

RESEARCH

4.1 Agricultural Research Council

The Agricultural Research Council was constituted according to the provision of the Gujarat Agricultural Universities Act 2004 in exercise of the power vested under Section 62 (1) in pursuance of

Section 17 (5). Dr. C. J. Dangaria monitored and guided the research activities during the reporting year. The members of Agricultural Research Council during 2013-14 were as under.

No.	Name	Designation
1.	Dr. N. C. Patel	Vice Chancellor (Chairman)
2.	Dr. C. J. Dangaria	Director of Research & Dean, P.G. Studies (Secretary)
3.	Dr. S. R. Chaudhari	Director of Agriculture, Government of Gujarat, Gandhinagar
4.	Dr. B. R. Shah	Director of Horticulture, Government of Gujarat, Gandhinagar
5.	Dr. A. J. Kachhia Patel	Director of Animal Husbandry, Government of Gujarat, Gandhinagar
6.	Dr. A. M. Parakhia	Director of Extension Education
7.	Dr. I. U. Dhruj	Associate Director of Research
8.	Dr. A. V. Barad	Dean, Agricultural Faculty
9.	Dr. N. K. Gontia	Dean, Agril. Engineering & Technology Faculty
10.	Dr. A. Y. Desai	Dean, Fisheries Science Faculty
11.	Dr. P. H. Tank	Dean, Veterinary Science & A. H. Faculty
12.	Dr. K. A. Khunt	Dean, Agri. Business Management Faculty
13.	Dr. M. S. Pithia,	Research Scientist and Convener of Crop Improvement AGRESCO sub-committee
14.	Dr. B. K. Sagarka	Professor & Head and Convener of Crop Production AGRESCO sub-committee
15.	Dr. K. L. Raghvani	Professor & Head and Convener of Plant Protection AGRESCO sub-committee
16.	Dr. D. V. Delvadia	Professor and Convener of Horticulture & Agro-forestry AGRESCO sub-committee
17.	Dr. P. M. Chauhan	Professor & Head and Convener of Agril. Engineering AGRESCO sub-committee
18.	Dr. A. S. Joshi	Professor & Head and Convener of Basic Science AGRESCO sub-committee
19.	Dr. P. R. Kanani	Professor & Head and Convener of Social Science AGRESCO sub-committee
20.	Dr. P. H. Vataliya	Professor & Head and Convener of Animal Science & Fisheries AGRESCO sub-committee

No.	Name	Designation
21.	Dr. K. L. Dobaria	Research Scientist (Groundnut)
22.	Dr. B. A. Golakia	Professor & Head (Biochemistry)
23.	Dr. R. Subbaiah	Professor & Head (Soil & Water)
24.	Dr. K. L. Mathew	Professor & Head (Fisheries)
25.	Dr. J. S. Patel	Professor & Head (Vet. Medicine)
26.	Dr. P. S. Bharodia	Rtd. Research Scientist (Plant Breeder)
27.	Prof. J. B. Savani	Rtd. Research Scientist (Agril. Engineering)
28.	Shri Sandipbhai Shantilal Thumar	Progressive farmer, At: Vadai, District: Junagadh

The University has also arranged a regular meeting of 11th Research Council on November 12, 2013 and 2nd circulation meeting on March 06, 2014 for approval of new research projects and research activities during this year.

11th Research Council Meeting



State Programmes

Monitoring of research works is done through a set system in the University. The University jurisdiction is comprised of four Agro-climatic Zones viz., North Saurashtra, South Saurashtra Agro-climatic Zones and partially North West and Bhal & Coastal Agro-climatic Zones. The authorities of Directorate of Research at Junagadh and Dry Farming Research Station, Targhadia coordinate, monitor and supervise the implementation of research programmes of various schemes in the respective zones. The monitoring is carried out directly on field as well as through presentation of findings in various committees viz., 1) Zonal Research and Extension Advisory Committee (two Zones), 2) Agricultural Research Sub Committees (Eight discipline wise), 3), Joint Agricultural Research Sub Committee (One for all disciplines) and 4) Combined Joint Agricultural

Research Sub Committee (One for four State Agricultural Universities). All the committee meetings are held regularly in every year to evaluate the progress of research works, research findings of each experiment, examination and scrutiny of new research programmes, examination and refining of findings to be delivered in the form of recommendations. The presentation of research results as well as reports for all research stations is mandatory. The reports are prepared separately for various committees. The functions and activities of various committees are given below.

