl. No.	Year	No. of Varieties Released	Variety
1	2013-14	2	Pigeonpea: BRG-5, Groundnut: KCG-6
2	2014-15	3	Groundnut: GKVK-5, Tamarind: GKVK-17, Fodder Cowpea: MFC-08-14
3	2015-16	5	Paddy: KMP-175, Paustic–9, Paustic–1, Paustic–7, Ragi: KMR–340
4	2016-17	8	Maize Hybrid: MAH-14-5, Pigeonpea: BRG-3 Grain Amaranth: KBGA–4, Sugarcane: VCF-0517, Forage Cowpea: MFC-09-1, Stevia: GKVK stevia Jamun: Chintamani Selection-1, Cowpea: AV-6
5	2017-18	4	Ragi: KMR-630, Hybrid Sunflower: KBSH-78 Soybean: KBS-23, Ricebean: KBR-1
6	2018-19	6	Paddy: Gangavathi sona*, Cowpea: PGCP-6, Blackgram: LBG-791, Sugarcane: COVC-16061, COVC-16062. Jack fruit: Lalabagh Madhura.
7	2019-20	3	Groundnut: GKVK-27, Cowpea: KC-8, Forage cowpea: MFC-09-3
8	2020-21	10	Paddy: KMP-220, MSN-99, Ragi: KMR-316, Foxtail millet: GPUF-3, Little millet: GPUL-6, Proso millet: GPUP-28, Grain Amaranth: KBGA-15, Sugarcane: COVC-18061, Fodder oats: RO-11-1, Jack fruit: Byrachandra
9	2021-22	9	Paddy: KMP-225 & RNR-15048*, Maize Hybrid: MAH-14-138, Brown top millet: GPUBT-2, Field Bean: HA-5, Niger: KBN-2, Sesamum: GKVKS-1, Castor: ICH-66*, Fodder sorghum: CNFS-1
10	2022-23	5	Ragi: ML-322, Little millet: GPUL-11, Proso millet: GPUP-32, Hybrid Sunflower: KBSH-85, Jack fruit: GKVK Red Jack
Total		**55**	

* Endorsement

15. ABSTRACT OF CROP VARIETIES / HYBRIDS & TECHNOLOGIES DEVELOPED DURING LAST TEN YEARS (2013-14 TO 2022-23)

Technology	No. of Varieties / Hybrids &Technologies										
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	GRAND TOTAL
A) Varieties	2	3	5	8	4	6	3	10	9	5	**55**
B) Technology											
1.Crop Improvement	-	1#	-	2#	-	2	1	5+1*	-	-	**12**
2. Crop production	6	11	12	14	7	8	8	8	16+1*	13	**104**
3. Control of Pests	0	2+1#	-	3	2	4	3	3	7	10	**35**
4. Control of Diseases	4	3	3	5	6	3	4	7	11	5	**51**
5. Sericulture	1	1+2#	-	-	-	-	-	3	1	-	**8**
6. Horticulture	-	-	4	3	-	1	-	-	-	2	**10**
7. Agril. Engineering	-	-	-	-	1+2*	1*	1	1+3*	2*	2	**13**
8. Food & Nutrition	-	-	-	2*+3#	2*	2*	13*	11*	6*	6*	**45**
9. Fishery Sciences	2	-	-	-	-	-	-	-	-	-	**2**
10.Apiculture	-	-	-	-	-	-	-	1	2+1*	-	**4**
TOTAL (B)	**13**	**21**	**19**	**32**	**20**	**21**	**30**	**43**	**47**	**38**	**284**
GRAND TOTAL (A+B)	**15**	**24**	**24**	**40**	**24**	**27**	**33**	**53**	**56**	**43**	**339**

