



(266.15 q/ha), Pilli Patti (272.55 q/ha) and Talaja-Red (280.34 q/ha), respectively. The purple bloch (12.67 %) was less as compared to check varieties AGFL-Red (20.30 %), Pilli Patti (23.56 %) and Talaja-Red (24.28 %). Population of thrips (5.7/leaf) was found less as compared to check varieties. It was found less pungent (Pyruvic acid: 1.22 %) as compared to check varieties AGFL-Red and Talaja-Red. In this variety, 12.94 per cent total soluble solids were recorded. The bulbs of GJRO 11 are medium in size with flat globe shape and red in colour.



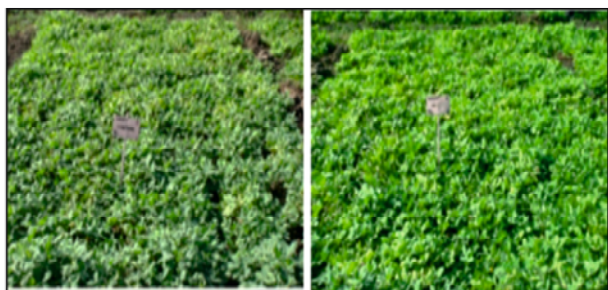
4.4 Crop Production

Recommendation for the farming community

Nutrient Management

Studies on the effect of water soluble foliar grade fertilizers on the growth and yield of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are recommended to fertilize the crop with FYM 7.5 t/ha + 60 % RDF (i.e. 15-30 kg N-P₂O₅/ha) for obtaining higher yield and net realization.



Effect of bio-phos on the performance of castor

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply 40 kg P₂O₅/ha and treat the seeds with phosphate solubilizing microorganism (*Chaetomium globosum*) @ 30 g/50 g seed along with recommended dose of nitrogen (120 kg/ha) for obtaining higher seed yield and net return.



Nutrient management in groundnut-Bt. cotton intercropping system

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut - Bt. cotton intercropping system (in 3:1 ratio) are recommended to apply 50 per cent RDF (i.e. 6.25-12.5-0 kg N-P₂O₅-K₂O/ha) to the groundnut crop and 100 per cent recommended dose of fertilizer (i.e. 160 kg N/ha) to the cotton crop for obtaining higher yield and net realization.



Effect of integrated nutrient management on yield, quality and nutrient uptake by garlic under salt affected soil

The farmers of South Saurashtra Agro-climatic Zone growing garlic in salt affected soil are recommended to apply 50 % RDF (*i.e.* 25:25:25 kg N:P₂O₅:K₂O/ha) along with FYM @ 10 t/ha for obtaining higher bulb yield and net return.

Package of Practices

Evaluation of preparatory and secondary tillage practices in rainfed groundnut

The farmers of South Saurashtra Agro-climatic Zone growing rainfed groundnut are recommended to adopt in-row subsoiling (20 cm depth) before sowing, interculturing at 15, 30, 45 and 60 days after sowing (DAS) and apply pendimethalin @ 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence with hand weeding at 30 and 45 DAS for achieving higher yield and net realization as well as effective moisture conservation and weed management.



Studies of possibilities of organic farming in pearl millet–gram crop sequence

The farmers of North Saurashtra Agro-climatic Zone adopting pearl millet-gram crop sequence and interested in organic farming are recommended to apply FYM 7.5 t/ha every year to pearl millet only for securing higher net realization and to maintain soil fertility.

Optimization of nutrients for pearl millet production in *kharif* season

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are recommended to apply 100 kg N and 30 kg P₂O₅/ha for obtaining higher yield and net return.

Nutrient management through organic and inorganic sources for major and trace elements in rainfed pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during *kharif* season are recommended to apply ZnSO₄ and FeSO₄ @ 20 kg/ha each, along with recommended dose of fertilizers (80-40-0 kg N-P₂O₅-K₂O/ha) and FYM 5 t/ha for obtaining higher yield and net return as well as for improving grain quality.

Weed management

Weed management in cumin

The farmers of South Saurashtra Agro-climatic Zone growing cumin are recommended to apply oxadiargyl 75 g/ha (6 EC 25 ml/10 lit) as early post-emergence application at 7 DAS followed by hand weeding at 45 DAS for achieving higher yield and net realization as well as effective weed management.



Evaluation of pre and post emergence herbicides for irrigated Bt. cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt. cotton are recommended



to apply pendimethalin 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence followed by hand weeding and interculturing at 30 and 60 days after sowing (DAS) or pendimethalin 900 g/ha (30 EC 60 ml/10 lit) as pre-emergence followed by quizalofop 40 g/ha (5 EC 16 ml/10 lit) at 45 DAS for achieving higher yield and net realization as well as effective weed management.



Pendimethalin fb HW

Drip system details:

Details	Operating time-Alternate days	
	Month	Minutes
Dripper spacing: 60 cm	March-May	2 Hrs. 20 min
Dripper discharge: 4lph	June	2 Hrs. 10 min
Operating pressure: 1.2 kg/cm ²	July-September	1 Hr. 30 min
Operating frequency: Alternate days	October-November	1 Hr. 40 min
	December-January	1 Hr. 25 min



Weed management in *kharif* urdbean

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* urdbean are recommended to apply quizalofop-ethyl 40 g/ha (5 EC 16 ml/10 lit water) at 20 days after sowing (DAS) and hand weeding at 40 DAS for obtaining higher yield and net realization as well as effective weed management.

Water Management

Effect of crop geometry and irrigation levels on sugarcane

The farmers of South Saurashtra Agro-climatic Zone growing sugarcane are recommended to adopt drip method of irrigation and plant the crop in paired rows (60-90-60 cm) and irrigate the crop at 0.9 PEF with laying laterals in each paired rows for securing higher cane yield and net return. Nitrogen and potassium should be applied at 80 per cent of recommended dose (i.e. 200-100 N-K₂O kg/ha) under drip irrigation in 10 equal splits starting from 45 DAP at an interval of 20 days.

Soil management

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

The farmers of South Saurashtra Agro-climatic Zone growing castor with saline irrigation water are recommended to select variety GC 3 and apply FYM @ 10 t/ha and gypsum 50% GR (3 t/ha) along with recommended dose of fertilizers.

Recommendations for Scientific Community

Study of uptake pattern of phosphorus in different varieties of castor

In castor crop, phosphorus uptake was 47.6, 33.1 and 19.3 per cent by leaf, stalk and root at branching stage, while at flowering stage 23.8, 13.3, 5.3 and 57.6 per cent and at capsule formation stage 13.7, 16.9, 3.4 and 66.0 per cent by leaf, stalk, root and spike, respectively. Among the different stages of plant growth, the maximum phosphorus uptake was obtained at capsule formation stage (370 mg/plant) followed by flowering stage (118 mg/plant) and branching stage (29 mg/plant). Among the different varieties, maximum phosphorus uptake by crop was observed with GCH-7 at all the growth stages.

