

RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2012



DIRECTORATE OF RESEARCH
JUNAGADH AGRICULTURAL UNIVERSITY
JUNAGADH - 362 001(Gujarat)



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**MESSAGE**

This booklet entitled “**Research Accomplishments and Recommendations-2012**” contains recommendations and technologies of various faculties like Agriculture, Agricultural Engineering, Fisheries and Veterinary Sciences developed during the year 2012 for the farming community of Saurashtra region-the jurisdiction of Junagadh Agricultural University. I am sure, this booklet will be highly useful to the scientists, extension officers, farmers and students.

I congratulate the scientists/teachers of the University for their sincere efforts and hard work in bringing out the recommendations through field experiments and the team of the Directorate of Research for compiling and publishing this booklet.

Junagadh
December 20, 2012


(N. C. PATEL)
VICE-CHANCELLOR



Junagadh Agricultural University
Junagadh - 362 001 (Gujarat)



PREFACE

It is a matter of great pleasure for me to highlight the research work carried out in the University and approved in the 8th Combined Joint AGRESCO meeting.

The Junagadh Agricultural University represents seven districts and 32.82 per cent area of the state. There are six colleges, four polytechnics and 30 Research Stations, which include Multidisciplinary Main Research Stations, sub Research Stations for various crops as well as Testing Centers in the University. The eight different sub-committees have been constituted and conveners were nominated to plan and monitor the research work. All the sub-committees have successfully completed their job. The University has arranged Research Councils i.e. 7th on August 9, 2011 and 8th on January 11, 2012 for approval of new research projects and research activities during this year. The University has initiated three new Research Stations viz., Cotton Research Station, JAU, Kukada Dist. Surendranagar, Agriculture Research Station, JAU, Talaja Dist. Bhavnagar and Bull Mother Farm for *Gir Cow & Jaffrabadi Buffalo*, JAU, Amreli. I would also like to mention that the Junagadh Agricultural University has signed one MoU with Rajkot District Co-operative Milk Producers Union Ltd. (Rajkot Dairy) for collaborative work in PG research in the faculty of Veterinary Science.

The University has also recently received the sanction of 38 new projects worth Rs. 380.14 lakh from ICAR, Govt. of Gujarat and Private Sectors. The main sanctioned projects are:

1. Establishment of Spices Research Centre at Junagadh.
2. Establishment of Aqua based Research and Training Centre in Coastal Saurashtra at Mahuva.
3. Establishment of Biofertilizer Unit at Junagadh.
4. Establishment of Research Centre on Onion at Talaja, Dist. Bhavnagar.

5. Development and promotion of promising varieties/ lines with high yield and high oil content with enhanced O/L ratio for enhancing production and quality of groundnut oil in drought-prone environments to boost the income of small and marginal groundnut farmers in India.

6. National Initiative on Climate Resilient Agriculture (NICRA) on Cattle.

The breeder seeds of different crops to fulfill the demand of private and public sectors as per the national and state indents were successfully produced. The required nucleus seeds of different crops were also produced for the breeder seed production in the ensuing seasons.

Under the HRD component, 116 scientist/teachers were sent to attend winter/summer school & short term training, 115 attended different seminar/ symposium/ conference at state & national level and 156 attended the workshop and group meet of their projects. The University has organized two national level programmes and eleven state level programmes like scientists' meets/ workshop/ seminar/ training etc. The university has also organized one ICAR sponsored winter school training on "Instrumental Techniques in Agriculture and Food Quality Assessment" during October 01-21, 2011 for the scientists of respective subject and one "International Training on Co-operative Management" during September 12-16, 2011 for the delegates of South Africa.

In the 8th Combined Joint AGRESCO meeting, four new varieties/ hybrids viz., Brinjal (GJB-3), Indian bean (GJIB-2), Ridge gourd (GJRGH-1) and Sesame (G. Til-3 endorsed) were recommended for release in the state. Besides, 35 technologies/recommendations were made for farmers and 18 recommendations were made for Scientific Community. In addition, as many as 84 new technical programmes were formulated to initiate the new research programmes for the solutions of the applied and basic problems of agriculture and allied fields. The new varieties/hybrid were also provisional released in 43rd meeting of State Seed Sub-committee held on August 16, 2012 at Gandhinagar.

Junagadh
December, 2012


(C. J. Dangaria)

DIRECTOR OF RESEARCH & DEAN
FACULTY OF P.G. STUDIES

Summary of new released varieties/hybrid and developed agro technologies during the 2011-12.

Name of the Sub-Committee	No. of Recommendations finalized		New Technical Programme
	Farmer	Scientific Community	
Crop Improvement	04*	-	01
Crop Production	14	-	25
Plant Protection	05	05	23
Horticulture & Agro Forestry	05	02	02
Agricultural Engineering	06	02	05
Fisheries Science	01	04	12
Animal Science	04	03	02
Basic Science	-	02	06
Social Science	-	-	08
Total	4*+35	18	84

* Varieties released

Recommendations for farmers

I. CROP IMPROVEMENT

Four new varieties/hybrid viz., Brinjal (GJB-3), Indian bean (GJIB-2), Ridge gourd (GJRGH-1) and Sesame (G. Til-3 endorsed) were recommended for farmers of the state during 2011-12.