*** Commercialization # Transfer of Technology**

16. RESEARCH STATIONS OF UAS, BANGALORE WITH LAND PARTICULARS

Research Station	Year of Est.	Area in ha.				Officer In-charge
		Total	Cultivated.	Irrigated	Rainfed	
ZARS, GKVK, Bangalore	1969	559.14	332.79	30	302.79	**Associate Director of Research** Senior Farm Superintendent
MRS, Hebbal, Bangalore	1906	28.59	14.99	9.7	5.29	Farm Superintendent
ARS, Chintamani, Chikkaballapur	1975	40.56	28.58	1	27.58	Farm Superintendent
ARS, Balajigapade, Chikkaballapur	1984	38.4	33.69	2	31.69	Assistant Professor
ARS, Pavagada, Tumkur	2009	4	2	-	2	Farm Superintendent
ARS, Nelamakanahalli, Chikkaballapur	2013	25.03	23.01	-	23.01	Farm Superintendent
ZARS, VC Farm, Mandya	1931	227.06	156.18	156.18	-	**Associate Director of Research** Senior Farm Superintendent
ARS, Madenur, Hassan	1973	42	24	4	20	Farm Superintendent
ARS, Tiptur, Tumkur	1984	66	54.75	4.75	50	Farm Superintendent
OFRS, Naganahalli, Mysore	1917	25.20	16.80	14.80	2.00	Farm Superintendent
ARS, Arasikere, Hassan	1958	31.21	21.49	2.4	19.09	Farm Superintendent
ARS, Gunjevu, Hassan	1995	141	58	8	50	Farm Superintendent
ARS, Kunigal, Tumkur	2014	48	30.58	-	30.58	Farm Superintendent

ZARS: Zonal Agricultural Research Station, MRS: Main Research Station

ARS: Agricultural Research Station, OFRS: Organic Farming Research Station

Associate Director of Research, GKVK is the Head of Zone-5

Associate Director of Research, VC Farm, Mandya is the Head of Zone-6

17. MANDATES OF THE RESEARCH STATIONS OF UAS, BANGALORE

Sl. No	Research Station	Year of Est.	Mandate
1.	ZARS, GKVK, Bangalore District	1969	Research on dry farming techniques, horticultural crops, millets, pulses, oil seeds, sericulture, organic farming, zero budget natural farming, soil test with crop response, long-term fertilizer usage, control of pests and diseases, food science & nutrition, potential crops, seed production in cereals, millets, pulses, oil seeds, agro-forestry and fodder research programmes, precision farming, integrated farming systems, medicinal and aromatic plants, apiculture, post-harvest technology, agricultural engineering and seed technology and horticultural nursery.
2.	MRS, Hebbal, Bangalore District	1906	Seed multiplication programme, weed control and inland fisheries seed production.
3.	ARS, Chintamani, Chikkaballapur District	1975	Research on groundnut production technologies, seed multiplication programme, sericulture and multiplication of planting materials.
4.	ARS, Balajigapade, Chikkaballapur District	1984	Research on integrated farming systems, varietal development and seed production programme in pigeonpea, sunflower, pulses, millets and multiplication of planting materials and fodder slips.
5.	ARS,Tiptur, Tumkur District	1984	Research on varietal evaluation, integrated farming systems, conduct of multi-location trials, Seed production of millets and multiplication of planting materials including fodder slips and seeds.
6.	ARS, Pavagada, Tumkur District	2009	Groundnut based cropping system and identification of alternate crops to groundnut. Management of pest and diseases of groundnut with emphasis on red headed hairy caterpillar, Seed production of millets and multiplication of planting materials.

7.	ZARS, VC Farm, Mandya District	1931	Research on developing improved crop varieties viz., rice, maize, sugarcane, ragi, pulses and fodder crops etc., Research on water management and integrated farming systems. Seed production in rice, finger millet, maize etc., Production of quality planting material of fodder crops, sugarcane, coconut etc.
8.	ARS, Madenur, Hassan District	1973	Research on biofuel crops, varietal evaluation and seed production of pulses and oil seeds, production of elite planting material of Biofuel crops.
9.	OFRS, Naganahalli, Mysore District	1917 2005*	Research on organic farming / natural farming, integrated farming system and organic seed production.
10.	ARS, Arasikere, Hassan District	1958	Varietal evaluation, seed production and multiplication of planting material and coconut seedlings.
11.	ARS, Gunjevu, Hassan District	1995	Research on biofuel crops and multiplication of planting materials in dryland horticultural crops and seed production.
12.	ARS, Nelamakanahalli, Chikkaballapur District	2014	Research on dry farming and seed production of millets, minor millets and pulses.
13.	ARS, Kunigal, Tumkur District	2014	Research on fodder crops, millets and pulses, conduct of multi-location trials and production of quality seeds and planting materials.

*It was re-established as an Organic Farming Research Station