Zonal Research Extension Advisory Committee (ZREAC):

This committee is functioning at zonal level of South Saurashtra & North Saurashtra Agro-climatic

Zones and two meetings are organized in a year viz., Kharif and Rabi summer. The research programmes/works carried out in different schemes/projects are presented by scientists in the meeting for thorough discussion and refinement of each ongoing project. In this meeting, more than 150 scientists from different disciplines as well as officers from line departments are participating and discussing the results of the projects as well as suggest improvement in new technical programmes for future research work. The officers from the line departments are also presenting feed back as well as over all agriculture situations in their regions and researchable issues based on farmers problems. It is the multidisciplinary task to evaluate

the research results of different disciplines.

During 2013-14, four meetings of ZREAC were organized; two each at Junagadh and Targhadia. In both ZREAC meeting, three varieties, 35 farmers recommendations, 14 scientific recommendations and 76 new technical programmes were approved (Table-4.1). The feedbacks as well as suggestion were also received from officers of line departments.

Table-4.1: Zonal Research Extension Advisory Committee (ZREAC) meeting organized during 2013-14

Name of Meeting	Held at	Date of meeting	No. of participants	No. of recommendations approved		New Technical Programmes
				Farmers	Scientific	
North Saurashtra Agro-climatic Zones (Zone-VI)						
19 th ZREAC (Rabi-summer)	Targhadia	October 29, 2013	52	3	2	2
20 th ZREAC (Kharif)	Targhadia	February 06, 2014	55	1	1	6
South Saurashtra Saurashtra Agro-climatic Zones (Zone-VII)						
19 th ZREAC (Rabi-summer)	Junagadh	October 10, 2013	140	2*+8	5	26
20 th ZREAC (Kharif)	Junagadh	January 29-30,2014	155	1*+23	14	42
Total				3*+35	22	76

* Variety released

20th ZREAC Meeting



20th ZREAC Meeting (Kharif 2013-14) organized under chairmanship of Dr. N. C. Patel, Hon'ble Vice Chancellor, on January 29-30, 2014 at Junagadh.

Eighth research council has its sub-committee on different subjects. These sub-committees review research work, approve new technical programmes and recommendations. During the period under report different sub-committees meeting held as under.

No.	Sub-committee	Date of meeting
1	Animal Science & Fisheries	12-13 February, 2014
2	Social Science	12-13 February, 2014
3	Basic Science	19-20 February, 2014
4	Horticulture and Agro Forestry	19-20 February, 2014
5	Agricultural Engineering	25-26 February, 2014
6	Plant Protection	25-26 February, 2014
7	Crop Improvement	4-5 March, 2014
8	Crop Production	4-5 March, 2014

4.2 New crops varieties, Farm implements, Management technologies

4.2.1 New crops varieties

Three varieties *viz.*, Gram (GG-5), Pigeonpea (GJP-1) and Garlic (GJG-5) were recommended for farmers of the state, as detailed below

Gram: Gujarat Gram-5 (GG-5)

This variety of chickpea yielded 27.6 and 12.2 per cent higher seed yield over check varieties Dahod Yellow and Gujarat Gram 1, respectively under irrigated condition in Gujarat. possessing medium size and brown colour seed. This variety is resistant to wilt and stunt diseases. This variety is approved for release in Gujarat state.