A. Vegetable Research Station, JAU, Junagadh

Brinjal: Gujarat Junagadh Brinjal-3 (GJB-3)

The farmers of Gujarat, growing brinjal during late *kharif* (15th August to 15th September) season are advised to grow brinjal variety Gujarat Junagadh Brinjal-3 (GJB-3). The variety was developed from a cross JNDB-37 x JNDB-92. This variety has recorded mean fruit yield of 393.9 q/ha, which was 43.6 and 29.3 per cent higher over checks varieties JBGR-1 (274.3 q/ha) and GOB-1 (304.6 q/ha), respectively. The fruits of GJB-3 are medium to big in size and oval in shape with green colour and good shining. Fruit pulp is creamy white with less seed. The plants are medium



in size and semi spreading. The variety is relatively tolerant to little leaf disease and jassid compared to checks viz., JBGR-1 and GOB-1.

Indian Bean (*Papdi*): Gujarat Junagadh Indian Bean-2 (GJIB-2)

The farmers of Saurashtra and middle Gujarat, growing Indian bean (*Papdi*) during late *kharif* (15th August to 15th September) season are advised to grow Indian bean (*Papdi*) variety Gujarat Junagadh Indian Bean-2 (GJIB-2). The variety was developed from a cross JNDIB-88 x JNDIB-23. The variety GJIB-2 has recorded a green pod yield of 112.5 q/ha, which was 25.6 per cent higher over check variety Gujarat Papdi-1 (89.56 q/ha). The pods of this variety are tender, flat and medium long in shape with green colour. The immature seed colour is light green and inflorescence length is more as compared to Gujarat Papdi-1. The plants are semi spreading; leaf spot and leaf blight disease intensity are less than Gujarat Papdi-1. Pod borer damage is at par with check.



Ridge Gourd: Gujarat Junagadh Ridge Gourd Hybrid-1 (GJRGH-1)

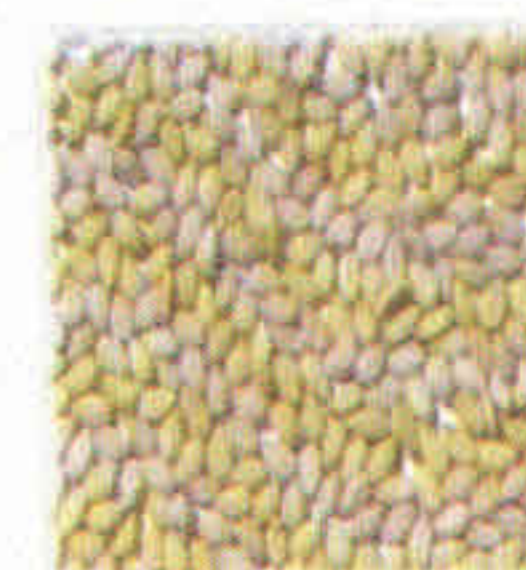
The farmers of Saurashtra and Middle Gujarat, growing ridge gourd during *kharif* season are advised to grow Gujarat Junagadh Ridge Gourd Hybrid-1 (GJRGH-1). This is a first public sector ridge gourd hybrid developed at Junagadh from a cross combination of JRGL-11 x JRGL-32. This hybrid recorded a fruit yield of 113.30 q/ha, which was 24.6 per cent higher over national check variety Pusa Nasdar (90.96 q/ha). The fruits of GJRGH-1 are long in size with green colour. It is moderately resistant to downy mildew and major pests.



B. Agricultural Research Station, JAU, Amreli

Sesame: Gujarat Til-3 (Endorsement for summer season)

The farmers of Saurashtra region growing sesame under *summer* season are advised to grow sesame variety Gujarat Til-3. This variety has



recorded seed yield of 1200 kg/ha, which was 7.6 per cent higher than check variety Gujarat Til-2 (1115 kg/ha). The seeds of variety G.Til-3 are white and bold containing 47.3 per cent oil and suitable for export. Disease and pest reactions are comparable with the check Gujarat Til-2.

II. CROP PRODUCTION

Nutrient Management

Fertilizer management in cotton + sesame (1:1) intercropping system under dry farming condition

The farmers of North Saurashtra Agro-climatic Zone (AES XV) adopting hybrid cotton + sesame (1:1) intercropping system under rainfed condition are advised to apply 40 kg N/ha to cotton and 25 kg N/ha + 12.5 kg P₂O₅/ha to sesame for getting higher yield and net return.

(Main Dry Farming Res. Station, JAU, Targhadia & Agril. Res. Station, JAU, Nana Kandhasar)

Fertilizer management in cotton + sesame (1:1) intercropping system under dry farming condition

The farmers of North Saurashtra Agro-climatic Zone (AES X) adopting cotton + sesame (1:1) intercropping system under rainfed condition are advised to apply 80 kg N/ha to cotton and 25 kg N/ha + 12.5 kg P₂O₅/ha to sesame crop for getting higher yield and net return.

(Main Dry Farming Res. Station, JAU, Targhadia & Agril. Res. Station, JAU, Jam Khambhalia)

Effect of nitrogen and bio fertilizer on yield of *shaniar* grass (*Sehima nervosum*)

The farmers of North Saurashtra Agro-climatic Zone growing *shaniar* grass (*khariif*) are advised to apply 60 kg N/ha in two equal splits first at 10 days after first rain and second at 30 days after first application for getting higher fodder yield.

