



RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS 2018



NAVARI
NAVARI AGRICULTURAL UNIVERSITY

DIRECTORATE OF RESEARCH
NAVARI AGRICULTURAL UNIVERSITY
NAVARI - 396 450 (GUJARAT)

Citation :

Research Accomplishments and
Recommendations 2018
Navsari Agricultural University
Navsari

Edited & Published by :

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Navsari

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Year of Publication :

December 2018

Publication number :

74/2018-19

Printed at :

Asian Printery
Nr. Talati Hall, Raipur,
Ahmedabad-380 001.



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Navsari - 396 450



MESSAGE

Navsari Agricultural University extends its excellence in tripartite activities *viz.* education, research and extension in agricultural and allied science. As per the mandate of SAUs, the University undertakes research based on the feedback from farmers of seven districts of South Gujarat. Scientists of University have achieved success in developing sustainable technologies to enhance productivity and to improve quality of produce which helps in achieving the goal of nation “Doubling the Farmers Income by 2022”.

NAU has constituted 10 Research Sub-Committees to review, monitor and supervise research work annually and thereafter, approved research outline and progress is scrutinized at state level in the presence of experts of all SAUs of Gujarat before taking varieties/ recommendations/ technologies to farmers.

It is my pleasure to present “Research Accomplishments and Recommendations-2018” covering eleven new varieties and 110 need based recommendations/ technologies developed by scientists for the farming and scientific communities during the year 2017-18.

I appreciate the efforts of scientific faculty members and supporting staff of University and congratulate them for bringing useful varieties/ recommendations/ technologies for benefitting farming community. I heartily congratulate Director of Research and Dean P.G. Studies and his team for compilation and publishing this booklet.

Place : Navsari

(C. J. Dangaria)
Vice- Chancellor





Navsari Agricultural University
Navsari - 396 450



FOREWORD

It is a matter of immense pleasure for me to put forward the publication of “Research Accomplishments and Recommendations-2018”. The prestigious booklet contains new varieties and technologies developed by the scientists of various Research Sub-Committees of Navsari Agricultural University for benefit of farmers, scientists and entrepreneurs. These varieties/ technologies were critically discussed and approved in the 14th Combined Joint AGRESCO meeting held at Junagadh Agricultural University, Junagadh during 03-05 April, 2018.

I congratulate all the scientists of NAU for their continuing efforts to improve research outputs of the University and developing new varieties and technologies for the benefit of farming and scientific community. I am also thankful to all the conveners of various sub-committees of Agricultural Research Council of Navsari Agricultural University for their contribution.

I express my sincere thanks to Hon'ble Vice Chancellor, Dr. C. J. Dangaria for his constant guidance and useful inputs in improving the research outcome of NAU. I also take opportunity to appreciate efforts of all technical staff of Directorate of Research for publishing farmer centric booklet.

(S. R. Chaudhary)

Director of Research & Dean
Faculty of P.G. Studies

Place : Navsari



RESEARCH RESUME

The research work carried out in different fields of agricultural sciences during the year 2017-18 has been very well discussed by different AGRESKO sub-committees of Navsari Agricultural University, Navsari for bringing out useful and beneficial recommendations for farmers and scientific community. Finally, 74 and 47 recommendations for farmers and scientific communities, respectively were approved in the 14th Combined Joint AGRESKO meeting of SAUs and Kamdhenu University held at JAU, Junagadh during on 03-05 April, 2018.

In the Crop Improvement group, total 11 high yielding varieties/hybrids were identified for release from NAU including 2 each from rice, sorghum and adenium, 1 each from mung bean, pigeon pea, finger millet, tomato and Malabar neem.

Location specific and economically viable production technologies were recommended by NRM group that covered various aspects like micro-irrigation, fertigation, mulching, cultural practices, nutrient management in different crops.

The achievements of plant protection group include control of disease and pest, bio efficacy and residue analysis of different pesticides *etc.*

In the pursuit of increasing fruits, vegetables, flower and forest tree production, recommendations emerged out were nutrients management, propagation technique, fertigation method, effect of growth regulators, value addition of different products, cultural practices in the horticulture & forestry group.

Modification in design of sugarcane planter, integrated water resource management, different irrigation schedule *etc.* has been recommended by argil. eng. group of NAU for the benefit of farmers.

Effect of different floor type, different bedding materials, Effect of heat ameliorative measures (fans, foggers and green net), effect of challenge feed on different animals have been recommended by animal production and fisheries / animal health group for achieving better growth and more economical returns.

The details of different sub-committees, conveners, date of meeting held and number of approved recommendations for farmers and scientific communities and approved New Technical Programmes are as under.

S. N.	Name of the Sub-Committees	Name of Convener	Date of meeting	No. of Recommendations		N T P
				Farmers	Scientific community	
1.	Crop Improvement	Dr. P. B. Patel	13-14/03/2018	11	0	1
2.	Natural Resource Management	Dr. V. P. Usdadiya	05-06/03/2018	26	3	26
3.	Plant Protection	Dr. S. P. Saxena	28/02-01/03/2018	6	17	17
4.	Horticulture	Dr. D. K. Sharma	22-23/02/2018	16	3	28
5.	Forestry	Dr. Manmohan J. R. Dobriya	21/02/2018	3	5	6
6.	Agril. Engineering	Dr. S. H. Sengar	12/02/2018	6	4	8
7.	Basic Science	Dr. H. D. Bhimani	07/02/2018	1	10	9
8.	Social Science	Dr. J. J. Makadia	15/02/2018	0	1	25
9.	Animal Production & Fisheries Science	Dr. Sandhya S. Chaudhary	12/02/2018	5	1	9
10.	Animal Health	Dr. V. S. Dabas	03/02/2018	0	3	2
11.	Joint AGRESKO		21/03/2018			
12.	Combined Joint AGRESKO		03-05/04/2018			
Total				74	47	131

RECOMMENDATIONS FOR FARMERS

I CROP IMPROVEMENT

1. Rice: Gujarat Rice – 15 (GR-15)

The biofortified rice culture, NVSR-6121 (5540 kg/ha) performed very well in Gujarat state and it exhibited overall 10.6 %, 19.9 % and 16.1 % grain yield superiority with easy threshability over the checks Dandi, NAUR-1 and GNR-3, respectively. It has long bold grain, long panicle, more productive tillers and more number of grains per panicle. It contains high zinc in grains (21.58 ppm) than check varieties (Dandi: 12.7 ppm, NAUR-1: 14.62 and GNR-3: 15.7 ppm) along with other good quality characters. NVSR-6121 is moderately resistant against bacterial leaf blight, grain discoloration and sheath rot. It is tolerant to brown plant hoppers and moderately resistant to stem borer, leaf folder and sheath mite. This variety recommended for transplanted rice growing areas of Gujarat.



(Associate Research Scientist, MRRS, NAU, Navsari)

2. Rice : Gujarat Rice Hybrid-2 (GRH-2)

Mid-late rice hybrid NVSR-H-1011 (6129 kg/ha) performed well in Gujarat state where it exhibited overall 7.1%, and 17.9% grain yield superiority over the best hybrid check US 312, and best variety GNR-3, respectively. Medium slender grain rice hybrid NVSR-H-1011 contains intermediate amylose and high head rice recovery. The proposed hybrid is moderately resistant against bacterial leaf blight, leaf blast, grain discoloration and sheath rot. The proposed hybrid is tolerant to insect pest like BPH, WBPH, leaf folder and stem borer. Rice hybrid NVSR-H-1011 recommended for rice growing areas of Gujarat state as GRH-2.



(Associate Research Scientist, RRRS, NAU, Vyara)

3. Pigeonpea : Gujarat Tur-104 (GT-104)

The average yield of pigeon pea variety NPMK-15-05 (GT-104) is 1890 kg/ha. It exhibited overall yield advantage of 21.9 %, 21.2 %, 12.5 % and 27.6 % over the checks Vaishali, GJP-1, AGT-2 and BDN-2, respectively. The variety GT-104 matures within 160-170 days (medium group) with semi spreading in nature, having red flower colour, long pod, 5-7 seeds per pod and cream seed colour. It has high yield potential and resistant against SMD. The pigeon pea variety GT-104 recommended for *kharif* season in Gujarat.



(Associate Research Scientist, Pulse Research Station, NAU, Navsari)

4. Mung bean : Gujarat Mung Bean-7 (GM-7)

The average yield of Mung bean variety NMK-15-08 (GM-7) is 1063 kg/ha. It exhibited overall yield advantage of 23.3 %, 6.4 %, 33.8 % and 26.2 % in *kharif* season and 12.2 %, 50.3 %, 22.7%

and 12.1 % in summer season over the check varieties Meha, GM-4, GAM-5 and GM-6, respectively. It matures within 70-75 days (medium group), having indeterminate in growth habit with medium seed size and shiny green seed colour. It has high yield potential and resistant against MYMV disease. The variety GM-7 is recommended for *kharif* as well as summer seasons of Gujarat.



(Associate Research Scientist, Pulse Research Station, NAU, Navsari)

5. Finger millet: Gujarat Nagli-8 (GN-8)

WN-585, the finger millet early variety (3065 kg/ha), performed well with 21.3 % and 13.7 % yield advantage over national checks VL-149 and VL-352, respectively. WN-585 have attractive red coloured bold grain (2.61 g per 1000 seed weight), good and nutritious quality, early and synchronous maturity, erect growing and non-lodging plant type. It is moderately resistant to leaf, neck and finger blast as well as foot rot diseases under field condition with tolerance reaction to pest like stem borer and aphids. WN-585 recommended for *kharif* cultivation in Gujarat as GN-8.



(Associate Research Scientist, Hill Millet Research Station, NAU, Waghai)

6. Sorghum: Gujarat Fodder Sorghum-6 (GFS-6)

The fodder sorghum variety GFS-6 (SRF-347) produced 34327 kg/ha green fodder & 11253 kg/ha dry fodder yield, which is 24.9 %, 13.8 % and 12.3 % higher in green fodder yield and 25.8 %, 11.5 %, and 21.0 % in dry fodder yield as compared to the check varieties GFS-5, CSV-21F (NC) and GAFS-12, respectively. This variety also showed superiority over checks in respect of insect infestation and fodder quality parameters with lower incidence of shoot fly and stem borer. The fodder sorghum variety GFS-6 (Gujarat Fodder Sorghum-6) is recommended for *kharif* season in Gujarat State.

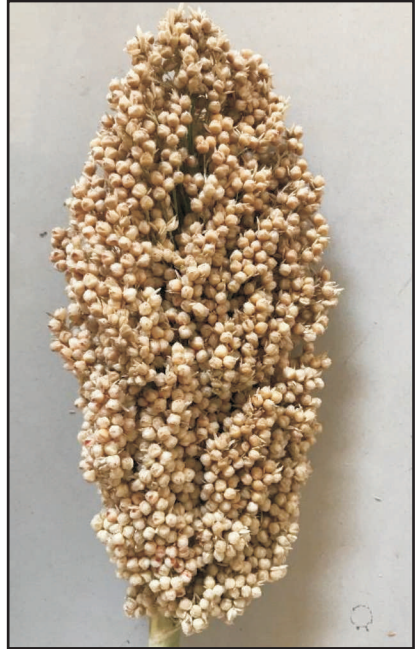


(Research scientist, Main Sorghum Research Station, NAU, Surat)

7. Sorghum: Phule Revati (Endorsement)

The *rabi* sorghum variety *Phule Revati* is higher yielder as compared to State and National checks. It produced average 2814 kg/ha grain yield & 8397 kg/ha dry fodder yield in South Gujarat under irrigated condition with increment of 31.7, 22.3, 62.2, 25.9 and 49 % in grain yield and 28.4, 38.9, 29.8, 16.0 and 24.4 % in dry fodder yield over local check varieties Nizer Goti, BP-53 and National check CSV-216 R, CSV-22 and CSV-29 R, respectively. While under residual moisture condition at Tanchha, it produces

2362 kg/ha grain yield, which is 33.4, 8.0, 32.7, 16.9 and 33.9 % higher over checks Nizer Goti, BP-53, CSV 216R, CSV 22 and CSV 29R, respectively. The variety produced 7977 kg/ha dry fodder yield with increment of 1.9, 11.0 and 29.7 % over checks Nizer Goti, CSV 216R and CSV 29R, respectively. The *Phule Revati* also depicted superiority over checks in respect to pest & disease. The Rabi sorghum variety *Phule Revati* is recommended for endorsement in *rabi* season under irrigated and conserved moisture condition in south Gujarat.