Weed management in garlic

The scientific community is informed that application of oxyfluorfen 240 g/ha as pre-emergence followed by hand weeding at 40 days after sowing (DAS) or application of oxadiargyl 90 g/ha as pre-emergence followed by hand weeding at 40 DAS gave higher yield and net realization as well as effective weed management.



Weed management in cumin

The scientific community is informed that application of pendimethalin 900 g/ha as pre-emergence followed by hand weeding at 45 days after sowing (DAS) gave higher yield and net realization as well as effective weed management.

4.5 Plant Protection

The research work carried out by plant protection group is to develop the economically viable technology for increasing production of agricultural commodities without any adverse effect on the environment and livelihood of the people.

Recommendation for the farming community

Agricultural Entomology

Management of sucking pests through insecticides in brinjal

For effective and economical control of brinjal whitefly, three sprays of chlorantraniliprole 18.5 SC, 0.002 %, 1.08 ml/10 litre water at 15 days interval starting from the pest infestation are recommended under South Saurashtra Agro climatic Zone. The PHI for chlorantraniliprole 18.5 SC, 0.002 % is one day.



Storage potential of bio-agent under refrigerator conditions

Farmers are advised to store the field collected ladybird beetles (*Coccinella septempunctata* (L.)) in jar containing folded papers under domestic refrigerator conditions (6.0 to 7.5°C) up to 120 days with the survival rate of 84 per cent without



hampering their longevity and fecundity. These stored predatory beetles can be released in field crops for biological control of insect pests.

Storability of HaNPV and SNPV under refrigerator condition

Farmers are advised for biological control of *Helicoverpa armigera* and *Spodoptera litura* through Nuclear Polyhedrosis Virus (NPV) to store the field collected NPV infected larvae under domestic refrigerator conditions (6.0 to 7.5°C). These NPV infected larvae can be stored up to 8 months of storage period with 100 per cent virulence, which can be utilized for the biological management of respective pest.

Studies on effect of drip v/s flood irrigation on the incidence of important mango pests

Mango growers of South Saurashtra Agro-climatic Zone are informed that the lower incidence of gall midge, hopper and thrips is found in drip irrigated orchard as compared to flood irrigated orchard.



Testing of efficacy of different newer insecticides against shoot fly and stem borer in pearl millet

Farmers of North Saurashtra Agro-climatic Zone growing *kharif* pearl millet are advised to treat the seeds with imidacloprid 600 FS, 8.75 ml/kg seeds, 4.20 g a.i./kg seeds at the time of sowing followed by spray with imidacloprid 17.8 SL, 0.009

% (5.0 ml/10 liter water, 45.39 g a.i./ha) at 35 days after germination of the crop for effective management of shoot fly and stem borer. The PHI for these insecticides is 42 days.

Storage study of wheat harvested by combine harvester

The farmers storing wheat are advised that wheat harvested by combine harvester (up to 6 % mechanically damaged grain) to be stored with the treatment of castor oil (15 ml/1.0 kg grain) and can be kept in GI bin container to keep safe against lesser grain borer up to eight months of storage as it reduces pest population, grain damage, weight loss as compared to untreated wheat kept in jute bags.

Testing bio-efficacy of certain insecticides against pod borer complex on urdbean

Farmers of South Saurashtra Agro-climatic zone are advised to apply two sprays of chlorantraniliprole 18.5 SC, 0.006 % (3 ml/ 10 litre water) or flubendiamide 48 SC, 0.0096 % (2 ml/ 10 litre water), first spray at 50 per cent flowering and second at 15 days interval for the control of pod borer complex in urdbean.

The PHI for chlorantraniliprole 18.5 SC is 20 days, whereas 11 days for flubendiamide 48 SC.

Plant Pathology

Assessment of *Trichoderma* population in the field under groundnut cultivation

Farmers of North and South Saurashtra Agro-climatic Zone are advised to apply *Trichoderma* every year for the management of stem/pod rot disease in groundnut.

Standardization of method and time of application of bio-control agents for management of stem and pod rot of groundnut caused by *Sclerotium rolfsii*

Farmers of South Saurashtra Agro-climatic Zone are advised furrow application of *Trichoderma harzianum* 2×10^6 cfug⁻¹ @1.25 kg in 125 kg of

castor cake/ha at the time of sowing as well as its broadcasting at plant base with same dose at one month after sowing for effective and economic control of stem and pod rot (*Sclerotium rolfsii*) of groundnut.

Compatibility of *Trichoderma* with different seed dressing agrochemicals used for the management of diseases and pest in groundnut

Farmers of South Saurashtra Agro-climatic Zone are advised that the agrochemicals used for seed treatment in groundnut viz., carbendazim 12 % + mancozeb 63 % - 75 WP @ 3.0 g/kg seed or mancozeb 75 WP @ 4.0 g/kg seed or carboxin 37.5% + thirum 37.5 % - 75 WP @ 3.0 g/kg seed or tebuconazole 2 DS @ 2.0 g/kg seed or imidacloprid 600 FS @ 3.0 ml/kg seed against seed and soil borne diseases/sucking pests do not reduce the soil population of *Trichoderma*, hence they are compatible with *Trichoderma harzianum*.

Effect of spawn rates on sporophore production of Oyster mushroom (*Pleurotus sajor-caju*)

Mushroom growers are advised to use 3.0 per cent spawn rate in polyethylene bags (18 × 24 inch) of oyster mushroom (*Pleurotus sajor-caju*) to get the optimum sporophore production with higher biological efficiency.

Effect of substrate rates on sporophore production of Oyster mushroom (*Pleurotus sajor-caju*)

Mushroom growers are advised to use 3 kg wheat straw substrate with 3 per cent spawn rate in polyethylene bags (18 × 24 inch) for the optimum sporophore production with higher biological efficiency of oyster mushroom (*Pleurotus sajor-caju*).

Management of cumin wilt (*Fusarium oxysporum f. sp. cumini*)

Farmers of South Saurashtra Agro-climatic Zone are advised to broadcast *Trichoderma harzianum* 2×10^6 cfug⁻¹ @ 5.0 kg mixed in 1000 kg of FYM/ha at the time of sowing for effective and economical control of cumin wilt.



Efficacy of different bio-control agents against cumin wilt caused by *Fusarium oxysporum f. sp. cumini*

Farmers of South Saurashtra Agro-climatic Zone are advised to broadcast mixture of *Trichoderma viride* @ 1.70 kg + *T. harzianum* @ 1.70 kg + *Pseudomonas fluorescens* @ 1.70 kg (2×10^7 cfug⁻¹) or *T. viride* @ 2.50 kg + *P. fluorescens* @ 2.50 kg (2×10^7 cfug⁻¹) mixed in 500 kg of castor cake/ha at the time of sowing for effective and economical control of cumin wilt.

Effect of foliar application of insecticides in cumin on *Trichoderma* applied in soil

Farmers of South Saurashtra Agro-climatic Zone are advised to apply *Trichoderma harzianum* (2×10^7 cfug⁻¹) @ 5 kg in 500 kg of castor cake/ha at the time of sowing as well as its broad-casting @ 5 kg/ha *Trichoderma* in 100 kg sand at one month after germination of crop for effective and economical control of cumin wilt.