(Grassland Research Station, JAU, Dhari)

Effect of phosphorus with and without K₂O on yield of *anjan* grass

The farmers of North Saurashtra Agro-climatic Zone growing *anjan* grass (*khariif*) are advised to apply 60 kg P₂O₅/ha as a basal dose along with recommended dose of 20 kg N/ha (10 kg as basal + 10 kg/ha at 30 DAS) for getting higher fodder yield.

(Grassland Research Station, JAU, Dhari)

Effect of potassium and zinc on yield and quality of fodder sorghum under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-XIV) growing fodder sorghum (*khariif*) are advised to apply 40 kg K₂O + 20 kg ZnSO₄/ha along with recommended dose of fertilizers (80:40 kg NP/ha) for getting higher fodder yield.

(Grassland Research Station, JAU, Dhari)

Effect of application of potassium and zinc on growth, yield and nutrients uptake by onion and its residual effect on *khariif* groundnut in medium black calcareous soil

The farmers of South Saurashtra Agro-climatic Zone adopting onion-groundnut sequence in medium black calcareous soil are advised to apply 75 kg K₂O/ha in two splits i.e. ½ K₂O as basal + ½ at 30 DAS besides 25 kg ZnSO₄/ha and recommended fertilizer dose (75:60 kg NP/ha) to onion crop for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Bt. cotton response to potash with and without zinc

The farmers of South Saurashtra Agro-climatic Zone growing irrigated Bt. cotton on medium black calcareous soil are advised to apply potassium @ 150 kg/ha as basal or in two splits (i.e. 1/2 as basal + 1/2 at 30 DAS) along with 50 kg zinc sulphate per hectare in addition to recommended fertilizer dose (N 160 kg/ha) for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Balance fertilization in Bt. cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt. cotton on medium black calcareous soil are advised to apply 10 t FYM/ha + 240 kg N/ha (four splits, 25 % at sowing and remaining three equal splits at 30, 60 and 90 DAS) and P₂O₅ @ 50 kg /ha as basal for getting higher yield and net return.

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Effect of soil amendments on different genotypes of gram under salt affected soil

The farmers of South Saurashtra Agro-climatic Zone having sodic soil



are recommended to grow gram variety GG-4 or GG-1 and apply 10 t FYM/ha + gypsum @ 50 % G. R. for getting higher yield and net return.



GG-4



GG-1

(Department of Agril. Chem. & Soil Science, JAU, Junagadh)

Integrated nutrient management in garlic on sandy loam soil of Saurashtra

The farmers of North Saurashtra Agro-climatic Zone (AES-X) growing garlic are advised to apply 75 % RDF (37.5:37.5:37.5 NPK kg/ha) along with either 2.5 t FYM/ha or castor cake 300 kg/ha for obtaining higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station JAU, Jam Khambhalia)

Integrated nutrient management for bajra-cotton rotation under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-XV) adopting bajra-cotton rotation are recommended to apply 50 per cent of recommended dose of fertilizers (bajra 40:20 NP kg/ha and cotton 40 kg N/ha) along with castor cake @ 900 kg/ha for getting higher yield and net realization.

(Main Dry Farming Research Station, JAU, Targhadia & Dry Farming Research Station JAU, Nana Kandhasar)

Evaluation for the potentiality of bio-fertilizer and organic resources for sustaining sesame yield under rainfed condition

The farmers of Western Bhal and Coastal Zone (AES-1(a), 1(b) and 3) growing sesame under rainfed condition are advised to apply 50 % of recommended dose of fertilizers i.e. 12.5:12.5 kg NP/ha along with 500 kg castor cake/ha and besides seed treatment of *Azotobacter* and PSB (CFU 108/g) each of 30 g/kg seed for getting higher yield and net

realization along with 50 % saving of fertilizers.

(Main Dry Farming Research Station, JAU, Targhadia and Dry Farming Research Station, JAU, Vallabhipur)

Package of Practices

Evaluation of different seed pellets on production of pasture grasses

The farmers of North Saurashtra Agro-climatic Zone growing *anjan* grass (*kharif*) are advised to prepare small balls containing seeds (40,000 balls/ha) using 200 kg soil + 200 kg FYM + 4 kg seeds mixture to get higher germination and fodder yield.

(Grassland Research Station, JAU, Dhari)

Weed Management

Weed management in *kharif* pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are advised to keep their field weed free through pre emergence application of atrazine @ 0.5 kg/ha (dissolved in 500 liters water) to obtain higher yield and net return.

(Main Pearl Millet Research Station, JAU, Jamnagar)

III. PLANT PROTECTION

Agricultural Entomology

Efficacy of newer insecticides against cabbage aphid

For effective and economical management of cabbage aphids under South Saurashtra Agro-climatic Zone, two spray of acetamiprid 20 SP 0.004 % (2 g/10 liter water) at 15 days interval starting from aphid infestation are recommended. The waiting period of acetamiprid 20 % SP (15 g. a.i./ha) should be maintained 7 days between last spray and harvesting of the crop.



(Department of Entomology, JAU, Junagadh)

Monitoring of *bajra* worm *Helicoverpa armigera* (Hubner) through sex pheromones during *kharif* season

The farmers of North Saurashtra Agro-climatic Zone growing *kharif* *bajra* are advised to install sex pheromone traps for monitoring of adult

male moths of ear head worm (*Helicoverpa armigera* Hubner) @ 5 traps/ha at 1 ft height above earhead after the formation of earhead.