(Research scientist, Main Sorghum Research Station, NAU, Surat)

8. Tomato: Gujarat Tomato-7 (GT-7)

Tomato genotype NTL 12-01 (284.2 q/ha) performed well under South, Middle and North Gujarat regions where, it exhibited overall 20.63, 20.29 and 21.04 % increased fruit yield over standard checks *viz*: JT 3 (235.6 q/ha), AT 3 (225.7 q/ha) and DVRT 2 (224.3 q/ha), respectively. The genotype showed less damage by fruit borer, whitefly as well as leaf miner as compared to standard checks. The genotype NTL 12-01 is recommended for cultivation of farmers of Gujarat regions as GT 7.



(Professor & Head, Dept. of Vegetable Science, ACHF, NAU, Navsari)

9. Adenium: Gujarat Adenium-1 (GAd-1)

Adenium variety Gujarat Adenium-1 (GAd.-1) is unique ornamental plant bearing attractive multipetalous red colored flowers with 15 petals per flower with good flower longevity. It can be propagated by grafting on local pink root stock. The nursery men dealing with ornamental plants are recommended to grow adenium variety GAd-1 under polyhouse for higher commercial value in Gujarat.



(Professor and Head, Dept. of Floriculture., ACHF, NAU, Navsari)

10. Adenium : Gujarat Adenium-2 (GAd-2)

GAd -2 is unique ornamental plant bearing reddish purple colored flowers having dual whorls each of 5 petals *i.e.* 10 petals in each flower along with good flower longevity. It can be propagated by grafting on local pink root stock. The nurserymen dealing with ornamental plants are advised to grow adenium GAd-2 under polyhouse for higher commercial value.



(Professor and Head, Dept. of Floriculture., ACHF, NAU, Navsari)

11. Malabar Neem: Gujarat Navsari *Melia Dubia*-1 (GNMD-1)

Malabar Neem (*Melia dubia* Cav.) tree variety GNMD-1 has performed very well in South Gujarat. After four years, the GNMD-1 has attained 10.90 m height with girth at breast height (GBH) of 49.50 cm. The volume at four years of age has been estimated 224.41 m³/ha with good biomass of 103.23 tonnes/ha. It has clear bole up to 3.70 m free from knots. Its bole is round and clean. The GNMD-1 showed superiority of 9.0, 105.6 and 47.3 % in height; 7.84, 35.6 and 17.9 % in girth at breast height and 26.77, 278.24 and 104.60 % in volume and biomass, over checks Kshitiz (NC), Ritu (NC) and Bahumukhi (NC), respectively. No incidence of insect pest was observed in GNMD-1. The variety GNMD-1 is recommended for farmers of South Gujarat for plantation.



II NATURAL RESOURCE MANAGEMENT

1. Effect of water application in different layers of soil on growth and yield of drip irrigated young mango plantation

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone having 8 to 9 years old mango plantation at a spacing of 5 m x 5 m are recommended to apply irrigation water after initiation of flowering directly in vertically inserting HDPE/PVC pipe (75 mm diameter) into the soil at 40 cm depth below ground level in four side 1.5 m away from mango trunk through spaghetti tube (4 mm diameter) fitted on online dripper through drip system for getting good quality mango fruit with higher yield, net profit and water use efficiency as compared to water applied through surface drip system.

System details

Lateral spacing	:	5 m
Dripper discharge	:	8 lph
No. of drippers per tree	:	4
Operating pressure	:	1.2 kg/cm ²
Operating frequency	:	Alternate day
Operating time	:	Oct. – Nov. : 120 to 202 min
	:	March – May : 206 to 330 min



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

2. Feasibility of drip irrigation in summer rice

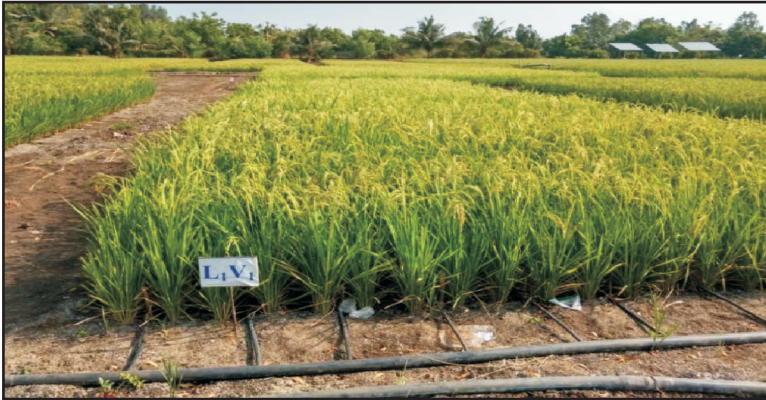
The farmers of South Gujarat Heavy Rainfall Agro-climatic

Zone growing summer rice are recommended that the surface irrigation is more economical than drip irrigation as it gives higher yield with less cost. However, in scarcity of water and availability of drip irrigation system, they can adopt the drip system at 60 cm lateral spacing for getting higher water productivity and 41% saving of water with 4 to 5 irrigations of 80 mm depth to be given by surface method during initial establishment of the crop.

The system details are as under :

Crop spacing: 20 x 20:40 cm (Paired row)

Lateral spacing	: 60 cm
Dripper spacing	: 60 cm
Dripper discharge	: 8 lph
Operating pressure	: 1.20 kg/cm ²
System operating period	: twice in week
Operating time	: March to May : 110 to 125 minutes (1.2 PEF)



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

3. Study on combined effect of irrigation, fertigation and mulching levels on fruit yield and quality of water melon

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing summer watermelon are recommended to apply irrigation through drip system at 0.6 PEF, fertilize the crop @ 150:75:75 kg NPK/ha and mulch with silver black plastic sheet (25 micron and 50 % covering) for achieving higher yield and net

return. The adoption of the practice saves 38 % water, gives 80 % weed control and produces good quality fruits.

Drip detail :

Lateral spacing	: 2 m
Dripper spacing	: 1 m
Dripper discharge	: 8 lph
Operating pressure	: 1.20 kg/cm ²
System operating schedule	: Alternate day
Stages wise water application and system operating time :	

Plant growth stage	Water application (l / plant)	System operating time (minute)
Vegetative	2.25	20
Flowering	2.25 - 8.25	20 – 60
Fruit setting	8.25 - 18.00	60 - 135
Maturity	18.00 - 15.50	135 - 115

Fertigation schedule :

Full dose of P₂O₅ and 10 % of N and K₂O applied as basal and remaining N and K through drip system in eight equal splits at weekly interval starting from 15 days after germination.



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

4. Study on pit method of planting in sugarcane under drip irrigation

The farmers of South Gujarat Heavy Rainfall Agro-climatic

Zone to planting sugarcane through pit method are recommended to dig out pit of 60 cm diameter with a spacing of 1.75 m x 1.75 m with a depth of 40 cm by using post hole pit digger. Sixteen sugarcane sets of two budded are to be put in pit with filling of soil and FYM/bio-compost to a depth of 25 cm below and 15 cm upper side of sets. By adopting of this method, three ratoon can be taken with higher yield and net profit as compared to two ratoon with paired row planting (0.6 m x 1.2 m) under drip irrigation.

The system details are:

Lateral spacing	:	3.5 m
Dripper spacing	:	1.75 m
Size of micro tube fitted on dripper	:	4 mm
Dripper discharge	:	8 lph
Operating pressure	:	1.2 kg/cm ²
Operating frequency	:	Alternate day
Operating time	:	October - December : 110-157 min. March - June : 186-248 min.



5. Effect of rate and frequency of micronutrient application on production of banana under drip irrigation

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing drip irrigated banana are recommended to apply 50 g micronutrient mixture (Grade-V)/plant as soil application in two equal splits at 10 and 40 days after planting along with Precision Farming Development Centre (PFDC) package of fertilization for

getting higher yield, net return, better quality of fruits and sustain the soil fertility.

Schedule of fertilization as per PFDC package :

Method of application	Days after planting	Urea (g/plant)	DAP (g/plant)	MOP (g/plant)
Soil application	30 th	63	40	40
	60 th	63	40	40
Fertigation	90 th	32	--	20
	105 th	32	--	20
	120 th	32	--	20
	135 th	32	--	20
	150 th	32	--	20
	165 th	32	--	20

System details :

Lateral spacing : 2.4 m, Dripper distance: 0.6 m, Dripper discharge: 4 lph,

Operating pressure : 1.2 kg/cm² and Operating frequency: Alternate day (0.6 PEF).



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

6. Study the N and K requirement of beet root grown on soils of South Gujarat

The farmers of coastal areas of South Gujarat Heavy Rainfall Agro-climatic Zone growing beet root (paired row: 20 cm x 45 cm x 75 cm, bed width: 75 cm, furrow top width: 45 cm) during *rabi*

season are recommended to apply 150 kg N and 60 kg K_2O /ha in addition to common application of 60 kg P_2O_5 and 10 t bio compost/ha for getting higher yield and net return.



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

7. Response of *Bt.* cotton hybrids to integrated nutrient management under coastal salt affected soil condition

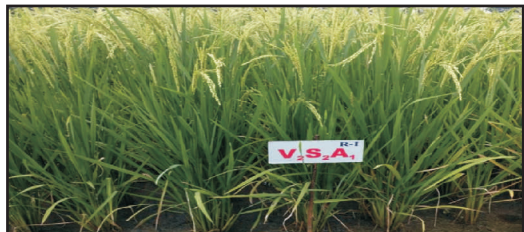
The *Bt.* cotton (GCH-8 (BG-II)) growing farmers of coastal areas of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to apply 10 t bio compost/ha and 300 kg N/ha in five equal splits at 30, 60, 75, 90 and 105 DAS for getting higher seed cotton yield and net return.



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

8. Comparative performance of hybrid and variety of rice under different spacing and age of seedling under South Gujarat conditions

The *kharif* hybrid rice growing farmers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to apply



10 t FYM/ha and transplant 18 days old seedling at 25 cm x 25 cm spacing. The crop is to be fertilized with 40,000 brickets/ha (60 Urea: 40 DAP) at 4 days after transplanting for getting higher yield and net return.

(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

9. Production potential of rice hybrids under different fertility levels in South Gujarat conditions

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing *kharif* hybrid rice are recommended to apply 10 t FYM/ha and fertilize the crop @ 125:37.5:00 kg NPK for getting higher yield and net return.



(Research Scientist, Soil & Water Mang. Res. Unit, NAU, Navsari)

10. Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane

Sugarcane growers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to plant sugarcane sets after overnight soaking in water and apply foliar spray of GA₃ (35 ppm) at 90, 120 and 150 DAP for getting higher remunerative production.



(Research Scientist, Main Sugarcane Research Station, NAU, Navsari)

11. Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity

Sugarcane growers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to apply 10 t FYM ha⁻¹ with biofertilizer (*Acetobacter* + PSB @ 12.5 lit ha⁻¹) and inorganic fertilizers as per soil test based values as well as zinc sulphate 25 kg ha⁻¹ before planting of sugarcane for getting higher cane yield, net return and sustaining soil fertility.