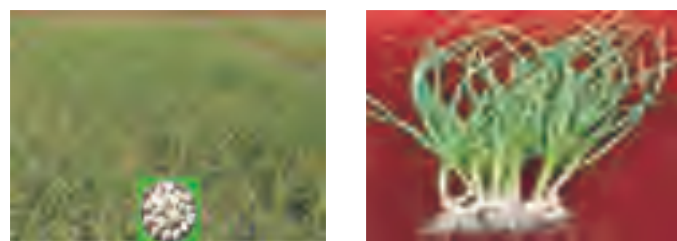
Pigeonpea: Gujarat Junagadh Pigeonpea-1 (GJP-1)

This Pigeonpea variety gave 71.1, 2.8, 29.1 and 25.2 per cent higher seed yield over check varieties, BDN 2, ICPL 87119, Vaishali and AGT 2, respectively during kharif season in South Saurashtra. It is medium late (176 days) in maturity, moderately resistant to wilt and Sterility Mosaic Diseases (SMD). The seed of GJP-1 is bold with white colour.



Garlic: Gujarat Junagadh Garlic-5 (GJG-5)

This variety of garlic recorded 23.3 and 26.9 per cent higher bulb yield over check varieties GG 4 and G 282, respectively during rabi season in Saurashtra and Middle Gujarat. The bulbs of this variety are medium in size, compact and white in color. This variety is approved for release in Saurashtra and Middle Gujarat regions.



4.2.2 Farm implements

Development of manually operated sapota cleaner

The farmers growing sapota are recommended to use hand operated sapota cleaner (capacity: 120 kg/h) having perforated metal sheet drum (45 cm diameter and 90.5cm length) lined with jute cloth on inner surface and be operated at 65 rpm for 90 seconds with 66% free space (in batch) for cleaning and shining the sapota surface after harvesting to reduce human drudgery.



Development of tractor drawn plant thinning device for row crops

The farmers and manufacturers are recommended to use JAU developed mini tractor drawn two row plant thinning device for maintaining plant spacing of 10 to 12 cm for small seed crops like pearl millet and sesamum. High thinning efficiency can be achieved using this device. As compared to manual thinning, approximately 70 % man-hours/ha can be saved.

4.2.3 Management technologies: NIL

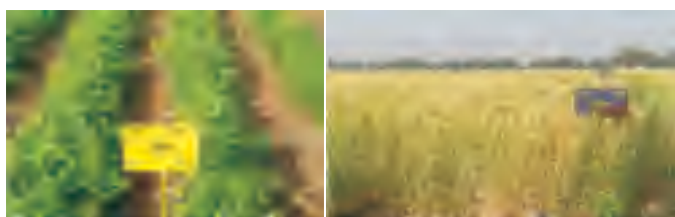


4.3 Agricultural Crops Recommendation for the farming community

Nutrient Management

Evaluation of potentiality of organic farming for groundnut (kharif)-wheat (rabi) cropping sequence

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut (kharif)-wheat (rabi) cropping sequence under organic farming are advised to apply FYM @ 2.5 t/ha to groundnut and 24 t/ha to



wheat for obtaining higher yield and net return along with maintaining soil fertility.

Nutrients requirement for bold seeded summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing bold seeded summer groundnut are advised to fertilize the crop with 50 kg N, 25 kg K₂O and 20 kg S (120 kg gypsum) per hectare with recommended dose of P₂O₅ (50 kg/ha) for securing higher yield and net realization.



Yield maximization in groundnut through nutrient management practices during kharif season

The farmers of South Saurashtra Agro-climatic Zone growing kharif groundnut are advised to apply FYM 7.5 t/ha + recommended dose of fertilizer (12.5:25 kg N:P₂O₅/ha) + 25 kg ZnSO₄/ha as basal for obtaining higher yield and net return.