Effect of foliar application of herbicides in cumin on *Trichoderma* applied in soil

Farmers of South Saurashtra Agro-climatic Zone are advised that the application of herbicides oxadiargyl 6 EC, 0.075 kg a.i./ha, 25 ml/10 litre at 7 days after sowing in cumin do not reduce the soil population of *Trichoderma harzianum*.



Recommendations for Scientific Community

Agricultural Entomology

Management of sucking pests through insecticides in brinjal

Three sprays of bifenthrin 10 EC, 0.02 %, 20 ml /10 litre water or buprofezin 25 SC, 0.06 %, 24 ml/10 litre of water at 15 days interval starting from the pest infestation found effective for the control of brinjal whitefly.

The PHI for bifenthrin 10 EC, 0.02 % and buprofezin 25 SC, 0.06 % is 1 and 7 days, respectively.

Population dynamics of important pests of mango

The incidence of mango hopper, thrips and flower bug was found high during December to February while, leaf gall midge and shoot borer were found active during September to October.

Population dynamics of important pests of pomegranate

Anar butterfly was found high during November to May while, thrips was found active during August to November in pomegranate.

Testing of efficacy of different newer insecticides against shoot fly and stem borer in pearl millet

Seed treatment with imidacloprid 600 FS @ 8.75 ml/kg, 4.20 g a.i./kg at the time of sowing followed by spray with spinosad 45 SC, 0.009 % @ 2.0 ml/10 litre at 35 days after germination of the crop found effective for the management of shoot fly and stem borer. The PHI for these insecticides is 42 days.

Incidence of insect pests of chickpea through the cropping period and monitoring of pod borer moths using pheromone traps

Normal and late sowing of chickpea varieties showed sustainable population of *Helicoverpa armigera* at 60 days after sowing.

Plant Pathology

Effect of fungicides application in cumin on *Trichoderma* applied in soil

Soil drenching of carbendazim 50 WP @ 2 kg in 2000 litre water/ha or foliar spray of mancozeb 75 WP @ 30 g/10 litre or hexaconazole 5 EC @ 10 ml/10 litre against soil borne diseases do not reduce the population of *Trichoderma harzianum* applied in soil.

Effect of foliar application of insecticides in cumin on *Trichoderma* applied in soil

Foliar spray of imidacloprid 17.8 SL @ 3 ml/10 litre or dimethoate 30 EC @ 10 ml/10 litre in cumin against sucking pests do not reduce the population of *Trichoderma harzianum* applied in soil.

Effect of foliar application of herbicides in cumin on *Trichoderma* applied in soil

Herbicides used as pre-emergence or early post emergence in cumin viz., pendimethalin 30 EC, 0.9 kg a.i./ha, 60 ml/10 litre at 2 DAS or glyphosate 41 SL, 0.75 kg a.i./ha, 37 ml/10 litre at 2 DAS reduces the soil population of *Trichoderma* up to one month after sowing but *Trichoderma* population was increased at later stage. While application of oxyfluorfen 23.5 EC, 0.240 kg a.i./ha, 20 ml/10 litre at 2 DAS do not reduce the population of *Trichoderma harzianum* applied in soil.

Disease management through organic practices for organic groundnut cultivation

Blanket furrow application of FYM @ 7.5 tonne/ha followed by *Trichoderma viride* as seed treatment @ 10 g/kg seed, and *T. viride* @ 4.0 kg enriched in 250 kg FYM and as spray @ 2.5 kg/ha (5 g/litre of water) at 30 and 45 DAS found effective for the management of diseases of groundnut.

4.6 Horticulture and Agro Forestry

Recommendation for the farming community

Effect of different sources of nitrogen with graded levels of inorganic fertilizer on papaya cv. *Madhubindu*

Farmers of South Saurashtra Agro-climatic Zone growing papaya (*Madhubindu*) crop are advised to apply 25 per cent N from FYM (6 kg FYM), and remaining 75 per cent N (150 g), 200g P and 250g K per plant from chemical fertilizers during 2nd, 3rd and 4th month after transplanting in equal splits for getting higher yield and net return.



Effect of micro nutrients on growth, yield and quality of papaya cv. *Madhubindu*

Farmers of South Saurashtra Agro-climatic Zone are advised to spray micronutrients viz., zinc sulfate 24.0 g (Zn 0.5 %) and Borax 10.0 g (B 0.1 %) per liter of water during 2nd and 4th month after transplanting for getting higher yield and net return in papaya cv. *Madhubindu*.



Dehydration of sapota slices

Fruit processors are advised to dry the sapota slices of 0.5 cm thickness in solar dryer up to 33 per cent recovery to maintain quality in storage up to six months at room temperature.



Effect of soil amendment with organic materials on yield and quality of tomato (cv. *Junagadh Tomato-3*) under sodic soil & brackish water condition

The farmers of South Saurashtra Agro-climatic Zone growing *Rabi* Tomato (*JT-3*) under sodic soil (EC 1.48 dS/m, pH 7.81, ESP 21.84 %) and brackish water (EC 4.34 to 4.88 dS/m) condition are advised to apply FYM 5 t/ha + 50 per cent R.D.F. (37.5+18.75+ 31.25NPK kg/ha) + poultry manure (3700 kg/ha) for securing higher yield and net return.



4.7 Agricultural Engineering

The Agricultural Engineering group accomplished the studies on design, development and fabrication of agricultural machinery, equipments, tools, renewable energy, processing and soil & water management.

Recommendation for the farming community

Impact of irrigation regimes and mulching on the economic productivity of drip irrigated cotton

Farmers of South Saurashtra Agro-climatic Zone growing Bt. Cotton are advised to adopt drip irrigation (with 1.2m lateral spacing, 40 cm dripper spacing and emitter discharge of 2 lph) in raised bed covered with silver black plastic mulch of 20 micron and irrigate every alternate day at 0.8 ET_c level (or to operate system for 2 to 3.5 hrs, 2.25 to 3.25 hrs and 1.25 to 3 hrs during September-October, November-December and January, respectively) for acquiring higher yield (33 %) and water use efficiency (79 %), higher water productivity (91%) and higher net return over no mulch.



Extraction of Pectin from Kesar Mango Peel by Resins

Mango processors are recommended to adopt a process technology developed by Junagadh Agricultural University for the production/extraction of pectin from mango peel using cation exchange resin as an extracting medium with peel to extracting medium ratio of 1:4, extraction pH of 2.56, extraction temperature of 80 °C, extraction

time of 60 min and two extractions. This method can give better yield and quality of pectin with benefit cost ratio (BCR) of 1.17.

Development and performance evaluation of low cost greenhouse fertigation irrigation system

The greenhouse / net house growers are advised to use low cost greenhouse fertigation system developed by Junagadh Agricultural University to apply fertilizer through drip irrigation as well as interested manufacturers are recommended for manufacturing this system.



Studies on microclimate and plant growth of capsicum under different type of Shade net

The farmers of South Saurashtra Agro-climatic Zone are recommended to adopt white coloured 50 per cent shade net house for cultivation of capsicum. This type of net house results in early production approximately 10-12 days, protection from insects/pests, diseases and higher yield of capsicum as compared to use of green, black and blue coloured shade net house.