As per soil test analysis based N,P₂O₅ and K₂O fertilizes to be applied as below:

Available soil N (kg/ha)	Recommended dose of N (kg/ha)
0-140	375
141-280	312.50
281-420	250
421-560	250
561-700	187.50
>700	125
Available soil P₂O₅ (kg/ha)	Recommended dose of P₂O₅ (kg/ha)
0-10	187.50
11-20	156.25
21-30	125
31-40	125
41-55	93.75
>55	62.5
Available soil K₂O (kg/ha)	Recommended dose of K₂O (kg/ha)
0-100	187.50
101-150	131.25
151-200	125
201-250	125
251-300	93.75
>300	62.5

(Research Scientist, Main Sugarcane Research Station, NAU, Navsari)

12. Intercropping and plant geometry in relation to mechanization in sugarcane

Sugarcane growers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to plant sugarcane in twin row (30-120-30 cm) with intercropping of four rows of onion in 120 cm spacing to fetch higher remunerative production. The practice is suitable for mechanization in sugarcane cultivation.



(Research Scientist, Main Sugarcane Research Station, NAU, Navsari)

13. Irrigation and fertilizer requirement of Indian bean variety GNIB-21

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone, growing *rabi* vegetable Indian bean (GNIB 21) are recommended to apply 4 irrigations of 50 mm depth at sowing, branching, flowering and after first picking. The crop is to be fertilized with 40 kg N/ha as basal dose for achieving profitable yield.



(Asst. Res. Sci., Pulse & Castor Research Station, NAU, Navsari)

14. Effect of row spacing and seed rate on growth and yield of sunnhemp seed crop during *rabi* season

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing sunnhemp seed crop under conserved moisture in *Kyari* land after *kharif* rice are recommended to sow the crop at 45 to 60 cm row spacing using 30 kg/ha seed rate.



(Professor & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

15. Integrated nutrient management in lucerne (*Medicago sativa* L.) under south Gujarat condition

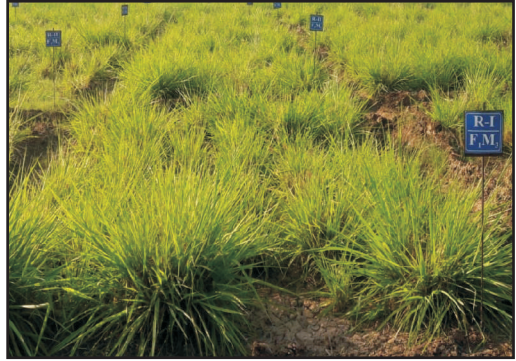
The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing lucerne are recommended to apply FYM 10 t/ha or biocompost 7 t/ha and fertilized the crop with 20:50:50 kg NPK/ha as basal and seed treatment of biofertilizers (*Rhizobium* + PSB each @ 10 ml/kg seed) for getting higher yield and net return.



(Professor & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

16. Nutrient management in guinea grass (*Panicum maximum* Jacq) under south Gujarat condition

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing guinea grass are recommended to apply 10 t/ha FYM and fertilized the crop with 62.5-37.5-37.5 kg NPK/ha as basal as well as 37.5 kg N/ha after each cut and 40 kg P₂O₅/ha each year for getting higher yield and net return.



(Professor & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

17. Cropping system diversification and/or intensification

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to adopt the rice-cabbage-green gram crop sequence for securing higher production, net profit and improving soil fertility.



(Professor & Head, Dept. of Agronomy, NMCA, NAU, Navsari)

18. Response of pigeon pea to nutrient management

The farmers of South Gujarat Agro-climatic Zone growing pigeonpea under rainfed condition during *kharif* season are recommended to apply RDF (25-50-0 kg NPK/ha as basal dose) along with three sprays of 1% water soluble 19:19:19 NPK at

branching, flowering and pod development stage for achieving higher yield and net return.



(Professor & Head, Dept. of Agronomy, COA, NAU, Bharuch)

19. Effect of Zinc on growth and yield of Finger millet

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing finger millet are recommended to apply 25 kg $ZnSO_4$ /ha in soil as basal dose OR give seed treatment with 30% ZnO at 10 ml/ kg seed and root dipping in 0.5% $ZnSO_4$ with recommended dose of fertilizer (40-20-20 kg NPK/ha) to get higher yield and net return.



(Professor & Head, Dept. of Agronomy, COA, NAU, Waghai)

20. Effect of different organics on finger millet (Nagli)

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing finger millet (GN 4) during *kharif* season are recommended to fertilize the crop with 50 % N through FYM (4 t/ha) + 25 % N through biocompost (660 kg/ha) + 25 % N through castor cake (250 kg/ha) + Azotobacter, 2 l/ha + PSB, 2 l/ha for getting higher yield and net return.



(Professor & Head, Dept. of Agronomy, COA, NAU, Waghai)

21. Response of vegetable Indian bean to land configuration and irrigation schedules

The farmers of South Gujarat Agro-climatic Zone growing Indian bean during *rabi* season are recommended to grow the crop on broad bed and furrow (top width of bed 90 cm, height 10 cm, distance between two beds 45 cm with distance between two rows 30 cm and within row 15 cm) and apply 6 irrigations of 40 mm depth in which 1st irrigation just after sowing and remaining 5 irrigations at an interval of 12 to 15 days. By adopting these practices, it gives higher green pod yield and net return.



(Asst. Res. Sci., Agricultural Research Station, NAU, Achhalia)

22. Effect of spacing and fertilizer management practices on *rabi* pigeon pea under conserved soil moisture condition

The farmers of Bara track of South Gujarat region growing pigeonpea *cv.* GT 102 during *rabi* season under conserved soil moisture are recommended to sow the crop at 60 x 30 cm spacing and apply recommended dose of fertilizers (20:40:00 kg N:P₂O₅:K₂O/ha) along with 1 t vermi-compost/ha + seed treatment

24. Influence of preceding summer crops and integrated nutrient management on cotton

The Bt cotton hybrid growing farmers of South Gujarat Agro-climatic Zone are recommended to grow summer green gram as preceding crop with recommended package of practices. They are also recommended to apply 2% banana pseudostem enriched sap as foliar spray at flowering stage with recommended dose of fertilizers (240 kg N + 40 kg P₂O₅ per ha) to Bt cotton hybrid in *kharif* season to achieve higher seed cotton equivalent yield and net realization.



Fertilizer schedule for Bt cotton hybrid

- 40 kg P₂O₅ as basal and 240 kg N applied in 5 equal splits at 30,60, 75, 90 and 105 days after sowing as top dressing

(Research Scientist, Main Cotton Research Station, NAU, Surat)

25. Agronomic requirements of pre released *G. hirsutum* variety in respect of plant density and fertilizer requirement under rain fed conditions. GN Cot. 26 (GBHV-170)

The farmers of South Gujarat Agro-climatic Zone growing rainfed *hirsutum* cotton (GN Cot. 26) are recommended to follow spacing of 120 cm x 45 cm with application of 150 kg N/ha for getting higher seed



cotton yield and net profit. Nitrogen should be applied in two equal splits i.e., 50 % as basal and 50 % at 30-40 days after sowing.

(Research Scientist, Main Cotton Research Station, NAU, Surat)

26. Effect of spacing and nitrogen levels on yield in aerobic rice

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone growing aerobic rice (GNR 3) are recommended to sow crop at spacing of 20 cm between rows and apply recommended dose of fertilizers (100- 30 NP kg/ha) for achieving profitable yield.



(Assoc. Res. Sci., Regional Rice Research Station, NAU, Vyara)

III PLANT PROTECTION

[A] Agricultural Entomology

1. Dispersal of *Trichogramma chilonis* Ishii (Hymenoptera: Trichogrammatidae) in sugarcane field

Sugarcane growers of South Gujarat Heavy Rainfall Agro-climatic Zone are advised to staple trichocard stripes on lower surface of the sugarcane leaves @ 12/ha (Approx. 4000 parasitized eggs/stripe) keeping distance of 30 m between two stripes for effective biological control of sugarcane borers.



(Professor & Head, Dept. of Entomology, NMCA, NAU, Navsari)

2. Population dynamics of *Helicoverpa armigera* (Hubner) through pheromone trap in tomato

Farmers of South Gujarat Heavy Rainfall Agro-climatic Zone III growing tomato are recommended to monitor the infestation of *Helicoverpa armigera* from 3rd to 18th week after transplanting tomato crop for timely management of pest.

(Professor & Head, Dept. of Entomology, ACHF, NAU, Navsari)

3. Dissipation and persistence of combi-product of chlorantraniliprole 9.26 % + λ cyhalothrin 4.63 % in/on pigeonpea

Pigeonpea growers of South Gujarat are recommended pre-mix formulation of chlorantraniliprole 9.26 ZC + λ -cyhalothrin 4.63 %, twice at 15 days interval starting from 50 per cent flowering stage @ 30 g a.i./ha (4.0 ml/10l water) for the control pod borer. Preharvest interval of nine days should be observed to avoid residue problem.

Recommendation as per CIBRC Format

Year	Crop	Pest	Pesticide with Formulation	Doses			Waiting Period (days)
				Quantity of formulation	Con c. (%)	Diluti on in water	
2018	Pige on Pea	Pod Borer	chlorantraniliprole 9.3%+ λ -cyhalothrin 4.6% ZC	220 ml/ 30 g a.i./ha	0.006	550L	9.0

(Associate Professor, FQTL, NAU, Navsari)

4. Dissipation and Persistence of Spiromesifen (22.9 SC) in Brinjal under South Gujarat Conditions

Brinjal growers of South Gujarat Heavy Rainfall Agro-climatic Zone are recommended to apply spiromesifen 22.9 SC, twice @ 96 g a.i./ha (8.4 ml/10 lit.) at 15 days interval starting from fruit setting stage for the control of red spider mite. Pre-harvest interval of one day should be observed to avoid residue problem.

Recommendation as per CIBRC Format

Year	Crop	Pest	Pesticide with Formulation	Doses			Waiting Period (days)
				Quantity of formulation	Conc. (%)	Dilution in water	
2018	Brinjal	Red spider mite	Spiromesifen 22.9 % SC	420 ml/96 g a.i./ha	0.02	500L	1.0

(Associate Professor, FQTL, NAU, Navsari)

5. Studies on bioefficacy of insecticides and botanicals against shoot fly and stem borer infesting sorghum crop

Sorghum growers of South and North Gujarat are recommended to treat seeds with thiamethoxam 30 FS @ 3 g/kg seeds before sowing or treat seeds with thiamethoxam 30 FS @ 3 g/kg seeds before sowing along with spraying of Neem base pesticide 1500 ppm @ 35 ml/10 lit .of water after 30 days of emergence of crop to manage the sorghum shoot fly and stem borer

Recommendation as per CIBRC Format

Year	Crop	Pests	Pesticide with formulation	Dose			Waiting Period	Residue
				Quantity of formulation	Conc	Dilution in water		
2018	Sorghum	Shoot fly Stem borer	Thiamethoxam 30 FS	3g/kg seed	-	-	-	-

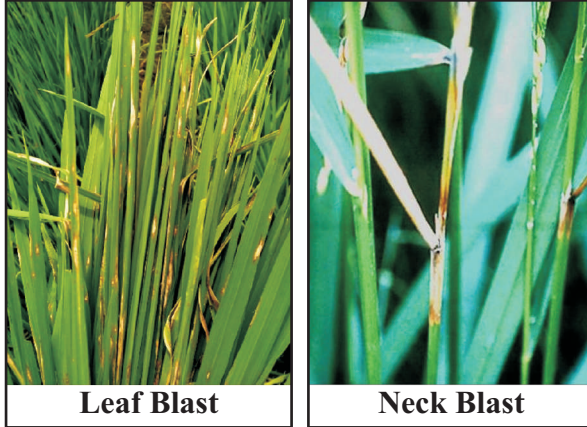
(Assistant Research Scientist, Main Sorghum Research Station, NAU, Surat)

[B] Plant Pathology

1. Biological management of rice blast

The rice growers of South Gujarat Agro-climate Zone are recommended to apply two sprays of *Pseudomonas fluorescens*

Waghai or *P. fluorescens* Navsari isolate @ 6 ml/l. foliar spray (108 cfu/ml) for effective management of leaf and neck blast and to get higher grain and straw yields. The first spray should be given at initiation of disease and second spray at the time of panicle emergence.