Effect of biofertilizer along with molybdenum application on yield of chickpea

The farmers of South Saurashtra Agro-climatic Zone growing irrigated chickpea are advised to treat seeds with Rhizobium culture @ 25 g/kg seed + phosphate solubilizing bacterial culture (*Bacillus subtilis*) 30 g/kg seed along with recommended dose of fertilizers (20:40 N:P₂O₅ kg/ha) for securing higher yield and net return. Application of molybdenum in chickpea was not found advantageous.



Effect of different organic, inorganic and bio-fertilizers on groundnut-pigeonpea relay cropping system

The farmers of South Saurashtra Agro-climatic Zone following groundnut - pigeonpea (2:1) relay cropping system are advised to apply recommended dose of fertilizers to both the crops to obtain higher yield and net returns or 50% RDF + FYM 5 t/ha along with seed treatment of Rhizobium and phosphate solubilizing bacteria (each 25-30 g/kg seed) to groundnut only to reduce the dose of chemical fertilizers.



Integrated nutrient management in rainfed cotton

The farmers of North Saurashtra Agro-climatic Zone (AES-VI) growing rainfed Bt. cotton are advised to apply 80 kg N + 10 t compost + 500 kg castor cake/ha along with bio-fertilizer (*Azotobacter* + PSB) for obtaining higher yield and net return beside improving soil fertility.



Effect of K application on yield of summer groundnut in calcareous soil

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut in medium black calcareous soil are advised to apply potassium @ 50 kg/ha as basal in addition to recommended dose of fertilizer (25:50 N:P₂O₅ kg/ha) for securing higher yield and net return.



Potassium fertilization to kharif groundnut in calcareous soil

The farmers of South Saurashtra Agro-climatic Zone growing kharif groundnut in medium black calcareous soil are advised to apply potassium @ 50 kg/ha as basal in addition to recommended dose of fertilizer (12.5:25 N:P₂O₅ kg/ha) for securing higher yield and net return.

Package of Practices

Impact of tillage practices and sowing pattern on Bt cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton are advised to prepare the field by ploughing followed by blade harrowing & planking and sow the crop on ridges (120 cm apart) for achieving higher seed cotton yield and net realization.



Relay cropping of castor in soybean

The farmers of South Saurashtra Agro-climatic Zone growing soybean are advised to adopt relay intercropping system with castor by sowing castor 30 days after sowing of soybean with row ratio of 1 : 2 (castor : soybean) for securing higher yield and net return.



Optimization of kharif groundnut production under resource constraints

The farmers of South Saurashtra Agro-climatic Zone growing kharif groundnut are advised to follow recommended practices of weed control, plant protection and fertilizer management for obtaining higher yield and net return. However, under the situation of resource constraints, farmers are advised to prioritize their resources in order of weed control > plant protection > fertilizer management.



Effect of time of sowing and hybrids on productivity of summer pearl millet

The farmers of North Saurashtra Agro-climatic Zone growing hybrid pearl millet during summer are recommended to sow the crop during second fortnight of February (30 °C average maximum temperature) to obtain higher yield and net return.

Time of planting and harvesting for early and midlate varieties of sugarcane

The farmers of South Saurashtra Agro-Climatic Zone growing sugarcane (CoC 671 and CoN 91132) are advised to plant the crop during last week of October to last week of November. The early maturing variety CoC 671 should be harvested between 11 to 12 months of planting and midlate maturing variety CoN 91132 should be harvested between 12 to 14 months of planting for securing higher cane yield and net return.



Evaluation of chickpea varieties under different dates of sowing under irrigated condition

The farmers of South Saurashtra Agro-climatic Zone growing irrigated chickpea are advised to sow the crop during first fortnight of November (mean minimum temperature 19.9 °C and mean maximum temperature 34.7 °C) for securing higher yield and net return.



Response of fennel to plant geometry under North Saurashtra Agro-climatic Zone

The farmers of North Saurashtra Agro-climatic Zone (AES-XV) growing *rabi* fennel are advised to sow the crop at 60 cm x 20-30 cm spacing for securing higher yield and net return.