(Main Pearl Millet Research Station, JAU, Jamnagar)

Management of eriophyid mites in coconut cv. D x T with nutrient and fertilizers

For the effective and economical management of eriophyid mite in hybrid coconut (DxT Mahuva), application of half dose of recommended chemical fertilizers (NPK-0.750: 0.375: 0.750 kg/palm/year) with 50 kg FYM, 1.5 kg gypsum and 0.075 kg borax/palm/year in June and remaining half dose of recommended chemical fertilizers (NPK 0.750:0.375:0.750 kg/palm/year) in October is recommended under South Saurashtra Agro-climatic Zone.



(Agricultural Research Station (Fruit Corps), JAU, Mahuva)

Plant Pathology

Integrated management of major diseases of groundnut

The farmers of South Saurashtra Agro-climatic Zone growing groundnut are advised to treat the seeds with tebuconazole 2 % DS @1.5 g/kg and spray tebuconazole 250 EC @ 10 ml/ 10 l water at 45 and 60 days after sowing.

OR

Apply talc based *Trichoderma* @ 10 g/kg seed and @ 4 kg/ha with 250 kg castor cake in furrow at the time of sowing and spray hexaconazole 5 EC @ 10 ml/10 l water twice at 45 and 60 days after sowing for economic and effective control of soil borne (collar rot & stem rot) and foliar (tikka & rust) diseases. The waiting period of tebuconazole 250 EC (125 g a.i./ha) and hexaconazole 5 EC (100 g a.i./ha) should be maintained 49 and 30 days, respectively between last spray and harvesting of the crop.



(Main Oilseed Research Station, JAU, Junagadh)

Wilt management in chickpea

The farmers of the South Saurashtra Agro-climatic Zone growing irrigated chickpea during *rabi* season are advised to adopt seed treatment of carbendazim 1g + thiram 2 g/kg seed along with soil application of *Trichoderma viride* (10^6 cfu/g) @ 2.5 kg mixed in 250 kg either castor cake or FYM/ha at the time of sowing in furrow for management of wilt and to get higher seed yield.



(Pulse Research Station, JAU, Junagadh)

IV. HORTICULTURE & AGRO-FORESTRY

Fertigation system in guava cv. Bhavnagar Red

The farmers of Saurashtra region growing guava cv. Bhavnagar Red (6 years and above old tree) for *Mrig Bahar* crop are advised, to apply 1.0 kg urea per plant through drip irrigation and 0.4 kg MOP (Murate of Potash) per plant in soil in four equal splits during June, August, October and December; while phosphorus (SSP 1.5 kg) as a basal dose with drip system operating for 3.00 hours daily during October to December and 4.00 hours during January to March with 4 drippers per tree, each having discharge 4 lit. per hour keeping dripper 1.0 meter away from trunk of tree, which will save 40.69 % irrigation water for higher production and income.



(Department of Horticulture, JAU, Junagadh)

Varietal evaluation of gerbera (*Gerbera jamesonii*) under green house

The farmers of South Saurashtra Agro-climatic Zone, interested to cultivate gerbera flower crop under



green house are advised to grow varieties Pink Elegance (pink), Savannah (red) and Dana Allen (yellow) for obtaining higher yield and income with good quality of cut flowers.

(Department of Horticulture, JAU, Junagadh)

Integrated nutrient management in sapota cv. Kalipatti

The farmers of South Saurashtra region growing sapota cv. Kalipatti are advised to apply full recommended dose of phosphorus and potash (450 g/plant P & K each) along with half dose of nitrogen (11.25 kg castor cake) and 100 g *Azotobacter* per plant during onset of monsoon and half recommended dose of nitrogen i.e. 450 g/plant during October to get higher fruit yield and net return.



(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Application of nutrients through root feeding of coconut cv. D x T (Mahuva)

The coconut growers of South Saurashtra Agro-climatic region are advised to apply full recommended dose of chemical fertilizer (1500, 750, 1500 NPK g/palm) and two dose each of 400 ml of nutrient solution in June and October [10 g each urea and muriate of potash, 5 g zinc sulphate, 2 g ferrous sulphate, magnesium sulphate, manganese sulphate and borax each, 1 g copper sulphate, 10 mg sodium molybdate, 10 mg citric acid and 460 mg NAA (10 ml Planofix) dissolved in one liter of water] through root feeding to get higher nut yield and net return in coconut cv. D x T (Mahuva).



(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Effect of soil amendment with organic materials on yield and quality of bottle gourd cv. Pusa Naveen under sodic soil and brakish water condition

Vegetable growers of South Saurashtra Agro-climatic Zone growing bottle gourd cv. Pusa Naveen under sodic soil and brakish irrigation water condition are advised to apply FYM 5 t/ha along with half recommended dose of chemical fertilizer i.e. 50:25:25, N:P:K kg/ha and poultry manure 3.3 t/ha to get maximum yield and net return.