(Assistant Research Scientist, Main Rice Research Station, NAU, Navsari)

IV HORTICULTURE

1. Effect of time of inarch grafting on success and survival in mango cv. Kesar.

Farmers and nurserymen of South Gujarat Heavy Rainfall Agro-climatic Zone I (AES-III) preparing inarch graft of mango are advised to prepare grafts throughout the year with uniform success rate and survival.

(Research Scientist, Regional Horticultural Research Station, ACHF,
NAU, Navsari)

2. Effect of time and dose of fertilizer application on yield and quality of sapota cv. Kallipati

The Farmers of South Gujarat Heavy Rainfall Zone-I (AES-III) having sapota orchard with adult trees of cv. Kalipatti are recommended to apply 100 percent recommended dose of fertilizers @ 1000-500-500g NPK/tree/year in three splits *i.e.* 250-125-125g NPK/tree in June along with FYM @ 100kg/tree/year. Remaining 250-125-125g NPK/tree in October and 500-250-250g

NPK/tree in February instead of two equal split *i.e.* in June and October. This treatment gives higher fruit yield of sapota with higher net realization in winter season in comparison to summer season.



(Research Scientist, Regional Horticultural Research Station, ACHF, NAU, Navsari)

3. Effect of pruning on sapota *cv.* Kalipatti at normal spacing

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES-III) having sapota *cv.* Kalipatti orchards of more than 30 years old are recommended to prune 1.0 m upper terminal growth once during december month for getting gradually higher yield and net returns.



(Associate Research Scientist, Fruit Research Station, NAU, Gandevi)

4. Effect of liquid manures on quality and productivity of banana and papaya grown under alternate row system

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES-III) growing banana and papaya under alternate row system are advised to apply 7.2 kg NADEP manure along with 2

1/plant Jeevamrut and 2 l/plant Amreetpani to each of banana and papaya crop for achieving higher yield and net return.

Detail management for banana and papaya alternate row system:

- i. Planting: Prepare the pits at 2.4 m x 1.5 m distance. Sow plant by applying 2.4 kg of NADEP manure per plant along with *PSB* and *Azotobactor* biofertilizer and *Trichoderma* and *Pseudomonas* bio-pesticide 2 ml or g each/plant.
- ii. 2.5 & 5 MAP: Apply 2.4 kg of NADEP manure per plant each time.
- iii. Apply liquid manures Jeevamrut and Amreetpani @ 400 ml/plant at one month interval starting from planting in 5 equal splits.
- iv. In banana, drench 500 ml 0.5% each of *Trichoderma* and *Pseudomonas* after one month of planting.
- v. In papaya, drench 400 ml 0.5% each of *Trichoderma* and *Pseudomonas* at 30 and 60 days of planting.
- vi. For plant protection measure, use the 40 fruit fly traps/ ha for control of fruit fly in papaya and alternate spray of cow urine 2%, neem oil 0.02%, neem kernel extract 0.5% for control of sucking pest and disease in the both crops as per need basis.



(Associate Research Scientist, ACSS, ACHF, NAU, Navsari)

5. Integrated Nutrient Management in cauliflower (*Brassica oleracea* var. *Botrytis*)

The farmers of South Gujarat Agro-climatic Zone-I growing cauliflower are advised to apply 20 kg N+ 40 kg P₂O₅ alongwith 20

t/ha FYM and 5.70 t/ha bio compost as basal dose. The 20kg nitrogen should be applied 30 DAT as top dressing to get higher yield and return.



(Professor & Head, Dept. of Veg. Science, ACHF, NAU, Navsari)

6. Response of okra to foliar application of Silicon

The farmers of South Gujarat growing summer okra are advised to spray silicon based liquid fertilizer@ 2 ml/l (silicon: 0.79% w/v + boron:0.18% w/v - OSAB-Si+) at 30,45 and 60 DAS to obtain higher yield and net income.

(Professor & Head, Dept. of Veg. Science, ACHF, NAU, Navsari)

7. Performance of grafted vs. non-grafted brinjal during rainy season under South Gujarat conditions

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES-III) are advised to adopt grafting technique using wild species (*Solanum torvum*) as rootstock and pink and purple *Surati Ravaiya* brinjal as scion for better plant survival during rainy season, better fruit set, comparatively less shoot and fruit borer infestation, extended life span, higher yield and net returns.



(Professor & Head, Dept. of Veg. Science, ACHF, NAU, Navsari)

8. Comparative performance of different parthenocarpic cultivars of cucumber through vegetative propagation under polyhouse conditions

Farmers cultivating parthenocarpic cucumber varieties in greenhouse are advised to use newly pruned side shoots of current crop as propagating material for raising of successive crop without paying high price for seed which performs equally well to the crop raised from seeds and concurrently, excessive plants generated from pruned side shoots can be sold for additional income.



(Professor & Head, Dept. of Veg. Science, ACHF, NAU, Navsari)

9. Effect of plant growth regulators on growth, quality and yield of *Dendrobium* orchid under NVPH

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I growing *Dendrobium* orchid under naturally ventilated polyhouse are advised to spray GA₃ @50 ppm (1 g/20 lit.) at every two months interval throughout the year for getting higher spike yield and net return.



(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

10. Response of gladiolus cv. Sancerre to different levels of fertilizers (N & P) in respect to growth and yield parameters

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-1 (AES-III) cultivating gladiolus are advised to apply 125: 150: 200 kg NPK/ha alongwith FYM @ 8 t/ha during bed preparation and remaining dose of nitrogen *i.e.* 125kg should be applied at 40 days after planting to produce higher yield and net return.



(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

11. Standardization of nitrogen and phosphorus levels in Chrysanthemum var 'Ratlam Selection'

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I (AES-III), growing Chrysanthemum variety 'Ratlam Selection' are advised to apply 150-100-100 kg NPK / ha along with FYM @ 10 t/ha. Full dose of phosphorus, potassium and half dose of nitrogen should be applied as basal dose whereas, remaining half dose of nitrogen should be applied after 30 days of transplanting for obtaining higher yield and net return.

(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

12. Effect of different growing conditions on growth and flowering of heliconia varieties

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-1 (AES-III) are advised to grow heliconia under 25% green agro-shade net house for getting higher yield and net return.



(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

13. Effect of foliar spray of polyamines and banana enriched sap on Rose (*Rosa hybrida* L.) under polyhouse conditions

Farmers cultivating rose in polyhouse are advised to give foliar application of enriched banana pseudostem sap (Novel O.L.F. @ 200 ml/10 lit. of water) 2 times at 15 days interval from second week of November to obtain higher yield and net returns.

(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

14. Standardization of suitable formulation for preparation of instant mango milk shake powder

Food processors are advised that instant mango milk shake powder can be prepared using 45% of mango powder, 35% of milk powder, 20% sugar with 0.5% citric acid. The product packed in 200 gauge PP pouches (50 microns) found stable up to 6 months at room temperature.



(Professor & Head, Dept. of Post Harvest Technology, ACHF, NAU, Navsari)

15. Standardization of protocol for the extension of shelf life of fresh sapota fruit

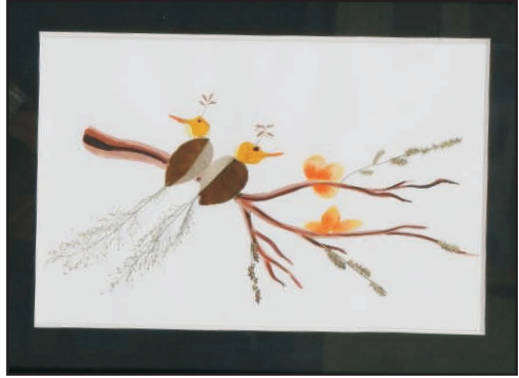
Farmers and entrepreneurs are advised to extend the shelf life of sapota fruits by packing in CFB box (10 kg capacity) and pre-cooling at 10°C for 8 hours. The shelf life of pre-cooled sapota fruits can be extended up to 12 days at 11°C including 3 days transportation.



(Professor & Head, Dept. of Post Harvest Technology, ACHF, NAU, Navsari)

16. Exploration and evaluation of local weed flora for value addition through drying

People interested in cottage industry and entrepreneurs are advised to use weeds for making dry flower products. Leaves of *Argyreia speciosa* can be dried in 7 days, inflorescence of *Celosia argentea* and *Setaria verticillata* in 5 days, *Cyperus rotundus* and *Dinebra arabica* in 4 days and *Eragrostis pilosa* in 3 days through press drying method at room temperature for use in dry flower products up to 6 month



(Professor & Head, Dept. of Flori. & Land. Archi., ACHF, NAU, Navsari)

V FORESTRY

1. Growth and productivity of *Melia composita* Willd. under different spatial geometries

Farmers of South Gujarat Heavy Rainfall Agro-climatic Zone-I are recommended to grow *Melia composita* Syn. *M. dubia* (Malabar neem, Burma neem, nimbaro) at 2 x 2 m spacing for getting higher wood biomass and economic returns.



(Professor & Head, Dept. of Silviculture & Agroforestry, COF, NAU, Navsari)

2. Influence of weather parameters on foraging activity of stingless bees (*Tetragonula laeviceps*) near the nests

Farmers of South Gujarat Heavy Rainfall Agro-climatic

Zone-I (AES-III) are advised to avoid application of pesticides during 13:00 to 15:00 hrs because of higher foraging activity (moving in and out of the nest) of stingless bees (*Tetragonula laeviceps*).



(Professor & Head, Dept. of Forest Product Util., CoF, NAU, Navsari)

3. Nesting habitat and nest architecture of stingless bees (*Tetragonula laeviceps*) in South Gujarat condition

While making the hive for the stingless bees (*Tetragonula laeviceps*), beekeepers are advised to keep entrance opening of hive in the range of 75 to 150 mm² with minimum hive volume of 1330 cm³.

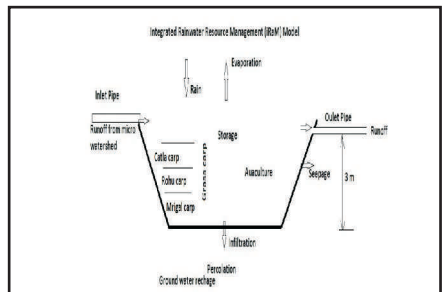


(Professor & Head, Dept. of Forest Product Util., CoF, NAU, Navsari)

VI. AGRICULTURAL ENGINEERING

1. Development of integrated rainwater resource management (iRaM) module for coastal areas of South Gujarat

Farmers of South Gujarat coast are recommended to construct ponds in lower depressions of their field, to harvest rain water for improving ground water quality along with rearing of



fresh water fish (Grass carp, Catla, Rohu and Mrigal). The pond may be constructed in 10 % area with 3.0 m depth including 0.5m free board. They may rear fresh water fish even by collecting rain water or excess canal water by adopting “iRaM”(Integrated rainwater resource management) model.

(Principal, College of Fisheries, NAU, Navsari)

2. Irrigation scheduling of teak seedlings grown in nurseries

It is recommended to farmers / state forest department raising teak stump in net house nurseries to irrigate the seedlings on every alternate day, for getting seedlings with superior growth. The approximate quantity of water application (ml) in poly-bags of 10 kg size, during different months should be as follows.

Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
300	200	200	300	300	400	400	300

(Principal, College of Forestry, NAU, Navsari)

3. Testing and modification of sugarcane planter

The farmers of South Gujarat heavy rainfall zone (AES-III) are advised to adopt IISR, Lucknow make automatic planter with minor adjustment (i.e. 30° enlargement in angle of covering device) for easy planting of sugarcane in heavy black soil. By



adopting this, it can reduce fuel consumption, saves in cost of cutting and covering sets and increase higher cane yield with more net income as compared to other local make planters.