Effect of mulch and irrigation level by drip on water use efficiency and yield of water melon

The farmers of South Saurashtra Agro-climatic Zone are advised to use silver black plastic mulch (20 µm) with drip irrigation at 0.6 ETc level to achieve higher crop production of water melon in summer season.



Details of mulching technology :		Details of irrigation system :	
1	Mulch film: 20 µm silver black plastic	1	Lateral spacing : 180 cm
2	Bed size: (a) Top width : 40 cm (b) Bottom width : 70 cm (c) Height : 30 cm	2	Dripper spacing : 40 cm
3	No. of row per bed : 2	3	Dripper discharge : 2 lph
4	Spacing : (a) Bed spacing : 180 cm (b) Row spacing : 20 cm (c) Plant spacing : 40 cm	4	Irrigation scheduling : Feb.:20 to 45 min/day March: 30 to 95 min/day April : 70 to 105 min/day May : 70 to 90 min/day

Recommendations for Scientific Community

The Impact of Seawater Intrusion on the Qualitative Parameter of Ground Water

The following scientific information as

models developed for rainfall and groundwater EC are released for the scientific communities/Line Departments of State/Central Governments/NGOs working in the coastal belts of the Saurashtra region.

No.	Costal belt region	Best fit model	R ²
1	0-5 km	$EC_{PM} = 0.6364(EC_{bm}) - 0.00166(RF) + 2.9495$	0.83
2	5-10km	$EC_{PM} = 0.6965(EC_{bm}) - 0.000359(RF) + 1.2837$	0.64
3	10-15km	$EC_{PM} = 0.4171(EC_{bm}) - 0.000267(RF) + 1.5592$	0.64
4	15-20km	$EC_{PM} = -0.3577(EC_{bm}) - 0.0000683(RF) + 1.8636$	0.82

An assessment of suitability of groundwater for drip irrigation in Saurashtra region

The following scientific information is released for the scientific community. The pH of the groundwater was observed higher (more than 7) in all districts of the Saurashtra region. The maximum ground water samples (99.14 %) were found in category scale forming but non corrosive class.

- Based on the EC, SAR and RSC of the

groundwater, 56.24, 18.4, 6.64 and 18.68 per cent samples were found under categories of good water, saline water, high SAR saline water and alkali water class, respectively.

- The hardness of the groundwater in Jamnagar, Rajkot, Surendranagar, Junagadh and Porbandar districts were varying from 9 to 177, 12 to 206, 12 to 292, 10 to 221 and 12-176, respectively.



4.8 Basic Science

Basic science group consist of plant physiology, bio-chemistry and plant molecular biology are given here in.

Recommendation for the farmers

Effect of Brassinolide foliar spray on yield and yield attributing characters of wheat

The farmers of South Saurashtra Agro-climatic Zone growing wheat under irrigated condition are recommended to spray growth promoter Brassinolide (BS) @ 0.01mgL⁻¹ (12.5 ml Brassinolide dissolved in 5 litres water, from which 150 ml is taken and diluted to 15 litres solution) at milk dough stage to obtain higher grain yield and net return.



Response of sesame (*Sesamum indicum* L.) to growth regulators

The farmers of North Saurashtra Agro-climatic Zone growing sesame in *kharif* season are recommended for foliar spray of Indole Acetic Acid (IAA) 100 ppm (1 gram/10 liter water) at flowering stage for obtaining higher yield and net return.

Effects of foliar application of organic and inorganic substances on the yield of chick pea (GJG-3) under limited water supply

The farmers of North Saurashtra Agro-climatic Zone (AES-VI) growing chickpea (Var.GJG-3) in *rabi* season are recommended to apply two irrigation (one at flowering and second at pod development stage) along with recommended dose of fertilizer (20:40 NP kg/ha) and foliar

application of KNO₃ @ 2 per cent twice at flowering and pod development stages for obtaining higher yield and maximum net return.

Effect of foliar spray of plant growth retardants on growth and yield parameters of *kharif* groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are recommended for foliar spray of cycocel (50 % SL) @ 1000 ppm (2.0 ml/lit) at 30 Days after sowing (DAS) or foliar application of paclobutrazol (23 % w/w SC) @ 500 ppm (2.5 ml/lit) at 60 DAS to suppress the excess vegetative growth and to get higher pod yield and net return.

Recommendations for Scientific Community

Biochemical Characterization of *Trichoderma*-spp. for Inhibition of *Macrophomina phaseolina* causing Root Rot in Castor

It is recommended to the scientific community that among seven *Trichoderma* spp., *T. koningi* MTCC 796 was found the best antagonist to inhibit the growth of pathogen *Macrophomina phaseolina* followed by *T. harzianum* NABII Th 1 on PDA media. Cell wall degrading enzymes - chitinase and -1, 3 glucanase are positively correlated to inhibit *in vitro* growth of fungal pathogen *M. phaseolina*. Two species specific SCAR primers, JAU-KON856-4 (F:5'ACCTTTCTGTCCTGCCCCTG3'; R:5' AGG AGAAAGGAGTGGTCCGGT3') for *T. koningii* MTCC 796 and JAU-HAR395-3 (F:5' CTTTGTGTTGACACGGTTCT3'; R:5'AAGCTTT GAAGTTGCGAGGA3') for *T. harzianum* NABII Th 1, were developed from sequenced, species specific, RAPD bands of OPA16. These two SCAR markers identified best antagonists inhibiting test pathogen *M. phaseolina*.

QTL mapping and development of SCAR marker for Fusarium wilt (*Fusarium oxysporum* f. sp. *ricini*) in Castor

JAUC1 to JAUC5 series of primers can be used in castor breeding programme to identify

Fusarium wilt resistant genotypes in Marker Assisted Selection (MAS) or Marker Assisted Backcrossing (MAB).

Sex Determination of Papaya (*Carica papaya*) through molecular markers

The scientific community involved in papaya improvement are recommended to use JAUP1 to JAUP4 series of primers for sex determination at pre-flowering stage in 'Madhubindu' variety of papaya.

QTL mapping and development of SCAR marker for *Macrophomina* root rot in Castor

JAUC6 to JAUC10 series of primers can be used in castor breeding programme to identify root rot resistant genotypes in Marker Assisted Selection (MAS) or Marker Assisted Backcrossing (MAB).

Yield assessment of some drought tolerant groundnut genotypes

It is recommended to the scientific community that the genotypes DRT-2004-7 and J-53 possessed drought tolerance under unirrigated condition. Both genotypes recorded higher pod, haulm and biological yield. Harvest index and partitioning to pod were also highest along with high LAI and number of nodules at 70 DAS, thereby having better assimilation of photosynthates towards sink under rainfed condition. These genotypes may be used as parents in breeding programme for development of drought tolerant varieties.