(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

V. AGRICULTURAL ENGINEERING

Modified atmosphere packaging of spine gourd cv. local

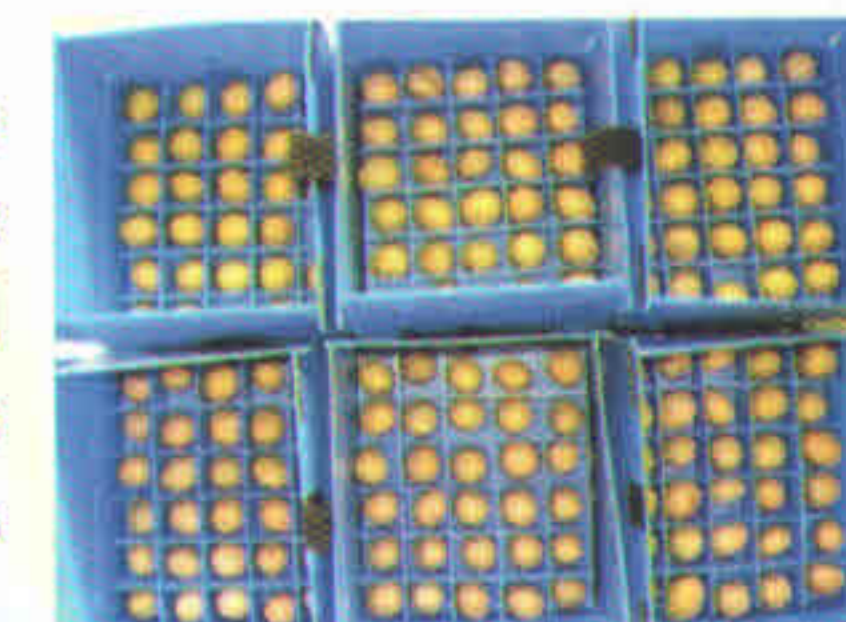
The farmers, processors and exporters are recommended to adopt modified atmosphere packaging technique developed by JAU for increasing the shelf life of spine gourd by packing in 50 μ LDPE bag with a combination of 2 % O₂ + 4 % CO₂ gas concentration and stored at 8°C temperature. The spine gourd can be stored up to 20 days by using this technique.



(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Transportation losses for sapota

The farmers, processors and exporters are recommended to adopt foldable plastic box with cells developed by JAU for local transportation of sapota fruit. This box was found cheaper compared to other containers considering cost of container, transportation, returning empty container/bag and total losses after transportation including decay after storage and also quality of the fruits retained during transportation.



(Department of Renewable Energy & Rural Engg., CAET, JAU, Junagadh)

Dehydration and storage of vegetables

The processors and exporters are advised to store dehydrated onion, garlic and unripe mango powder in polyethylene (HDPE) bags of 50 micron in vacuum packaging (740 mm Hg) to retain the quality up to 120 days of storage period.

(Department of Processing & Food Engg., CAET, JAU, Junagadh)

Storage of onion

The farmers and traders who are interested to store the onion for more than four months are recommended to use forced air ventilated storage structure to get 36 per cent more marketable red onion.



(Department of Processing & Food Engg., CAET, JAU, Junagadh)

Method of sowing of groundnut under poor drainage condition

The farmers of South Saurashtra Agro-climatic Zone growing bunch type groundnut under poor drainage field condition are advised to sow by broad bed furrow method (55 cm width and 15 cm depth of furrow and 100 cm bed width between two furrows) for getting higher yield and net return.

(Research Testing & Training Center, JAU, Junagadh)



New horticultural crops in coastal belt area of Saurashtra region using saline water with drip and mulching technology

The farmers of South Saurashtra Agro-climatic Zone having saline ground water (EC 3.15 dS/m) and medium black calcareous soil (EC 0.88 dS/m) conditions are advised to introduce trees like; seemaruba, tamarind, aonla, pomegranate, sapota, date palm, ber, carambola and guava with drip irrigation.



Seemaruba

Date palm

(Research Testing & Training Centre, JAU, Junagadh and Cotton Research Station, JAU, Khapat)

VI. FISHERIES SCIENCE

Foulers and borers of pearl oyster (*Pinctada fucata*) in around Sikka area

The aqua farmers of the Gulf of Kutch are advised to take appropriate control measures as the pearl oysters has been found to be infested by the foulers and borers such as sponges like *Cliona vastifica*, *Cliona carpenteri*, *Cliona celata*, Coelenterate like Bryozoans and Hydroids, crustaceans like copepod, *Balanus amphrite*, pea crab, bivalves like *Crassostrea*, animals of minor phyla like isopod, amphipod and tunicates like Ascidians sp. and annelids like Tubicolous and Serpulid worms.

(Fisheries Research Station, JAU, Sikka)

VII. ANIMAL HEALTH & ANIMAL PRODUCTION

Impact of herd composition on herd performance traits in Gir cattle

On a large farm of Gir cattle in South Saurashtra region, herd structure of 330-345 heads with 100-110 (30-33 %) cows, 65-70 (18-21 %) breedable heifers and 245-250 (72-75 %) total female proportion in the herd is optimum to achieve higher wet average (7.3-7.7 lit), herd average (4.2-4.7 lit), % milch cows (55-60 %) and higher return over feed cost (140 %) in the herd.