(Prof. & Head, Dept. of Agril. Engg., NMCA, NAU, Navsari)

4. Packaging and storage studies of drumstick '*Moringa oleifera*' and its pulp

1. Farmers, processors, and entrepreneurs are recommended to preserve the drumstick pod pieces by packing in glass bottle and 'A-1 tall' tin can with 2% brine covering and steam retorting at 115°C temperature for 15min and cooling. Thus, bottled and canned drumstick pod pieces can be stored safely and utilized up to 8 and 12 months, respectively.



2. Farmers, processors, and entrepreneurs are recommended to preserve the drumstick pulp in glass bottle and 'A-1 tall' tin can after sterilization, steam retorting at 121°C temperature for 10 min and cooling. Thus, bottled and canned drumstick pulp can be stored safely and utilized up to 8 and 12 months, respectively.



(Head, CE on PHTC, ACHF, NAU, Navsari)

5. Technology for utilization of Orange Peel and Seed

Processors and entrepreneurs are recommended to dry the sweet orange peel and seed below 7% final moisture content using tray dryer at 50°C drying air with tray load of 4.6kg/m² and 2.7kg/m² for 32h and 21h, respectively to extract highest orange oil with optimum d-limonene content.

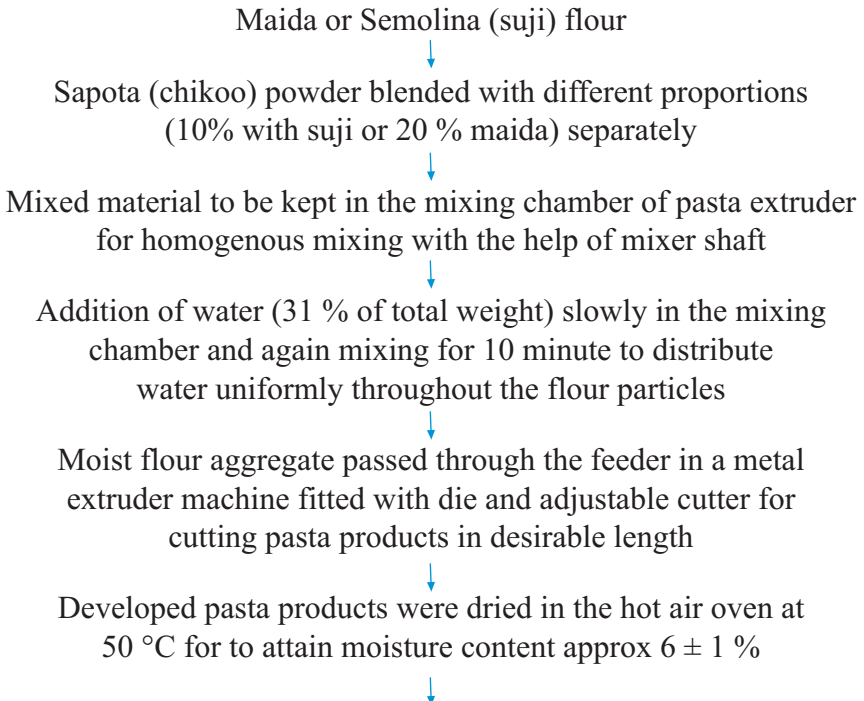


(Head, CE on PHTC, ACHF, NAU, Navsari)

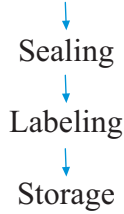
6. Development and studies of sapota (chikoo) powder based value added product (pasta) using semolina (Suji) and maida

The processors and entrepreneurs are recommended to prepare sapota powder blended pasta by replacing 20 % of maida with sapota (chikoo) powder and by adding water @ 31% of total weight for extrusion followed by drying at 50 °C temperature to attain moisture content 6.0 ± 1.0 %. Dried pasta can be safely stored in 200 micron thick HDPE bags up to six months at ambient temperature.

Process Flow Chart for the Preparation of Pasta from Maida or Semolina (suji) Blended with Sapota (Chikoo) Powder



Dried pasta packed HDPE bags of 200 micron thickness

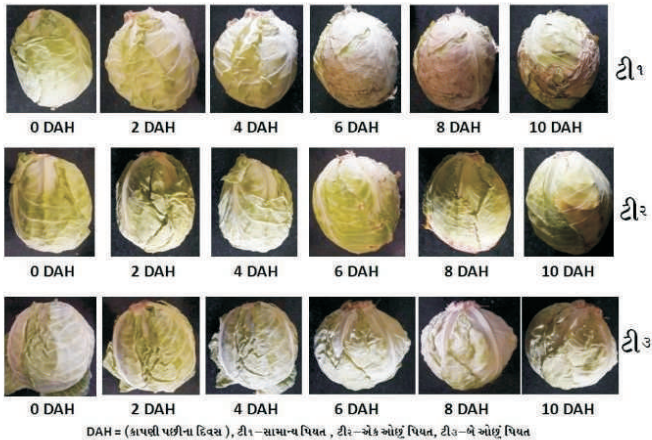


(Dean, College of Agril. Engg. & Tech., NAU, Dediapada)

VII BASIC SCIENCE

1. Effect of pre-harvest water stress on yield and post-harvest quality of cabbage (*Brassica oleraceae* var. *capitata* L.)

The farmers of South Gujarat Heavy Rainfall Agro-climatic Zone AES III growing cabbage are advised to withheld two irrigations, first at head development (35-40 DAS) and second at leaf overlapping stages (65-70 DAS) for sustaining post-harvest quality, increasing yield, saving water and to get higher net return



કોમ્પીજના દ્વારા ઉતાર્યા પછીના અવલોકનો (ઓરડાના સામાન્ય તાપમાને)

(Prof. & Head, Dept. of Plant Mol. Bio.& Biotech, ACHF, NAU, Navsari)

VIII ANIMAL PRODUCTION AND FISHERIES

1. Effect of different floor types on the growth performance and behavioural traits of Surti buffalo calves during winter

Surti buffalo keepers of South Gujarat are recommended to

use paddy straw as bedding material on concrete to house buffalo calves up to 6 months of age to get better growth rate during winter season.



(Research Scientist, Livestock Research Station, NAU, Navsari)

2. Effect of heat ameliorative measures (fans, foggers and green net) on physiological, haematological, biochemical and productive performance of lactating Surti buffaloes

Surti buffalo keepers of South Gujarat region are recommended to house Surti buffaloes in shed having fans, foggers and rooftop whitewashed with lime for decreasing heat stress during summer season from 9 am to 5 pm (temperature decreases upto 3°C) which is beneficial in sustaining milk production.

(Professor & Head, Dept. of Vet. Physiology and Biochem. CVSc&AH, NAU, Navsari)

3. Effect of bedding materials on broiler performance

The Poultry farmers of south Gujarat region are recommended to use sugarcane baggase as a bedding material for rearing of broilers to minimize cost of bedding without affecting growth rate and Feed Conversion Ratio.



(Professor & Head, Dept. of Instructional Livestock Farm Complex, CVSc & AH, NAU, Navsari)

4. Study of Indian white shrimp (*Fenneropenaeus indicus*) growth under varying salinities

The brackish water shrimp growing farmers of coastal areas of Gujarat are recommended to maintain pond water salinity of 25-30 ppt (parts per thousand) in Indian white shrimp rearing for better survival, growth and economical returns.



(Principal, College of Fisheries Science, NAU, Navsari)

5. Effect of challenge feeding on production and reproduction performance of Surti buffaloes

Farmers of South Gujarat are recommended that feeding of concentrate mixture @ 1% of body weight for 2 months before and after calving in Surti buffalo heifers increases calf birth weight, increases daily milk production and income.



(Research Scientist, Livestock Research Station, NAU, Navsari)

RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

I NATURAL RESOURCE MANAGEMENT

1. Use of Plant Growth Regulators for enhanced yield and quality of sugarcane

Overnight soaking of sugarcane sets in 50 ppm ethereal could be done before planting for getting higher cane yield of sugarcane in South Gujarat heavy rainfall zone.

(Research Scientist, Main Sugarcane Research Station, NAU, Navsari)

2. Soil resource information for land capability classification (LCC) and Fertility capability classification (FCC) of six villages situated at hilly undulating terrain of Dangs District.

Under Heavy Rainfall Agro- climatic Zone of Dang following measures are suggested for possible improvement in yield of paddy, gram, groundnut, finger millet, pigeon pea, sorghum and vegetables grown on 0 to 5 % sloppy land and mango, cashew nut and other horticultural fruit crops grown up to 8 % slope:

1. Erosion must be controlled through making bunds / field bunds to restore nutrient rich surface soil considering slope of land and improve soil moisture.
2. Planting / sowing should be done at onset of rains with small flush of N to avoid limiting factor of moisture during dry spell. Further, N must be added in split to increase its efficiency under heavy rainfall situation.
3. Care must be taken in regard to source and method of P fertilizer application to combat medium to high P- fixation capacity of soils.
4. Organic carbon content of soil regularly be assessed and in certain cases low organic carbon containing soil must be replenished by locally available organic materials/manure. Further, available K in soil should be assessed frequently and in case of soils with low ability to supply soil K due to poor retention should be improved by frequent application of K fertilizer.

(Research Scientist, Soil Science Department, NAU, Navsari)

3. Soil and land restoration planning of six villages of Dang District situated at hilly undulating terrain

In order to minimize erosion, washing out of nutrients in upper soil and also to increase moisture conservation for improving yield of different crops grown in Sarvar, Sodmal, Kalamkhet, Motidabdar, Daguniya and Chikhaldada villages of the Dang district of heavy rainfall zone, following different soil conservation measures are suggested:

Soil conservation measures	Length (m) or No. required					
	Villages					
	Sarvar	Sodmal	Kalamkhet	Motidabdar	Daguniya	Chikhaldada
Stone Bunding	4472 m	1010 m	1237 m	258 m	18969 m	1751 m
Soil + Stone Bunding	30213 m	21739 m	12092 m	167 m	28778 m	735 m
Field Bunding (by soil)	21184 m	19546 m	4646 m	21 m	5295 m	7479 m
Making outlet through wire waste	87 no.	23 no.	2 no.	-	1 no.	-
Gully Plugging	44 no.	10 no.	7 no.	-	1 no.	-
Gabion structure	8 no.	1 no.	31 no.	-	-	-
Masonry Foundation Outlet	142 no.	99 no.	10307 no.	90 no.	145 no.	-
Horticultural fruit plant	12784 no.	9784 no.	11250 no.	868 no.	6434 no.	2367 no.
Forest tree	25910 no.	14080 no.	1237 m	1390 no.	13986 no.	1751 m

(Research Scientist, Soil Science Department, NAU, Navsari)

II PLANT PROTECTION

A. Entomology

1. Survey of natural enemies of rice insect pests

The parasitoids viz., *Telenomus* sp. (0.00-31.08, Av. 9.84 % parasitization) and *Tetrastichus* sp. (0.00-7.15, Av. 1.11 %) were found parasitizing eggs of yellow stem borer; Tachinidfly (0.00-20.44, Av. 8.07 %), *Charops* sp.(0.00-33.73, Av. 15.33 %) and *Apanteles* sp. (0.00-66.67, Av. 13.17%) on larvae of paddy skipper; *Xanthopimpla* sp.(0.00-26.67, Av. 4.77 %) and *Brachymeria* sp.(0.00-50.00, Av. 2.69) on pupa of paddy skipper; *Apanteles* sp. (0.00-24.38, Av. 10.15 %) on larva of paddy leaf folder. Moreover, *Trissolcus* sp. and *Oenocyrtus utetheisae* (0.00-21.25, Av. 5.62 %) on eggs of paddy gundhi bug were found predominant as well as potent parasitoids in paddy agroecosystem under south Gujarat condition.