4.9 Veterinary Science and Animal Husbandry

Cattle Breeding Farm, Junagadh Agricultural University is the largest and oldest farm and is the only organized research station where purebred *Gir* Cattle and *Jaffrabadi* Buffaloes are maintained in the country. This research station is involved since its inception in conservation, improvement and advancement of *Gir* Cattle & *Jaffrabadi* Buffaloes

through selective breeding. Research programmes such as Progeny Testing in *Gir* Cattle and Establishment of Elite herd of *Gir* Cattle and *Jaffrabadi* Buffaloes. ICAR sponsored research projects such as "Genetic improvement in indigenous germ-plasm" and "Network Project on *Jaffrabadi buffaloes*" are the key projects functional at the research station.

The herd of *Gir* Cattle was established as early as in 1920 by the erstwhile Nawab of Junagadh State, while *Jaffrabadi* herd was established in the year 1978. Since that this research station always maintains about 650 heads of *Gir* Cattle and 300 heads of Buffaloes. Besides maintaining pure bred herds of *Gir* Cattle and *Jaffrabadi* buffaloes, at the station, the center is involved in conservation and improvement of field animals of these breeds through Field Progeny Testing programmes and supply of high quality males to different *Gram Panchayats*.

Presently this station has a 134 hectare of land out of which about 30 hectare is pasture land. The subsidiary farm known as Narsimehta Talav has 16 hectare and Jonpur farm Grass land of 130 Hectare from where annually 4 to 5 Lakh Kg of dry grass is made available for feeding the animals.

Frozen semen doses balance available from previous year stock was 14,676 for *Gir* bulls and 36,177 for *Jaffrabadi* bulls. During the year 2014 total 10,097 frozen doses from *Gir* bulls and 10,970 frozen semen doses from *Jaffrabadi* bulls were produced at the semen station at Cattle Breeding Farm. Out of these 3,526 doses of *Gir* were used for AI in field, 402 doses were used for AI on farm and 758 doses were sold to AI workers. Similarly for *Jaffrabadi* buffaloes 6,336 doses were used for AI in field, 52 doses were used for AI on farm and 2,973 doses of *Jaffrabadi* bulls, were sold to AI workers.

During the year 2014-15, 24 *Gir* breeding bull calves were distributed among various *Gram-panchayat* for breeding the rural *Gir* population. Similarly during the year 12 *Jaffrabadi* growing males were sold to the different *Gram panchayat* for breeding the *Jaffrabadi* buffaloes.

**Table 4.10 Performance of *Gir* and *Jaffrabadi* herds at CBF during the year 2014**

No.	Particulars	<i>Gir</i> herd	<i>Jaffrabadi</i> herd
1	Total Lact. Milk yield (Lit.)	2267	2174
2	300 D.Milk yield (Lit.)	1990	2017
3	Lactation days	347	333
4	Dry days	182	185
5	Calving interval(days)	455	469
6	Age at 1 st Calving(days)	1381	1624
7	Age at 1 st Heat(days)	1137	1277
8	Service period(days)	176	167
9	No/of service/AI/Conception	1.60	1.12
10	Overall mortality (%)	2.17	2.10

Table 4.11 List of Elite cows producing more than 2500 Lit of milk in 300 days of lactation

No.	Name of Cow	B. No.	Order of lact	300 D Milk Yield (Lit)
1	Tara	47/94	3	3500
2	Sapana	89/97	3	3545
3	Mala	17/08	1	2711.7
4	Lamba	41/07	1	2249.5
5	Simran	52/08	1	2509
6	Patanjali	70/06	1	3376
7	Putali	33/00	6	3257.3
8	Parita	65/01	3	3248
9	Shobhana	53/00	3	2723.3
10	Bhairavi	71/00	3	2581.8
11	Shilpi	59/01	1	2991.2
12	Panchakali	15/02	2	2964.5
13	Charulata	69/02	2	3013.9
14	Prithvi	39/02	3	2106.4
15	Gunjan	31/02	3	3475.4
16	Devi	37/04	2	2989.6
17	Diwali	69/04	4	2870.8
18	Kiran	38/04	4	3837.5
19	Hiren	51/05	2	3764.6
20	Pinki	27/04	2	2776.2
21	Virani	44/03	2	3356.7
22	Mumta	77/03	2	3501.6



No.	Name of Cow	B. No.	Order of lact	300 D Milk Yield (Lit)
23	Dulari	82/05	2	2585
24	Parinita	26/08	2	2599.2
25	Dipika	01/09	1	2438
26	Monalisa	29/09	1	2963.6
27	Mona	65/04	1	2510.8
28	Uday	19/04	1	3061.2
29	Prasana	90/06	2	3032.2
30	Chandra	47/04	3	3012.2
31	Sunidhi	120/05	3	3476.1
32	Shivani	56/06	3	3319.1

Table 4.12 A.I. Performance in the field during year 2014-15

No.	Name of the Centre	AI done in <i>Gir</i> Cow	Cows conceived	AI done in <i>Jaffrabadi</i> Buffalo	Buffaloes Conceived
1	Shedaya	198	98	153	78
2	Pipli	204	78	211	105
3	Loej	350	217	967	524
4	Movana	203	77	303	139
5	Surva	338	190	363	178
6	Mandlikpur	453	221	593	282
7	Sherdi	186	84	365	156
8	Hadmadiya	187	69	110	32
9	Gundala	204	76	283	91
10	Ghumli	14	10	13	13
11	Chaparda	22	3	21	15
12	Porbander	71	31	488	146
13	Khorasa	125	60	150	73
14	Odadar	69	15	-	-
15	Chachakvad	87	7	-	-
16	Porbandar (JAU)	42	12	-	-
17	Dolasa	-	-	446	61
	Total...	2753	1248	4466	1893

In the area under operation of these centers 5,972 *Gir* calves and 14,727 *Jaffrabadi* Buffaloes calves, were born till date. These calves are breeding specific and excellent genetic worth to farmers in increasing milk production in the region.

Frozen semen doses produced on the farm were sold at the rate of Rs. 30/- per dose and the following number of semen doses of the bulls are available at the research station for sale and distribution.

Table 4.13 Semen doses available for sale and distribution

No.	<i>Gir</i> Bulls		<i>Jaffrabadi</i> Bulls	
	Name of the bull	Semen doses available	Name of the bull	Semen doses available
1	Murari	1208	Bhagro	6845
2	Rupak	778	Laxman	3417
3	Bhavik	366	Moti	8641
4	Pankaj	3505	Haresh	1790
5	Bhola	2034	Sundar	3014
6	Raj	2284	Raja	1722
7	Sarang	4036	Nagraj	3339
8	Krishna	85	Dhinglo	4787
9	Milan	2883	Bholenath	1839
10	Shiv	250	Nayan	1483
11	Umang	1853	Madhav	446
12	Damodar	350	Bajrang	383
13	Balaev	280	Abhijeet	80
14	Bhagirath	175		
	Total	20,087		37,786

Total Sixteen research schemes are in operation at Cattle Breeding Farm, JAU, Junagadh. These schemes are aimed at genetic improvement in these bovines maintained at the farm and also in the field through supply of genetically superior and pedigreed bulls to *Gram Panchayt* and other agencies associated with breeding and improvement of *Gir* and *Jaffrabadi* breed and also through supply of frozen semen doses to field A.I. centers. Strengthening of Livestock Inspector Training Center, Establishment of Artificial Insemination Training Centers in Saurashtra, are the extension schemes functional at the center. About 2513 farmers, 834 women farmers, 75 extension workers visited this station and were provided technical guidance.