(Cattle Breeding Farm, JAU, Junagadh)

Impact of herd composition on herd performance traits in Gir cattle

Dairy farmers/gaushalas of Gir herd in South Saurashtra region desiring to improve herd performance and return should set optimum targets of herd performance traits of 7.6 lit. wet average, 4.3 lit. herd average and more than 64 % milch cows for economical and sustainable dairy farming.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Gir cows

Dairy farmers of large herd of Gir cattle in South-Saurashtra region should set the target of age at first calving < 44 months and calving interval of 14 months to improve these traits for maximum return. They can maintain Gir cows up to 8 lactations for economical dairy farming; however, high yielding cows may be maintained for more than 8 lactations also.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Jaffrabadi buffaloes

Dairy farmers of large herd of Jaffrabadi buffaloes in South-Saurashtra region should set age at first calving of 47 months and calving interval of 15 months as targets to improve these traits for maximum return. They can maintain Jaffrabadi buffaloes upto 6 lactations for economical dairy farming, however, high yielding buffaloes may be maintained for more than 6 lactations also.

(Cattle Breeding Farm, JAU, Junagadh)

Recommendations for scientific community

I. PLANT PROTECTION

Agricultural Entomology

Testing bio efficacy of insecticides through seed treatment against sucking pests of *summer* groundnut

Seed treatment with imidacloprid 600 FS @ 2 ml/kg seed gave effective control of jassids and thrips in *summer* groundnut up to 35 days after sowing.

(Main Oil Seed Research Station, JAU, Junagadh)

Monitoring of fruit flies in mango orchard through methyl eugenol trap

In mango orchards of South Saurashtra Agro-climatic Zone, the population of fruit fly (*Bactocera dorsalis* Hendel) males was maximum during April to September (14th to 36th Met. Standard week). Its activity was related positively with high humidity (80 to 90 %) and 24 to 26°C minimum temperature.

(Department of Entomology, JAU, Junagadh)

Monitoring of fruit flies in mango orchard through methyl eugenol trap

In mango orchards of North Saurashtra Agro-climatic Zone, the population of fruit fly (*Bactocera dorsalis* Hendel) males was maximum during 1st week of April to last week of July (13th to 31st Met. Standard week). Its activity was related positively with maximum (32 to 42°C) and minimum (21 to 27°C) temperature and relative humidity (63 to 89 %).

(Grassland Research Station, JAU, Dhari)

Monitoring of pod borer by pheromone trap in chickpea

The population of gram pod borer (*Helicoverpa armigera* Hub.) males was observed throughout the crop period except severe winter month, with maximum activity in 3rd Met. Standard week. Its activity was related negatively with maximum and minimum temperature and mean evaporation.

(Grassland Research Station, JAU, Dhari)



Population dynamics of shoot fly and stem borer in forage sorghum in relation to abiotic factors

The sorghum shoot fly (*Atherigona soccata*) and stem borer (*Chilo partellus*) in *kharif* forage sorghum were active during 14 to 21 DAG and 45 DAG, respectively. Weather parameters did not show any effect on damage caused by both the pests; however, afternoon relative humidity caused negative effect on the damage caused by shoot fly.

(Grassland Research Station, JAU, Dhari)

II. HORTICULTURE & AGRO-FORESTRY

Response of different genotypes of custard apple to weather parameters

The climatic parameters like temperature, humidity and rainfall influenced the flowering, fruit setting, fruit retention percentage, fruit yield and disease-pests incidence. More humidity and off seasonal rain during March-April insist the first and second reproductive flush and adversely affects the third flush.

Optimum temperature and rain leads to more fruit set. Heavy rain during fruit set also tends to more drop with less fruit retention percentage. Mealy bug population is decreasing with increasing rain, whereas, black spot decreases when wind speed is less. Custard apple requires 30-35°C temperature during flowering and fruit setting, 75-90% humidity and 600-1400 mm even distributed rainfall. Off seasonal rain disturbs the flowering pattern and adversely affects the crop.

(Department of Horticulture, JAU, Junagadh)



Survey of coconut gardens in Gujarat state

From the survey of five districts of South Saurashtra and South Gujarat region, it was observed that only 14.29 % farmers are growing hybrid coconut varieties (D x T and T x D) and 45.71 % farmers preferred seedlings from nursery of university as well as horticulture departments of state government. While, 38.10 % farmers are growing coconut as per recommended spacing and 50 % farmers follow recommended dose of fertilizers. It



was also observed that only 10 % farmers adopt the recommended irrigation practices and none of the farmers is using drip irrigation and plant protection measures in their orchards. Therefore, it is suggested that the extension functionaries are required to motivate the farmers to adopt recommended cultivation practices for coconut.

(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

III. AGRICULTURAL ENGINEERING

Water balance and assessment of groundwater recharge in Meghal river basin of Saurashtra region

The efficient utilization of available water in Meghal river basin is recommended using surface as well as micro irrigation systems. The total groundwater recharge through rainfall and water harvesting structures in the study area was found 12,592 ha m. The possible options for efficient utilization of groundwater using different irrigation systems are as below:

Option 1: Using surface irrigation methods

In Meghal river basin, if surface irrigation system is adopted at 60 per cent application efficiency, about 9,084 ha of wheat crop (irrigation water requirement 457 mm) can be irrigated using 5,187 ha m of water. The remaining amount of water can be used for irrigating horticultural crops viz., coconut, mango and sapota (gross irrigation requirement 1097, 453 and 768 mm) of about 3,669, 1,005 and 596 ha area, which covers about 2/3rd area of horticultural crops.