(Prof. & Head, Dept. of Ento., NMCA, NAU, Navsari)

2. Survey of natural enemies of sugarcane insect pest

The parasitoids viz., *Telenomus* sp. (0.00-37.30, Av. 9.02 % parasitization) on egg mass of sugarcane top borer; *Trichogramma* sp. (0.00-50.00, Av. 7.42 %) on egg mass of sugarcane shoot borer; *Apanteles* sp.(0.00-20.83, Av. 3.17 % on *Chilo* sp.), Tachinid fly (0.00-35.00 Av. 9.58 % on *Chilo* sp.) and Tachinidfly (0.00-33.33, Av. 1.89 % on *Sesamia* sp.) on larvae of shoot borer; *Tetrastichus* sp.(0.00-50.00, Av. 12.26%) on egg mass of sugarcane pyrilla and *Encarcia* sp. (0.00-91.67, Av. 25.77 %) on puparium of sugarcane whitefly were found predominant and potent parasitoids in sugarcane agroecosystem under south Gujarat conditions.

(Prof. & Head, Dept. of Ento., NMCA, NAU, Navsari)

3. Screening of sugarcane varieties for Mealybug resistance

Sugarcane genotypes viz., Co 10015, CoN 05071 and CoN 14072 were found less susceptible against mealybug.

(Asstt. Res. Scientist (Ento), Main Sugarcane Research station, NAU; Navsari)

4. Screening of promising genotypes for multiple resistance against rice yellow stem borer, *Scirpophaga incertulas* Walker and sheath mite, *Steneotarsonemus spinki* Smiley of rice

Rice genotypes viz., NWGR-7011, NWGR-9088, IET-23189 and IET-22649 showed multi-resistant reactions against rice yellow stem borer, *Scirpophaga incertulas* Walker and sheath mite, *Steneotarsonemus spinki* Smiley.

(Assoc. Res. Scientist (Ento), Main Rice Research Centre, NAU, Navsari)

5. Survey for assessment of losses due to mealybug infestations in the cotton fields of farmers

The loss due to mealybug infestation in cotton (based on 4-grade infested plants) was estimated to be 1.07 (0.00 to 2.97) per cent and the natural parasitism of *Aenasius bambawalei* Hayat was 8.55 (4.73 to 14.93) per cent under farmers' management practices in 21 surveyed villages of Surat and Bharuch districts.

(Assoc. Res. Scientist (Ento), Main Cotton Research Station, NAU; Surat)

6. Survey for assessment of losses due to pink bollworm infestations in the cotton fields of farmers

The quantitative loss due to pink bollworm infestation was estimated to be 2.14 (0.88 to 3.61) per cent under farmers practices of 274 cotton fields in 21 surveyed villages of Surat and Bharuch districts during 2015-16 to 2017-18.

(Assoc. Res. Scientist (Ento), Main Cotton Research Station, NAU; Surat)

7. Studies on species composition of sugarcane shoot borer

Sugarcane crop in South Gujarat Agro-climatic Zone was infested by complex of two species of shoot borer namely, *Sesamia inferens* (Walker) and *Chilosacchariphagus indicus* (Kapur). Moreover, *S. inferens* was found to be predominant shoot borer species.

(Scientist (Pl. Prot.), Krishi Vigyan Kendra, NAU; Vyara)

8. Evaluation of acaricides against pigeonpea eriophyid mite *Aceria cajani*

Three sprays of spiromesifen 22.9 SC @ 0.005 % (2 ml/10 lit)

or fenazaquin 10 EC (10 ml/ 10 lit) @ 0.01 % at 25, 40 and 55 days after sowing which effectively control pigeonpea eriophyid mite, *Aceria cajani* and give higher seed yield and net return. Further, the residues of these acaricides were found below determination level in pigeonpea seeds and plant residue.

(Asstt.Prof.College of Agriculture,NAU, Bharuch)

B. Plant Pathology

9. Screening of sugarcane varieties for red rot resistance

Sugarcane varieties viz., Co 10005, Co 10006, Co 10026, Co 10027, CoT 10367, Co 09009, Co 10031, CoT 10368, CoT 10369, PI 10131, CoN 14071, CoN 14072, CoN 14073 and CoN 14074 were found moderately resistant to red rot under artificial inoculation condition.

(Asstt. Res. Scientist (Pl. Path.), Main Sugarcane Research Station, NAU; Navsari)

10. Screening of Sugarcane varieties for whip smut resistance

Sugarcane varieties viz., Co 10005, Co 10006, CoT 10366, CoT 10368, CoT 10369, CoVC 10061, PI 10132, CoN 14071, CoN 14072, CoN 14073 and CoN 14074 showed resistant reaction against whip smut disease under artificial inoculation condition.

(Asstt. Res. Scientist (Pl. Path.), Main Sugarcane Research Station, NAU; Navsari)

11. Screening of promising genotypes for multiple resistance against bacterial blight, sheath rot and grain discolouration diseases of rice

Rice genotypes viz., IET-23832, IET-22015, NVSR-6100 and NVSR-6137 were found multiple resistant against bacterial blight and sheath rot diseases under artificial inoculation and high disease pressure in the field and grain discoloration in normal field condition.

(Asstt. Res. Scientist (Pl. Path.), Main Rice Research Centre, Navsari)

12. Screening of promising genotypes for bacterial leaf blight disease of rice

Rice genotypes viz., NVSR-348, NVSR-351, IET-18710 and NVSR-6121 were found resistant against bacterial blight disease by artificial inoculation under field condition.

(Asstt. Res. Scientist (Pl. Path.), Main Rice Research Centre, Navsari)

13. Management of Sterility Mosaic Disease of Pigeon pea

The spraying of either fenazaquin 10 EC @ 0.01 % or propargite 57 EC @ 0.1 % after 25 days of sowing and second at 15 days after first spray was found significantly most effective to manage sterility mosaic disease through vector control and gave higher seed yield and better net profit of pigeonpea in SMD nursery. Further the residues of these insecticides remained below determination level ($< 0.05 \mu\text{g/ml}$), ($< 0.03 \mu\text{g/ml}$) in pigeonpea seeds and plant residues, respectively.

(Assoc. Prof. (Pl. Path.), College of Agriculture- NARP- Bharuch)

14. Epidemiology of rainfed cotton diseases under Bharuch condition

Maximum temperature as well as morning and evening temperature of soil upto 20 cm depth showed highly positive significant effect on development of cotton root rot whereas, maximum temperature had highly positive significant effect against bacterial leaf blight of cotton, however rest of parameters showed non-significant effect on bacterial leaf blight. Maximum temperature had non-significant effect on Alternaria leaf spot but minimum temperature, vapour pressure (morning & evening), RH (morning & evening), wind speed and rainfall showed highly significant negative effect, whereas sunshine and evaporation showed highly significant positive effect on alternaria leaf spot development.

(Asstt. Prof. (Pl. Path.), COA- NARP- Bharuch)

15. Survey of major cotton diseases under Bharuch and Narmada districts

The maximum disease intensity of bacterial leaf blight and alternaria leaf spot of cotton were observed in 42-43rd SMW (15-28th October) *i.e.* 14.34 per cent and 50-51st SMW (10-23rd December) *i.e.* 19.67 per cent in Bharuch district and 42-43rd SMW (15-28th October) *i.e.* 17.83 per cent and 50-51st SMW (10-23rd December) *i.e.* 21.83 per cent in Narmada district, respectively.

(Asstt. Prof. (Pl. Path.), COA- NARP- Bharuch)

16. Current situation and status of Rice False Smut disease in South Gujarat

The disease incidence was noticed higher in Vansda Taluka. The losses due to false smut of rice was estimated to be 0.029 (Dediapada Taluka) to 2.354 per cent (Vansda Taluka) in 50 surveyed villages of 10 talukas of south Gujarat. The false smut disease of rice has attained a major status in Vansda taluka and recorded maximum loss up to 28.02 per cent in the Kavdej village on hybrid rice during *Kharif* 2016.

(Asstt. Prof.(Pl. Path.), Regional Rice Research Station, NAU, Vyara)

17. Survey of root knot nematode (*Meloidogyne graminicola*) in rice nurseries of South Gujarat

Roving Survey was conducted in rice nurseries during summer season from the year 2015-2018 and found 18.64 percent root knot disease incidence with 5.25 percent gall index in infested rice nurseries of South Gujarat. Rice root knot pathogen was identified as *Meloidogyne graminicola* and is first reported in South Gujarat condition.

(Asstt. Prof.(Pl. Path.), Regional Rice Research Station, NAU, Vyara)

III HORTICULTURE

1. Screening of salt tolerant rootstock for mango from South Gujarat region

Genotype 73-2 was found better in terms of germination, seedling growth and survival at EC 4 to 5 dSm⁻¹ salinity level. Scientists, those who are interested to work on salt tolerant rootstock of mango may take advantage in hybridization programme.

(HoD, Dept. of Fruit Science, ACHF, NAU, Navsari)

2. Screening and selection of superior plant types in comparison to alphonso mango

Out of the total 148 trees screened, 30 regular bearing trees (Alternate bearing index >.25) were evaluated for sensory and biochemical analysis of fruits as per fruit descriptors for mango. Three selections (25, 29 and 30) were found promising in shape of fruit, less peel, colour of pulp, pulp percentage, taste and other biochemical parameters and can be further evaluated in block plantations. Incidence

of spongy tissue was not found and there was no major incidence of pest and diseases on these plants.

(Research Scientist (Horti.), AES, NAU, Navsari)

3. Determination of nutritional composition of minor fruits

Minor fruits (mentioned below) of South Gujarat are found rich in following parameters as compared to banana and sapota.

Fruits	Composition better than banana and sapota
Palmyra palm	K (3902ppm), Ca(739ppm), P (268ppm) and Zn (2.79ppm)
Jamun	Total phenol (241.6 mg/100g), Antioxidant activity (126.5 mg/100g), Ca (324ppm) and Mg (241ppm)
White wax apple	Antioxidant activity (16.4 mg/100g)
Carambola	Vitamin-C (16.1 mg/100g), Total phenol (20.8 mg/100g), Antioxidant activity (28.4 mg/100g), K (4099ppm), Ca (657ppm), Mn (3.01ppm) and Cu (2.75ppm)
Tamarind	Carbohydrates (62.8%), Protein (2.81%), Vitamin-C (18.9 mg/100g), Total phenol (25.6 mg/100g), Antioxidant activity (30.4 mg/100g), K (12433ppm), Ca (2759ppm), Mg (1286ppm), P (1099ppm), Fe (154.3ppm), Mn (6.47ppm), Zn (7.11ppm) and Cu (6.13ppm)
Jackfruit	Total phenol (31.8 mg/100g), Antioxidant activity (62.9 mg/100g), K (5135ppm), Ca (405ppm), Mg (533ppm) and Mn (5.12ppm)
Star gooseberry	Protein (4.31%), β carotene (100.7 μ g/100g), Vitamin-C (17.1), Total phenol (105.0 mg/100g), Antioxidant activity (83.7 mg/100g), K (4411ppm), Ca (4933ppm), Mg (1518ppm), P (545ppm), Fe (17.2ppm) and Zn (3.94ppm)
Lasoda	β carotene (62.7 μ g/100g), Total phenol (41.8 mg/100g), Antioxidant activity (55.7 mg/100g), K (4644ppm), Ca (656ppm), P (431ppm), Mn (3.51ppm) and Zn (2.06ppm)

Kair	Protein (2.24%), Total phenol (61.5 mg/100g), Antioxidant activity (77.7 mg/100g), K (7313ppm), Ca (1011ppm), Mg (723ppm), P (999ppm) and Zn (4.71ppm)
Rayan	β carotene (87.63 μ g/100g), total phenol (157.4 mg/100g), Antioxidant activity (92.6 mg / 100g), Ca (284ppm) and P (321ppm)

(Professor & Head, Dept. of Fruit Science, ACHF, NAU, Navsari)

IV FORESTRY

1. Evaluation of Eucalyptus clones for growth and biomass

It is recommended that clone T15 grown in south Gujarat Heavy Rainfall Zone-1, situation III can be used for further breeding/ improvement programme for better productivity at 3 m x 1.5 m spacing.