During the year 2014-15, Mini Cattle Feed Plant (Roughage Processing Plant and Block making machine) produced 38,200 Kg of palette fodder based feed from dry fodder - Molasses and

urea mixed blocks were prepared and fed to the animals, utilizing agricultural byproduct like Groundnut haulms and Wheat Bhusa which were converted in to enriched pelleted Cattle Feed.

***Gir* Cow**

This group has released eight scientific recommendations, which are briefed here in. During the year, six new experiments were conducted on genetic improvement, animal nutrients, animal production and health.



Information for scientific community

Survey on ethno-veterinary practices and preliminary evaluation of antibacterial activity of commonly used plants for animal health in Junagadh district

Methanol extract of *Prosopis juliflora* (Gando Baval) leaves at the concentration of 200 mg/ml has good *in vitro* antibacterial activity against bacterial isolates from animals, viz., *Escherichia coli*, *Streptococcus agalactiae* and *Staphylococcus aureus*.

Radio-anatomy of heart size in Mongrel dogs using Vertebral heart score system

The normal VHS for mongrel dogs is 8.0 to

11.1 V. The deviation from this range may indicate cardiac abnormalities.

Histomorphometry & Histochemical observations on the ovaries of Jaffrabadi buffaloes in different season of year

In *Jaffrabadi* buffaloes, based on biometrical and micrometrical observations, higher functional activities of ovaries are observed in winter season.

Molecular characterization of Interleukin-8 (IL-8) gene in Jaffrabadi Buffalo (*Bubalus bubalis*)

It is recommended to use following primers for the study of IL-8 gene involved in mastitis resistance.

List of Primers

No.	Primer Sequence 5'-3'	Primer length (bp)
Primer 1	Forward 5'-GGGCGGAGGTTGCGTATT-3'	18
	Reverse 5'-TAAGAGGGATCCCAGTAAGGTTT-3'	23
Primer 2	Forward 5'-GACGAGCTTCAGGCAACTATCA-3'	22
	Reverse 5'-ATATTAAATGCCATGGAGACAAA-3'	23
Primer 3	Forward 5'-TGGAAGAATCCAGCAAAGTTC-3'	21
	Reverse 5'-TGACAGAAGGCACAGGCATA-3'	20
Primer 4	Forward 5'-CCAATCGATCTGGAAATCCT-3'	20
	Reverse 5'-TGACTAAGAGGTCTTTCTGTTTGTG-3'	25
Primer 5	Forward 5'-ACAAACAGAAAGACCTCTTAGTCA-3'	25
	Reverse 5'-CAAACCTGATGACTCTGACA-3'	22



Molecular characterization of Toll Like Receptor 4 (TLR-4) gene in *Jaffrabadi Buffalo (Bubalus bubalis)*

Allele B is more frequent than allele A for *TLR-4/ALU I* gene and use of following primers is recommended in *Jaffrabadi* buffaloes.

Exon(s)	No.	Primer Sequence 5'- 3'	Amplicon Size (bp)
Exon 1	Primer-1	Forward 5'-CACAGAGCCACTTCTGGTCA-3'	180
		Reverse 5'- TTTTCAGAAGCAAGGCCAAG-3'	
Exon 2	Primer-2	Forward 5'- ACCTGAGCTTTAACTACCT-3'	280
		Reverse 5'-AATATTCTGCTGAATAGGA-3'	
Exon 3	Primer-3	Forward 5'-CTGGGCTCTCAAGTTTACGG-3'	410
		Reverse 5'-AACCAGCCGGTTGATTTTAA-3'	
	Primer-4	Forward 5'-GGCTGGTTTTGGGAGAATTT-3'	420
		Reverse 5'-TGTGAGAACAGCAACCCTTG-3'	
	Primer-5	Forward 5'-CAAGGGTTGCTGTTCTCACA-3'	478
		Reverse 5'-GAGCGAGTGGAGTGGTTCAT-3'	
	Primer-6	Forward 5'-TGCTCCCTGACATCTCACA -3'	440
		Reverse 5'-TCTGACAAGTGGCATTCTG-3'	
Primer-7	Forward 5'-TCAGGAATGCCACTTGTTCAG-3'	406	
	Reverse 5'-CAGGTCTGGGCAATCTCATA-3'		
Primer-8	Forward 5'-CCAGAGCCGATGGTGTATCT-3'	410	
	Reverse 5'-CACTGAATCACCGGGCTTT-3'		
Primer-9	Forward 5'-GGTAAACCCACGAGTCCAGA-3'	286	
	Reverse 5'-CCCCCGGAAGTTCTATATT-3'		

To study the retrieval rate and grading of oocytes from ovary of culled *Jaffrabadi* buffaloes

Higher recovery rate and good quality oocytes can be obtained from ovaries without CL (Corpus Luteum) in *Jaffrabadi* buffalo using slicing method.

Comparative study on Efficacy of different medicaments for induction of estrus in true anoestrous *Jaffrabadi* heifers (*Bubalus bubalis*)

The true anoestrous *Jaffrabadi* buffalo heifers of 3 to 3.5 body condition score responded well to CIDR or ovosynch-protocol in terms of estrus induction and conception rate.

Association of milk components with Intra-mammary infection in *Jaffrabadi* Buffaloes

The milk lactose and milk urea nitrogen are found to be decreased in *Jaffrabadi* buffaloes with mastitis.

4.10 Fisheries Science

Recommendation for fish farmers

Growth, mortality and stock assessment of Soldier cat fish *Osteogeneiosus militaris* of Veraval coast

The present level of fishing of the Soldier cat fish confirmed that the stock is over exploited in Veraval. Hence, it is recommended to fishermen of Veraval not to increase the fishing efforts.



Study the effect of some natural cryoprotectants on quality of Japanese threadfin breams (*Nemipterus japonicus*) surimi during frozen storage

Surimi processors and exporters are recommended to use 1% shrimp chitosan as natural cryoprotectant in Japanese threadfin bream surimi to get better gel strength and good water holding capacity instead of commercially used cryoprotectants (sugar, sorbitol, polyphosphate) upto 240 days under frozen storage at -18°C.

Effect of salinity on survival rate of *Penaeus monodon* larvae

It is recommended to hatchery entrepreneurs to use 15 ppt salinity water for larval (zoea and mysis) rearing and 20 ppt salinity water for post-larval (PL1 to PL20) rearing of *Penaeus monodon* for higher survival.