Option 2: Allocating all crops under micro irrigation system

In Meghal river basin, if drip irrigation system is adopted (90 per cent application efficiency) for existing horticultural crops of coconut, mango and sapota in 5,595, 1,602 and 796 ha area water required is 6,137, 725 and 611 ha m respectively. The remaining water can be utilized through sprinkler irrigation (80 per cent application efficiency) for irrigating wheat crop will cover about 11,950 ha area. This can bring under irrigation all horticultural crops and an additional area of 2,866 ha (31.6 %) of wheat crop.

(Department of Soil & Water Engg., CAET, JAU, Junagadh)

Rainfall analysis for crop planning

- 1) Rainfall amount of 25.4 mm & 37.1 mm and 8.98 mm & 30.64 mm will be received at 75 % and 60 % probabilities in 27th and 29th

Meteorological Standard Week (MSW), respectively. The conditional probability of getting 30 mm is 66.64 % and 65.17 % during 27th and 29th MSW, respectively. Therefore sowing operation can be carried out during this period.

- 2) Annual, seasonal rainfall and rainy days followed the increasing trend after 2000. The average length of the rainy season was observed 99 days. Drought resistance, low water requirement, short duration crop and its varieties having crop growth period maximum 99 days should be grown.
- 3) During 32 MSW, probability of a dry spell of length seventh is higher (0.64). Therefore, this period can be used to carry out interculturing operations and formation of ridges. Fertilizer top dressing needs to be done when the soil is sufficiently moist i.e. before 32 MSW. During 35 MSW to 37 MSW, probability of a dry spell of length 21 or more is higher; therefore spraying of anti-transparent and mulching can be done to reduce evapotranspiration losses.
- 4) Excess rain water received during 28th to 31st MSW can be harvested and later used as a life saving irrigation at times when prolonged dry spells occur.

(Main Dry Farming Research Station, JAU, Targhadia)

IV. FISHERIES SCIENCE

Preparation and evaluation of edible fish powder prepared from small sized croaker *Otolithes ruber* (Block & Schneider, 1801) landed at Veraval harbor

Fishery entrepreneurs and processors are advised to use small sized croaker *Otolithes ruber* along with their bones for the production of heat sterile protein and mineral rich edible fish powder having a shelf life of seven months.

(College of Fisheries, JAU, Veraval)

Qualitative studies of zooplankton in Meghal River at Chorwad

The Meghal River system, located in South Saurashtra region harbours Zooplanktons belonging to seven genera viz., *Cyclops*, *Daphnia*, *Filinia*, *Brachionus*, *Bosmina*, *Moina* and *Keratella* during monsoon and winter months.

(College of Fisheries, JAU, Veraval)

Identification and quantification of rotifer fauna of Okhamandal region

Thirteen species of rotifers are found in Okhamandal region. The rotifers are found in higher diversity and density in Surajkaradi pond and Gomati creek than seacoast areas in Okhamandal region in monsoon and post monsoon seasons. They are more abundant in lower salinity.

(Fisheries Research Station, JAU, Okha)

Cycle Evaluation for fish landing at Veraval of Veraval coast

The entrepreneurs and financial institutions are advised to consider an aggregate, profit making time span of seven years as the cycle period for fish landing centre, Veraval.

(College of Fisheries, JAU, Veraval)

V. BASIC SCIENCE

Regeneration protocol for Malkankani (*Celastrus peniculata* Willd)

a) Surface sterilization :

Seeds of *Malkankani* could be used for *in vitro* germination after surface sterilization with carbendazim 2.5 g/ litre of water for 30 minutes followed by 0.1% mercuric chloride treatment for 20 minutes and washed with sterilized distilled water for four to five times for removing traces of the chemicals.



b) Callus induction :

Shoot tips from *in vitro* grown seedlings, collected aseptically should be inoculated for callusing in MS medium with 15.0 μ M BA (Benzyl adenine) and 30.0 μ M AS (Adenine sulphate).



c) Shoot multiplication :

Proliferated compact green callus should be recultured in the same medium (MS + 15.0 μ M BA + 30.0 μ M AS) for multiple shoot induction and plantlet development.



d) *In vitro* rooting :

Maximum rooting, more number of roots and longer roots are

achieved in half strength MS medium supplemented with 10.0 μ M IAA (Indole Acetic Acid).



e) Hardening :

For acclimatization of *in vitro* multiplied seedlings in greenhouse, a pot mixture of soil:sand (1:1) could be successfully utilized which gave the highest (78.33 %) survival percentage.



(Department of Genetics & Plant Breeding, JAU, Junagadh)

Effect of brassinolide on germination and biochemical parameters of chickpea

The application of Brassinolide as seed soaking treatment for 2hrs @ 0.25 mg/l in chickpea crop gives good and speedy germination as well as enhanced seedling vigour. This may be attributed to the activation in metabolism during germination through increased enzymatic activities and total soluble sugar content.