Recommendations for Scientific Community

Status of sulphur fractions in medium black soils of Rajkot district (Gujarat)

- In general, minimum and maximum values of various sulphur fractions were recorded in soils of Tankara and Upleta, respectively.
- The higher and lower values of various sulphur fractions were recorded with groundnut-groundnut mono sequence and cotton/groundnut-*rabi* crops sequences, respectively.
- The values of all the sulphur fractions were recorded higher with medium deep soil (>60 cm) in comparison to shallow soil (<60 cm).
- The higher and lower values of various fractions of sulphur were recorded with irrigated and unirrigated conditions, respectively.
- Value of organic S was lower with irrigation applied through bore well in comparison to open or canal/river sources.
- District as whole 32.1 per cent soils fall under deficient category, while 44.6 per cent in medium and only 23.2 soils are in high range.

Establishment of critical limit of sulphur under onion crop in medium black calcareous soils

For recommending sulphur application to onion crop grown on calcareous soils of Saurashtra, STL of Gujarat should consider critical limit of 10 ppm S in soil and 0.56 per cent in onion plant at 60 DAS.



Establishment of critical limit of sulphur for garlic crop in medium black calcareous soils

For recommending sulphur application to garlic crop grown on calcareous soils of Saurashtra, Soil Testing Labs (STLs) of Gujarat should consider critical limit of 10 ppm S in soil and 0.45 per cent in garlic plant at 60 DAS.



Relative salinity tolerance of different wheat genotypes

The relative salt tolerant of wheat varieties was found in order of GW 322 > GW 366 > Lok 1 > GW 273 > GW 496 up to EC 4.0 dS/m of irrigation water.

Soil test based fertilizer application for targeted yields of Bt. cotton in Saurashtra region of Gujarat

The Soil Testing Labs (STLs) of Gujarat are advised to use following equation for achieving targeted yield (up to 30 q/ha) of Bt cotton grown in Saurashtra region.

$$FN = 20.80 \times T - 1.55 SN$$

$$FK_2O = 18.97 \times T - 1.47 SK$$

Where; FN = Fertilizer N to be applied (kg/ha)

SN = Available soil N (kg/ha)

T = Targetted yield (q/ha)

FK₂O = Fertilizer K₂O to be applied (kg/ha)

SK = Available soil K₂O (kg/ha)



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

Testing Bio-efficacy of insecticides against sucking pest in summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to spray imidacloprid 17.8 SL 0.005 % (3 ml/ 10 litre water; 25 g a.i./ha) twice at 15 days interval starting after initiation of pest for effective and economical management of sucking pests in groundnut. The Pre Harvest Interval (PHI) of this insecticide is 40 days.



Management of shoot fly and stem borer in bajra crop

The farmers of North Saurashtra Agro-climatic Zone growing kharif pearl millet are advised to treat the seeds with thiamethoxam 35 FS @ 9.0 ml/kg (3.15 g a.i./kg) or imidacloprid 600 FS @ 8.75 ml/kg (5.25 g a.i./kg) seed at the time of sowing followed by spray

of either profenophos 40% + cypermethrin 4.0%, 44 EC 0.044% (10 ml/10 litre water; 220 g a.i./ha) or cartap hydrochloride 50 SP 0.05% (10 g/ 10 litre water; 250 g a.i./ha) or thiodicarb 75 WP 0.015% (2 g/10 litre water; 75 g a.i./ha) at 30 days after germination of the crop for the effective management of shoot fly and stem borer. The PHI for these insecticides is 61 days.

Chemical control of thrips (*Thrips tabaci* L.) in onion through newer insecticides

For effective and economical management of thrips in onion, two sprays of spinosad 45 SC 0.009% (2 ml / 10 litre water; 45 g a.i./ha) or chlorfenapyr 10 EC 0.008% (7.5 ml /10 litre water; 37.5 g a.i./ha) or fipronil 5 SC 0.007% (14 ml / 10 litre water; 35 g a.i./ha) at 10 days interval starting from thrips infestation are recommended under North Saurashtra Agro-Climatic Zone. The PHI for spinosad, chlorfenapyr and fipronil is 34 days.