Information for scientific community

Record of marine finfishes commonly landed at Veraval fishing harbor

Seventy finfish species of different genera were recorded during the period of October 2010 to May 2014 at Veraval fish landing centre. The major groups of finfish available are sharks and rays, pomfrets, croakers, groupers, threadfins, ribbonfish, clupeids, lizard fish, sea catfishes, leather jackets, bull's eye. Fishes like *Rachycentron canadum*, *Mene maculate*, *Pomadasys maculates*, *Lethrinus ramark*, *Upenus sp.*, *Cypselury obligolepis*, *Remora remora*, *Therapon jarbua*, *Therapon theraps*, *Harpodon nehereus*, *Plotosus conius*, *Coryphaena hippurus* are available in very less proportion at Veraval fish landing center.



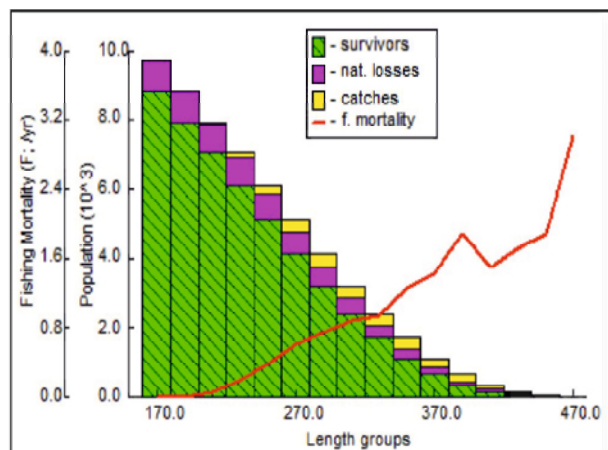
Antibacterial activity of some available seaweeds from Veraval coast

Seaweeds extract of *Gracilaria edulis*, *Sargassum weightii* and *Hypniamus ciformis* collected from Veraval coast contains antibacterial activity against *Aeromonas hydrophila*, *Pseudomonas aeruginosa* and *Vibrio alginolyticus*, respectively.



Growth, mortality and stock assessment of soldier catfish *Osteogeneiosus militaris* (Linnaeus, 1758) off Veraval coast

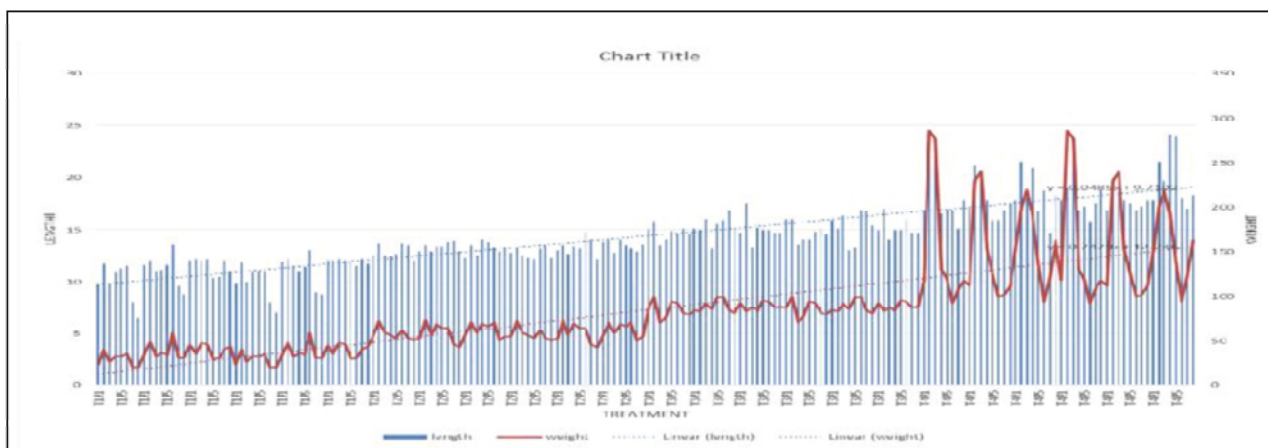
The present level of fishing on the Soldier catfish, *Osteogeneiosus militaris*, confirmed that the stock is being overexploited. Estimated growth parameters for *O. militaris* were 523 mm and 0.62 for L_{∞} & K respectively. Estimated mortality parameters for *O. militaris* were 1.09, 3.67 and 2.58 for natural mortality, total mortality and fishing mortality respectively.



Length–weight relationship and stomach content analysis of Japanese threadfin bream (Pink Perch), *Nemipterus japonicus*

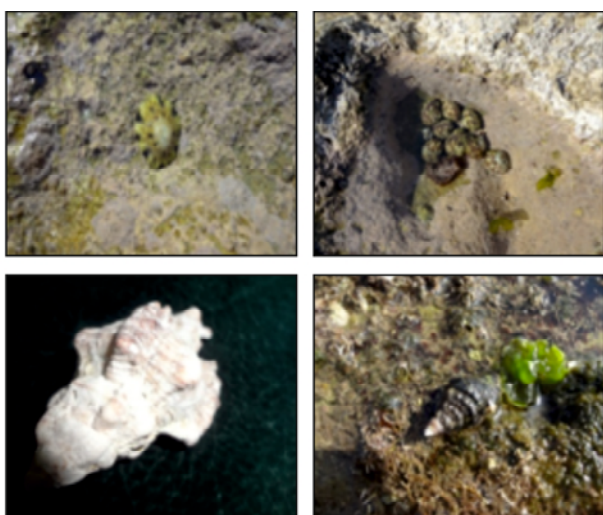
The size and weight of Threadfin bream, *Nemipterus japonicus* available at Gujarat coast ranged from 6.5-24.1 cm and 20.5-277 g

respectively with the length-weight relationship equation $\text{Log } W = -2.2520 + 2.4669 \text{ Log } L$. The major food composition of *N. japonicus* constituted of crustaceans (54.35%), finfishes (30.24%), molluscs (7.80%), and unidentified and semi-digested materials (5.80%).



Study on biodiversity of shellfishes in rocky intertidal zone of Veraval coast

The most abundant and year round species found at Veraval are *Patella radiate* followed by *Turbo intercostalis*, *Chiton granoradiatus*, *Rinoclavis sinensis* and *Cerithium* spp. of molluscs and *Balanus amphitrite* among the crustaceans.



4.11 Social Science / Home Science

Social science group consist of agricultural economics, agril. statistics, extension education and home science.

Agricultural economists worked on the different research projects viz., farm cost studies of important crops in Gujarat, growth Performance of Major Horticultural Crops in Gujarat state, scheme for creating a permanent machinery for studying the cost of cultivation/production of principal crops in Gujarat state, network project on market intelligence and harnessing opportunities for productivity enhancement (HOPE) of sorghum and millets in Sub-Saharan Africa and South Asia. Price forecast reports of different crops viz., groundnut, cotton, maize, potato, arhar and castor were published in 28 clippings of leading English and Gujarati news papers for the benefit of farmers. For the dissemination of price forecast report to the farmers, the Voice Mail SMS service is being provided in collaboration with IFFCO Kisan Sanchar Ltd., Ahmadabad. Eleven messages of price forecast have



been disseminated during February to December, 2014, which accounts to a total of 7,89,085 Voice Mail SMS. Market Intelligence was also disseminated through letters, E-mail messages and kept on JAU website, hard copies in training/meetings. Also, the commodity report on cotton, groundnut, potato and maize has been prepared and submitted to the PI of the project.