(Department of Genetics & Plant Breeding, JAU, Junagadh)

VI. ANIMAL HEALTH & ANIMAL PRODUCTION

Impact of herd composition on herd performance traits in Gir cattle

Maintaining an established breeding herd of an average of 110 Gir cows in South Saurashtra region results in an average of 388 (i.e. 400) total heads, 260 total adult units and 72 % total female population with 85 (22 %) breedable heifers, 80 (21 %) growing females below 2 years of age and 63 (57 % total cows) milch cows with wet average of 6.8 lit., herd average of 3.8 lit. and return of 116 % over feed cost. Herd structure and performance vary significantly by year. Month significantly influences calving rate and herd average. Wet average (7.2 vs 6.1 lit), herd average (4.2 vs 3.4 lit) and % milch cows (57-60 vs 54-55 %) remain higher from March to May and lower during August-September months. Performance traits show negative trend with number of cows, total breedable females and total heads present in the herd. Hence, optimum herd structure should be maintained for higher performance and return.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Gir cows

In organized large dairy herd of Gir cattle in South Saurashtra region-i)

Over all breeding efficiency, lactation efficiency, age at first calving, calving interval and lactation period of Gir cows were 86.9 ± 0.5 %, 61.1 ± 1.1 %, 1527.8 ± 14.2 (50.1 mo.), 481.2 ± 4.9 (15.8 month) and 281.0 ± 4.6 days, respectively. About 29 % of heifers calved for the first time below the average age of 44 months and 38 % of cows calved at an average calving interval of 14 months. ii) Average milk production of Gir cows increased with increase in parity and reached peak of 2300 lit. of 300-d milk yield in 5th lactation. In subsequent lactations also, 300-d lactation milk yield remained between 1950 and 2100 lit. up to 8th lactation which indicated high persistency of production over parity. Productive life of cows averaged 8.5 years (i.e., 3108 days) with 10,000 lit. life time milk production with an average of 4.3 calvings during lifetime. iii) About 19 % Gir cows remained in the herd for more than 12 years of age (on an average 14.6 years) and more than 25 % of cows performed in the herd for more than 6 lactations. Hence, breeding goals of less than 44 months of age at first calving and 14 months of calving interval may be set for Gir cattle.

(Cattle Breeding Farm, JAU, Junagadh)

Breeding and lactation efficiencies of Jaffrabadi buffaloes

In organized large dairy herd of Jaffrabadi buffaloes in South Saurashtra region-i) Over all breeding efficiency, lactation efficiency, age at first calving, calving interval and lactation period of Jaffrabadi buffaloes averaged 79.0 ± 1.5 %, 58.2 ± 1.6 %, 1656.7 ± 28.6 (54.3 month), 541.9 ± 7.9 (17.8 month) and 291.9 ± 5.0 days, respectively. About 28 % of heifers calved for the first time below the average age of 47 month and 31 % of buffaloes calved at an average calving interval of 15 months. ii) Average milk production of Jaffrabadi buffaloes increased with increase in parity and reached peak of 1900 lit. of 300-d milk yield in 4th lactation. In subsequent lactations also, 300-d lactation milk yield remained between 1700 and 1800 lit. upto 6th lactation which indicated high persistency of production over parity. Productive life of buffaloes averaged 10.1 years (i.e., 3701 days) with 8500 lit. life time milk production with an average of 4.7 calvings during life time. iii) About 20 % Jaffrabadi buffaloes remained in the herd for more than 12 years of age (on an average 16.6 years) and more than 38 % of these animals performed in the herd for more than 6 lactations. Hence, breeding goals of less than 47 months of age at first calving and 15 months of calving interval may be set for Jaffrabadi buffaloes.

(Cattle Breeding Farm, JAU, Junagadh)

Production of Nucleus / Breeder seeds during the year 2011-12

Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total (q)
				National	State	
1.	Groundnut	GG-2	11.27	2.10	100.50	113.87
		GG-5	18.00	-	52.80	70.80
		GG-6	1.40	-	-	01.40
		GG-7	4.50	3.00	3.20	10.70
		GG-8	5.80	4.50	-	10.30
		GAUG-10	8.94	-	23.40	32.34
		GG-11	20.40	-	33.00	53.40
		GG-14	1.50	42.20	-	43.70
		GG-16	2.70	21.00	-	23.70
		GG-20	171.90	40.80	310.23	522.93
		GG-21	4.50	7.80	-	12.30
		GJGHPS-1	12.00	5.10	23.70	40.80
		GJG-9	7.88	-	-	07.88
		GJG-31	22.50	-	9.00	31.50
		GJG-17	3.75	-	-	03.75
GJG-22	2.25	-	-	02.25		
		Sub Total	299.29	126.50	555.83	981.62
2.	Pearl Millet	GHB-538	-	-	9.28	09.28
		GHB-558	-	-	6.20	06.20
		GHB-719	-	-	3.43	03.43
		GHB-732	-	-	6.05	06.05
		GHB-744	-	-	1.24	01.24
		Sub Total	-	-	26.20	26.20
3.	Sesame	G.Til-1	-	0.30	3.14	03.44
		G.Til-2	-	1.96	8.03	09.99
		G.Til-3	-	1.15	13.89	15.04
		G.Til-10	-	0.30	0.50	0.80
		Purva	-	-	0.21	0.21
		Sub Total	-	3.71	25.77	29.48
4.	Chickpea	GG-1	9.91	25.00	32.00	66.91
		GG-2	4.70	11.40	29.25	45.35
		GG-3	5.13	37.15	16.40	58.68
		GG-4	3.83	43.50	-	47.33
		Sub Total	23.57	117.05	77.65	218.27
5.	Wheat	GW-366	10.76	359.60	187.20	197.96
		GW-496	-	-	158.80	158.80
		Sub Total	10.76	359.60	346.00	716.36
Grand Total			333.62	606.86	1031.45	1971.93