(Professor & Head, Dept. of Forest Biology and Tree Improvement, CoF, NAU, Navsari)

2. Mass propagation of *Acacia mangium* through axillary bud

Tissue culture scientists are informed to surface sterilize the axillary buds of *Acacia mangium* with absolute alcohol (100 %) for 1 min + mercuric chloride (0.1 %) for 6 min followed by thorough washing and culturing in MS media supplemented with combination 1.0 mg/l BAP + 0.1 mg/l Kin for shoot initiation and multiplication and further rooting the microshoots in $\frac{1}{2}$ MS supplemented with 2.0 mg/l IBA. Vermiculite medium may be used for hardening of *in vitro* plantlets for large scale propagation of *A. mangium*.

(Professor & Head, Dept. of Forest Biology and Tree Improvement, CoF, NAU, Navsari)

3. Effect of different salinity levels of irrigation water on young teak plants

Scientific community is hereby informed that the teak clones (*i.e.* CPT-262, CPT-266 and local) are salt sensitive and the critical limit for irrigating with saline water is EC 4.0 dS/m. Further it is advised that Na/K ratio could be used as an indirect indicator for salt tolerance in teak.

(Professor & Head, Dept. of Natural Resource Mgmt, CoF, NAU, Navsari)

4. **Effect of different salinity levels of irrigation water on clones of *Casuarina equisetifolia***

Scientific community is hereby informed that, *Casuarina equisetifolia* cuttings could be grown successfully up to the EC 8.0 dS/m saline irrigation water, without any remarkable reduction in biomass. The critical limit of salinity of irrigation water, for *Casuarina equisetifolia* is recorded EC 16.0 dS/m. Among the tested clones, IFGTBCE-1 clone is found to be more salt tolerant and could be grown up to EC 12.0 dS/m of saline irrigation water.

(Professor & Head, Dept. of Natural Resource Mgmt, CoF, NAU, Navsari)

5. **Assessment of Land use / Land cover Changes in South Gujarat Using Remote Sensing and Geographical Information System**

It is observed that Surat district recorded major shift (18.25 %) from forest area to orchards, plantations and gardens. Marshy lands have increased in Navsari (28.90%) and Bharuch (2.38%) district. Built up areas significantly increased in Navsari (69.09 %) followed by Narmada (44.40 %) district. The barren land may be planted with suitable forest / fruit species which will provide environmentally sustainable economic growth of the region. Therefore, policy makers, state agriculture and forest departments are suggested to utilize the technique of Remote Sensing and GIS for assessing the changes in land use, at regular basis, to maintain the vegetative cover, essentially required to sustain the ecological balance of the region.

(Professor & Head, Dept. of Natural Resource Mgmt, CoF, NAU, Navsari)

V **AGRICULTURAL ENGINEERING**

1. **Developing program for online tour approval for NAU**

The online tour approval system developed by Navsari Agricultural University can be adopted by employees of Navsari Agricultural University.

(Principal & Dean, AABMI, NAU, Navsari)

2. **Developing mobile app for the APMC operations**

An android based mobile app for APMC operations

developed by Navsari Agricultural University can be used for dissemination of APMC data to the farming community.

(Principal & Dean, AABMI, NAU, Navsari)

3. **Developing web portal for the farmers of South Gujarat region**

A web portal developed by Navsari Agricultural University for the farmers of South Gujarat region can be used for agricultural information dissemination to the farming community.

(Principal & Dean, AABMI, NAU, Navsari)

4. **Development of integrated rainwater resource management (iRaM) module for costal areas of South Gujarat**

The scientists are recommended to use the Chandra and Sexena (1975) estimation equation for ground water recharge in Navsari cost.

$$Rr = [3.984(P - 40.64)]^{0.5}$$

Where,

Rr = Recharge to the groundwater (cm)

P = Monthly precipitation (cm)

(Principal, College of Fisheries, NAU, Navsari)

VI **BASIC SCIENCE**

1. **In-silico studies of NAL1 protein using bioinformatic approach in various cereal crops**

It is informed to the scientific community that NAL1 protein structure derived using I-Tasser web server can be used as a reference model for future molecular docking experiments and validation in rice.

(Principal, Aspee Shakilam Agri. Biotechnology Institute, NAU, Surat)

2. **Metabolic profiling and anatomical study of jassid resistance and susceptible genotype of cotton**

It is informed to scientific community that the molecules namely butanedioic acid, 2, 6, 10, 14, 18 - pentamethyl - 2, 6, 10, 14, 18 - eicosapentaene and d-ribose increase whereas, octacosane and gluconic acid decrease which may be responsible for jassid

resistance in cotton. Further, genotypes with higher phenol, free gossypol, trichome density and length with more leaf thickness whereas, lower reducing sugar and tannin contents should be used for selecting jassid resistant genotypes.

(Research Scientist, Main Cotton Research Station, NAU, Surat)

3. Isolation, identification and exploitation of microbes from composting site for xylanase production for agro waste management

It is informed to scientific community that Xylanase producing *Bacillus licheniformis* X6 in combination with *Aspergillus terreus* XF9 degrade 15.5 % rice straw at ambient temperature after 40 days of incubation.

(Prof. & Head, Dept. Food Quality Testing Lab., NMCA, NAU, Navsari)

4. Microbial pigment as food additive to replace chemically synthesized colour

Yellow and orange pigments produced by bacteria *Micrococcus luteus* and *Kocuria rosea*, respectively having antioxidant activity can be used as natural colorants.

(Prof. & Head, Dept. Food Quality Testing Lab., NMCA, NAU, Navsari)

5. Isolation and identification of cyanobacteria as source of single cell protein

It is informed to scientific community that *Anabaena* isolate 2 having high protein content (381.12 µg/mg) and antioxidant activity (28 %) has the potential to be used as single cell protein.

(Prof. & Head, Dept. Food Quality Testing Lab., NMCA, NAU, Navsari)

6. Isolation of important microorganisms in biodegrading crop residues

Scientific community is informed to prefer *Bacillus alkalophilus* RR isolate over *Vibrio mediterranei* ST-4 and *Bacillus okuhidensis* ST-9 for cellulose decomposition in rice straws because of minimum C:N ratio and maximum cellulose decomposition activity.

(Prof. & Head, Dept. of Plant Pathology, NMCA, NAU, Navsari)

7. Screening of pigeon pea genotypes for qualitative characters

It is informed to scientific community that pigeonpea variety BDN-2 contains high quantity of soluble protein (12.61 %), calcium (2.88 mg/kg) and magnesium (2.45 g/kg). Vaishali has high amount of iron (78.30 mg/kg), zinc (12.20 mg/kg) and molybdenum (6.02 mg/kg) content. NPK-15-25 variety has high amount of phosphorous (0.73 %), while NPK15-05, NPK-15-14, GT-1, AGT-2 and BNP-1B have high amount of copper (80.23 mg/kg), potassium (9.86 g/kg), manganese (14.23 mg/kg), boron (98.27 mg/kg) and cobalt (12.333 mg/kg), respectively.

(Prof. & Head, Dept. of Soil Science & Agri. Chem., NMCA, NAU, Navsari)

8. Molecular diversity assessment in geographical collection of Eucalyptus germplasm using DNA based marker system

Scientific community is informed to use RAPD markers OPB-14, OPH-07, OPH-13, OPH-15 and ISSR marker UBC-873 for genetic diversity analysis in eucalyptus clones. Genetically diverse clones viz., CPM-2070, CPM-2306, JKSC-02 with Corymba-1, G-283 and IFGTBEC-2, JKSC-02 and Pellita-1 can be used in future breeding programmes.

(Prof. & Head, Dept. of Basic Sci. & Humanity, CoF, ACHF, NAU, Navsari)

9. Assessment of genetic diversity present in different bamboo species using DNA based marker system

It is informed to scientific community to use markers OPB-07, OPC-06, OPD-08, OPD-11 and OPD-12 for genetic diversity analysis in bamboo. Additionally, species *B. vulgaris* green and *B. vulgaris* yellow were genetically most similar species followed by *Gigantochloa atrovioleacea* and *Gigantochloa rostrata*, and *Bambusa vulgaris* yellow and *Bambusa wamin*. Whereas, *Dendrocalamus giganteus* and *Guadua aungustifolia* were found to be genetically most diverse followed by *Bambusa balcooa* and *Guadua aungustifolia* and *Sasa auricoma* and *Dendrocalamus skkimensis*.

(Head, Dept of Basic Sci. and Humanity, CoF, ACHF, NAU, Navsari)

10. Assessment of genetic diversity through molecular markers in mango (*Mangifera indica* L.)

Scientific community is informed to use markers OPA-04, OPG-17, OPA-18 and OPB-19 for genetic diversity analysis in mango. Amarapali and Dashehari varieties were found to be genetically most similar, followed by Sonpari and Baneshan; Neelphanso and Sonpari; Dashehari and Mallika; Ratna and Sindhu and Sonpari and Alphanso. Whereas, Banglora and Neelphanso were found to be genetically most diverse varieties followed by Lal Malgoa and Amrutang; and Lal Malgoa and Vanraj.

(Res. Scientist, Regional Horticultural Res. Station, ACHF, NAU, Navsari)

VII SOCIAL SCIENCE

1. Forecasting of rice (*Oriza sativa*) yield using ordinal logistic regression

The discriminant function analysis is more effective tool (model) for pre harvest forecasting of rice yield as compare to Multiple Linear Regression (MLR) technique and Ordinal logistic regression for Navsari district.

(Asth. Prof. (Ag. Stat.), CoA, NAU, Waghai)

VIII ANIMAL PRODUCTION AND FISHERIES

1. Effect of heat ameliorative measures (fans, foggers and green net) on physiological, haematological, biochemical and productive performance of lactating Surti buffaloes

Fans, foggers and white washing of the rooftop with microfine lime powder of the pucca shed as heat ameliorative measures help to control mean, minimum and maximum meteorological variables (temperature, humidity, THI) to reduce heat stress by increasing glucose, triglycerides, cholesterol, reduced glutathione and total antioxidant status during hot dry season and thus sustain milk production.

(Head of the Department, Veterinary Physiology and Biochemistry, CVSc & AH, NAU, Navsari)

IX ANIMAL HEALTH

1. Evaluation of *in vitro* antimicrobial properties of endophytes isolated from medicinal plants *Terminalia bellirica* (Baheda) and *Bixa orellana* (Sindur/Annatto seed)

Ethyl acetate extract of endophytic fungi (*Schizophyllum spp.*) isolated from *Bixa orellana* (Sindur, Annatto seeds) leaves possess antibacterial activity against *Bacillus subtilis* (0.08 µg/ml), *Proteus mirabilis* (0.08 µg/ml), *Staphylococcus aureus* (0.16 µg/ml), *Pseudomonas aeruginosa* (2.56 µg/ml) and *Streptococcus pyogenes* (5.12 µg/ml).

(Professor and Head, Dept. of Pharmacology and Toxicology, Veterinary College, NAU, Navsari)

2. Evaluation of *in vitro* antimicrobial properties of endophytes isolated from medicinal plants *Terminalia bellirica* (Baheda) and *Bixa orellana* (Sindur/Annatto seed)

Ethyl acetate extract of endophytic fungi (*Schizophyllum spp.*) isolated from *Terminalia bellirica* (Baheda) leaves possess antibacterial activity against *Staphylococcus aureus* (0.64 µg/ml), *Bacillus subtilis* (0.64 µg/ml), *Proteus mirabilis* (0.64 µg/ml), *Streptococcus pyogenes* (2.56 µg/ml), *Pseudomonas aeruginosa* (2.56 µg/ml), *Escherichia coli* (2.56 µg/ml), and *Salmonella typhimurium* (2.56 µg/ml).