4.12 Mega Seed Unit

At mega seed processing plant, the crop seeds produced in the farms were processed. The processed good quality seeds were sold to farmers under the brand name of "*Sawaj Beej*". Very good response was observed among the farmers to avail this facility.

Table 4.14 Production of truthful seeds of field crops under mega seed project during year 2014-15

No.	Crop	Production (q)
1	Groundnut	1075.93
2	Chickpea	807.13
3	Sesame	159.38
4	Wheat	1762.75
5	Cotton	14.00
6	Cumin	33.02
7	Coriander	70.27
8	Soybean	182.96
9	Mungbean	52.77
10	Uradbean	68.90
11	Pigeon pea	205.47
12	Sugarcane setts	1717.40
13	Fenugreek	0.30
14	Garlic	30.00
15	Onion (Bulb)	37.00
16	Papaya seeds	0.89
17	Cluster bean (Guar gum)	0.80
18	Paddy	59.20
19	Vegetable seeds	6.22
	Grand Total...	6284.39
20	Planting Materials:	
	A) Fruit crops graft Nos.	16,959
	B) Fruit crops and other saplings Nos.	83,412
	C) Seedlings Nos.	23,110
	Total...	1,23,481



The breeder seeds of different crops also produced to fulfill the demand of private and public sectors as per the national and state indents under coordination of Mega Seed Unit and concern crop

scientist are given in following table. The required nucleus seeds of different crops were also produced for the breeder seed production in the ensuing season.

Table 4.15 Production of Nucleus / Breeder seeds during year 2014-15

No.	Crop	Variety	Nucleus Seed	Breeder Seed (q)		Total (q)
				National	State	
1	Groundnut	GG-2	1.20	3.00	88.76	92.96
		GG-5	1.80	-	58.50	60.30
		GG-7	0.30	-	32.10	32.40
		GG-8	2.50	17.65	-	20.15
		GG-9	6.50	14.00	26.45	46.95
		GAUG-10	-	-	36.40	36.40
		GG-11	0.90	-	70.00	70.90
		GG-16	0.80	18.45	-	19.25
		GG-17	1.30	-	32.08	33.38
		GG-20	2.50	50.00	1569.77	1622.27
		GG-21	-	12.30	-	12.30
		GJG-22	0.40	-	101.84	102.24
		GJG-31	-	18.20	10.90	29.10
		GJGHPS-1	1.40	-	53.10	54.50
	Sub Total	19.60	133.60	2079.90	2233.10	
2	Pearl millet	Hybrid seed	-	-	2.82	2.82
		Parent seed	-	-	3.59	3.59
		Sub Total	-	-	6.41	6.41
3	Sesame	G.Til-2	-	1.75	10.84	12.59
		G.Til-3	-	0.40	1.57	1.97
		G.Til-4	-	-	0.60	0.60
		G.Til-10	-	1.25	0.75	2.00
		Sub Total	-	3.40	13.76	17.16
4	Chickpea	GG-1	1.75	-	29.00	30.75
		GG-2	6.00	27.25	44.00	77.25
		GG-3	7.25	47.00	34.25	88.50
		GG-4	1.80	6.50	-	8.30
		Sub Total	16.80	80.75	107.25	204.80
5	Wheat	GW-366	6.70	144.40	64.00	215.10
		GW-496	-	-	77.60	77.60
		Lok-1	-	-	68.00	68.00
		Sub Total	6.70	144.40	209.60	360.70
Grand Total			43.10	362.15	2416.92	2822.17

4.13 Others

4.13.1 Front line demonstration organized on farmers' field during year 2014-15

Crop scientists have successfully organized total 276 Front Line Demonstrations on farmers' fields in addition to the FLDs organized by KVKs of JAU.

Table 4.16 Front Line Demonstrations

No.	Name of Crop	No. of FLDs
1	Groundnut	45
2	Chickpea	10
3	Pigeonpea	10
4	Sesame	20
5	Castor	20
6	Wheat	10
7	Pearl millet	95
8	Cotton	50
9	Spices	16
Total...		276

4.13.2 Production of *Sawaj-Trichoderma*, *Sawaj-Azotobacter*, *Sawaj-Rhizobium* and *Sawaj-PSB*

The Department of Plant Pathology has produced and provided 5849 liters (11698 bottles) of SAWAJ-*Rhizobium*, 991 liters (1981 bottles) of SAWAJ-*Azotobacter* and 994 liters (1987 bottles) of SAWAJ-PSB liquid bio-fertilizers to the State Department of Agriculture for distribution to

farmers as an integrated part of *Krushi Mahotsava* Kits and sold directly to farmers at reasonable price (₹ 60/bottle). The department has also produced and distributed 37,216 kg (packets) bio-agent *Trichoderma harzianum* under the brand name of SAWAJ-*Trichoderma* for the management of various soil borne diseases especially stem and pod rot of groundnut in the Saurashtra region.





4.13.3 Commercial products of biocontrol

During the year 2014-15, various microbial agents e.g. viruses, bacteria, fungi, protozoans and nematodes are being used in IPM programme. Among viral pathogens, Nuclear Polyhedrosis Viruses of *Helicoverpa* (*HaNPV*) (163 bottles),

Spodoptera (*SINPV*) (143 bottles), entomopathogenic fungi, *Beauveria bassiana* (5857 kg), Trichocard (800 Nos.), Fruit fly trap (297 Nos.) and Fruit fly lure (350 Nos.) are widely used for insect control. These pathogens are highly specific to their host and being considered environmentally safe.



Spodoptera litura Nuclear polyhedrosis Virus (*SINPV*)



Helicoverpa armigera Nuclear polyhedrosis Virus (*HaNPV*)



Beauveria bassiana



Fruit fly trap

Table 4.17 New research programmes sanctioned during year 2014-15

No.	Agency	No. of Research Programmes	Amount (₹ In Lakh)
1	ICAR	02	30.28
2	Govt. of India	02	98.09
3	Govt. of Gujarat	01	14.49
4	GOG-Plan	04	167.49
5	RKVY	01	15.00
6	Other Agencies	20	83.51
	Total...	30	408.86

4.13.4 RKVY Projects

Two projects under RKVY were implemented in Junagadh Agricultural University during the year 2014-15 as per details given below.

Project-1: Construction of educational building of Agro ITI at Mahuva



- The civil work is completed.

Project-2: Production of groundnut breeder seed at farmers' field

Physical Progress:

- 746.20 quintal breeder seed of groundnut variety GG-20 was produced from 77.50 acre at farmer's fields during *kharif*-2014.
- 45.50 quintal breeder seed of groundnut variety GJG-22 was produced from 9.0 acre at farmer's fields during *kharif*-2014.
- Thus total 791.70 quintal of groundnut breeder seeds were produced under this project.

Financial Progress

- The assistance has been given ₹ 900 per quintal breeder seed procured.
- Out of fund allocation ₹ 8.62 lakh, the expenditure incurred ₹ 7.13 lakh during 2014-15 under this project.