(Professor and Head, Dept. of Pharmacology and Toxicology, Veterinary College, NAU, Navsari)

3. Relationship of body measurements and testicular parameters on extra-gonadal sperm reserves in buck

It is recommended to use Scrotal Circumference (SC in cm) as a base for calculation of Testicular Diameter (TD) and Epididymal Weight (EW) in live bucks through following regression equations:

$$TD \text{ (cm)} = -0.892 + 0.231 \times SC \text{ (R}^2=0.904\text{) and}$$

$$EW \text{ (g)} = -6.450 + 0.635 \times SC \text{ (R}^2=0.792\text{)}$$

(Professor and Head, Dept. of Veterinary Gynaecology & Obstetrics, Veterinary College, NAU, Navsari)

Varieties developed by Navsari Agricultural University

Crop	No. of Varieties	Details of Varieties
Cotton	13	G.Cot.Hy. 12, G.Cot.20, G.Cot.25, G.Cot.Hy. 6 (BG II), G.Cot.Hy.8 (BG II), G.N.Cot.22, G.N.Cot.Hy-14, G. Cot. Hy. 10 BG-II, G. Cot. Hy. 12 BG-II, G.N.Cot.-26, G.N.Cot.-29, G.N.Cot.-32, G.N.Cot.Hy-18.
Rice	11	NAUR-1, GNR-2, GNR-3, GNR-4, PURNA, GNR-5, GNR-6, GNRH-1, GNR-7, GR-15, GRH-2
Sugarcane	7	GNS-4, GNS-5, GNS-6, GNS-7, GNS-8, GNS-9, GNS-10
Pigeon pea	3	GT-102, GNP-2, GT 104
Nagli	5	GN-4, GN-5, G.NN-6, GNN-7, GN-8
Vari	2	GV-2, GNV-3
Sorghum	4	G.Jowar-42, CSV- 21F, GNJ-1, GFS-6
Indian bean	3	G.Wal-2, GNIB-21, GNIB-22
Moong	3	GBM-1, GNM-6, GM-7
Turmeric	2	GNT-1, GNT-2
Little Gourd	1	GNLG-1
Pointed Gourd	1	GNPG – 1
Castor	1	GNCH-1
Niger	1	GNNig 3
Brinjal	1	GNRB-1
Tomato	1	GT-7
Adenium	2	Gad-1, Gad-2
Malabar Neem	1	GNMD-1
Total	62	

Endorsement

1. Pigeonpea : Vaishali (2007)
2. Rice: NAUR-1 (Aerobic condition) (2012)
3. Sweet potato: Bhukanti (2017)
4. Sorghum: Phule Revati (2018)

Recommendations for Farming community																
Research Sub-committee	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Crop improvement	1	1	3	4	4	1	3	1	5	4	5	0	14	9	11	66
Agronomy & Soil Science (NRM)	15	6	17	11	13	14	12	16	17	22	8	7	15	19	26	218
Horticulture & Forestry	2	0	2	5	2	9	1	16	10	5	10	17	18	8	16	121
Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	7
Plant Protection	1	7	4	4	5	3	6	3	7	5	10	2	3	6	6	72
Agril. Engineering	2	0	1	1	0	1	1	1	4	2	5	1	4	4	6	33
Basic Science	0	2	1	0	0	0	0	1	1	0	1	0	0	0	1	7
Social Science	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Animal Production	0	0	0	0	0	0	0	2	2	2	2	3	5	3	5	24
Animal Health	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3
	21	16	28	25	24	28	23	40	47	40	41	31	60	54	74	552



NAUROJI BIOFERTILIZERS

ઉચ્ચ ગુણવત્તા ધરાવતા સંશોધિત નૌરોજી જૈવિક ખાતરો



<p>Benefits of Biofertilizers</p> <ul style="list-style-type: none"> ✓ 50% reduction in chemical fertilizers ✓ 20% increase in production ✓ 20-40 kg/ha increase phosphorous solubilization ✓ Improve soil texture and Increase soil fertility ✓ Eco-friendly ✓ Increase seed germination ✓ Improve plant growth by vitamins and growth hormones 	<p>જૈવિક ખાતરો થી થતા ફાયદા</p> <ul style="list-style-type: none"> ✓ ૫૦% રાસાયણિક ખાતરો ની બચત ✓ ઉત્પાદન માં ૨૦% વધારો ✓ પ્રતિ હેક્ટર ૨૦-૪૦ કિ.ગ્રા રાસાયણિક કોસ્તરસ ખાતરની લભ્યતા વધારે ✓ જમીનનું ખંધારણ સુધારે અને તેની ક્ષમ્યતામાં વધારો ✓ કિસાયતી નેમજ પર્યાવરણ માટે સુરક્ષિત ✓ છોડના ઉગવાના દરને વધારે ✓ વિદ્યમીન તેમજ જીવિ વર્ધકો જાનવી છોડને ખોપણ પુરુ પાડે
<p>Manufactured and Marketed by Biofertilizers Production Unit Department of Plant Pathology, N.M. College of Agriculture Navsari Agricultural University, Navsari-396450 Contact No.: +91 9537294343</p>	<p>ઉત્પાદન કરતાં નેમજ વિકેતા બાયોકોર્ટીલાઈઝસ પ્રોડક્શન યુનિટ નવસારી રોગશાસ્ત્ર વિભાગ, ન.મ.કૃષિ મહાવિદ્યાલય નવસારી કૃષિ યુનિવર્સિટી, નવસારી-૩૯૬ ૪૫૦ સંપર્ક: +૯૧ ૯૫૩૭૨૯૪૩૪૩</p>



**NAUROJI
STONEHOUSE
FRUITFLY TRAP**

- ❖ To control the Fruit flies in mango, sapota and other fruits and in climber vegetables
- ❖ It prevents yield loss up to 85% and eco-friendly in nature
- ❖ Fruit Crops- Methylry Eugenol Block Vegetables- Cuelure Block
- ❖ 10 Traps/ha
- ❖ Hang above 5 to 6 feet from the ground



ઉત્પાદક અને વિકેતા:

ફૂડ ક્વોલિટી ટેસ્ટિંગ લેબોરેટરી
ન. મ. કૃષિ મહાવિદ્યાલય
નવસારી કૃષિ યુનિવર્સિટી
નવસારી- ૩૯૬ ૪૫૦
સંપર્ક. ફોન. નં. ૦૨૬૩૭ ૨૨૯૭૮



**નૌરોજી
સ્ટોન હાઉસ
ફળમાખી ટ્રેપ**

- ❖ કેરી, ચીકુ અન્ય ફળોમાં તથા વેલાવાળા શાકભાજીમાં ફળ-માખીના નિયંત્રણ માટે
- ❖ ઉત્પાદનમાં ૮૫% સુધીના નુકશાન અટકાવે છે
- ❖ ફળ પાકે માટે- મિથાઈલ યુજીનોલ બ્લોક અને વેલાવાળા શાકભાજી માટે- ક્યુલુર બ્લોક
- ❖ ૧૦ ટ્રેપ પ્રતિ હેક્ટર
- ❖ જમીનથી ૫ થી ૬ ફૂટ ઊંચે લટકાવો



NAUROJI
S E E D S



NAUROJI
S E E D S

યુનિવર્સિટી દ્વારા બહાર પાડવામાં આવેલ જુદા જુદા પાકોની નવી જાતોની ઉપલબ્ધતા
Availability of new varieties seeds of different crops produced by the University

૧. ડાંગર :- એન.એ.જી.આર.-૧, જી.એન.આર.-૨, જી.એન.આર.-૩, જી.એન.આર.-૪, પુર્ણા
૨. જુવાર :- જી.એન.-૩૮, જી.એન.-૪૨, સી.એચ.વી-૨૧ એચ (પાટલાકા માટે)
૩. નામ્મી :- જી.એન.-૪, જી.એન.-૫, જી.એન.એન.-૮
૪. લી - જી.વી - ૧, જી.વી - ૨,
૫. અરસાણી :- જી.એન. - ૨
૬. તુવેર :- વૈશાલી, જી.વી. - ૧૦૨, બી.ડી.એન. - ૯૧૧
૭. અમ :- સી.ઓ. - ૪, જી.બી.એમ. - ૧
૮. પાપડી/લાલ :- જી.એન.આઈ.બી.-૨૧, ગુ.લાલ-૧, ગુ.લાલ-૨,
૯. ડામાર :- જી.એન. હાઈબ્રીડ - ૮, જી.એન. હાઈબ્રીડ - ૯, જી.એન. હાઈબ્રીડ - ૧૦, જી.એન. હાઈબ્રીડ નવાબી.જી. II, જી.એન. ૨૦, જી.એન.એન. ૨૫
૧૦. દાંગર :- જી.એન.ડી. - ૧
૧૧. શેરડી :- જી.એચ.-૪, જી.એચ.-૫, જી.એચ.-૬, જી.એચ.-૭, જી.એચ.-૮

1. Paddy- NAUR-1, GNR-2, GNR-3, GNR-4, Purna
2. Sorghum- GI-38, GI-42, CSV-21-F
3. Finger millet- GN-4, GN-5, GNN-6
4. Little millet- GV-1, GV -2
5. Niger- GN-2
6. Pigeonpea- Vaishali, GT-102, BDN-711
7. Mungbean- CD-4, GBM-1
8. Indainbean- GNIB-21, G.Wal-1, G.Wal-2
9. Cotton- G.Cot.Hy.-6, G.Cot.Hy.-8, G.Cot.Hy.-10, G.Cot.Hy.-12(BG-II), G.Cot- 20, G.N.Cot-25
10. Turmeric- GNT-1
11. Sugarcane- GS-4, GS-5, GS-6, GS-7, GS-8

ખાસિયતો જનીતિક શુદ્ધ અને ઉચ્ચ ગુણધર્મવાળા બિયારણ
વિજ્ઞાનિક સમીક્ષાથી તૈયાર કરેલ પ્રમાણિત બિયારણ

Features Genetically pure and quality seeds
Produced scientifically certified seeds

OUR MISSION

" Our Mission is accelerating Agricultural productivity and production for improving the viability of agriculture "

ઉત્પાદક અને વિક્રેતા
નવસારી કૃષિ યુનિવર્સિટી
નવસારી - ૩૬૬ ૪૫૦
એન નં - (ઓ). ૦૨૬૩૭-૨૮૨૧૦૩



PRODUCED AND MARKETED BY
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NAUROJI

નોરોજી

NOVEL



નોવેલ

Banana Pseudostem Based
Organic Liquid Fertilizer

ફળનાં થડમાંથી બનાવેલ
સેન્દ્રિય પ્રવાહી ખાતર



ADVANTAGES

- It is pure organic product.
- It contains NPK as well as micro nutrients.
- It contains naturally occurring growth promoters.
- It is a growth promoter, it is very helpful in nursery plants.
- It enhance total plant growth, number of flower, maximum conversion of flowers into fruits and pods
- Enhance vigorous root development and growth

ફાયદાઓ

- સંપૂર્ણ સેન્દ્રિય પ્રવાહી ખાતર છે.
- નાઈટ્રોજન, ફોસ્ફરસ, પોટાશ ઉપરાંત શુદ્ધ તત્વો પણ ધરાવે છે.
- કુદરતી રીતે શોષ થતાં વૃદ્ધિવર્ધક ધરાવે છે.
- જુદા જુદા પાકમાં ફુલ, ફળ અવરથાએ છંટેકાવ કરવાથી ઉત્પાદન વધે છે.
- વૃદ્ધિવર્ધક હોય નરોરી તબક્કા માં છોડનો વૃદ્ધિ અને વિકાસ ઝડપી થાય છે.

ઉત્પાદક અને વિક્રેતા

બનાના સ્યુડોસ્ટેમ પ્રોસેસીંગ યુનિટ
જળ અને જમીન વ્યવસ્થાપન સંશોધન એકમ
નવસારી કૃષિ યુનિવર્સિટી, નવસારી. ફોન : ૦૨૬૩૭-૨૮૨૧૦૩



વૃત્તિકુલા ઓર્ગેનિઝેશન

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