Management of sucking pests of *kharif* groundnut through newer insecticides

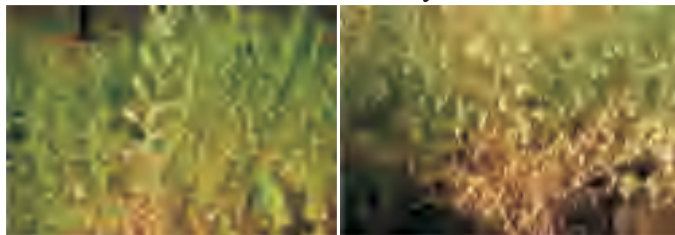
For effective and economical management of sucking pests in *kharif* groundnut, two sprays of imidacloprid 17.8 SL 0.005% (2.8 ml/10 litre water; 25 g a.i./ha) or fipronil 5 SC 0.007% (14 ml / 10 litre water; 35 g a.i./ha) or difenthiuron 50 SP 0.05% (10 g/10 litre water; 250 g a.i./ha) at 15 days interval starting from the pest infestation are recommended under North Saurashtra Agro-climatic Zone. The PHI for imidacloprid, fipronil and difenthiuron is 27 days.



Efficacy of new molecules against *Helicoverpa armigera* in chickpea

For effective and economic control of pod borer (*Helicoverpa armigera*) in chickpea crop, farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of chlorantraniliprole 20 SC 0.003% (1.5 ml/ 10 liter water; 15 g a.i./ha) or emamectin

benzoate 5 SG 0.001% (2 g/ 10 liter water; 5 g a.i./ha) or profenophos 50 EC 0.1% (20 ml/ 10 liter water 500 g a.i./ha). First spray should be applied at 50% flowering and second at 15 days after first spray. The PHI for these insecticides is 27 days.



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

The farmers of South Saurashtra Agro-climatic Zone are advised to apply two sprays of spinosad 45 SC 0.009% (2 ml/ 10 litre water; 45 g a.i./ha) or thiodicarb 75 WP 0.075% (10 g/ 10 litre water; 375 g a.i./ha) or flubendiamide 48 SC 0.0096% (2 ml/ 10 litre water; 48 g a.i./ha) or chlorantraniliprole 20 SC 0.003% (1.5 ml/ 10 liter water; 15 g a.i./ha) starting from 50 per cent flowering and second spray at 15 days after first spray for the control of pod borer complex in pigeonpea. The PHI for these insecticides is 30 days.



4.4 Horticultural Crops

Recommendation for the farming community

Effect of green manuring on yield of coconut cv. T x D and soil properties

Coconut growers of South Saurashtra Agro-climatic Zone are advised to grow sunhemp or dhaincha as green manuring crop in adult coconut plantation (T x D hybrid) for improving soil fertility and to get more yield and net return.



Effect of different concentration of ethephon application on gum production from *Acacia senegal* (L.) Willd (Gorad)

The farmers of North Saurashtra Agro-climatic Zone are recommended to apply 5 ml of 900 ppm ethephon [2.25 ml Ethrel (40%) in 1 liter of water] by drilling 5 cm hole of 1 cm diameter on stem at 1 m height above the ground of about five year age of *Acacia senegal* (Gorad) during first week of March for getting higher gum production and maximum net return.



Recommendation for the scientific community

Effect of time of ethephon application and trunk diameter on gum production from *Acacia senegal* (L.) Willd Gorad

It is recommended that application of 5 ml ethephon @ 100 ppm [0.25 ml Ethrel (40%) in 1 liter of water] to *Acacia senegal* (Gorad) above one meter ground level having 51-70 cm trunk girth during first fortnight of March resulted in higher gum production and higher net return.



Effects of plant growth regulators on buds and bolls shedding in cotton (*Gossypium hirsutum* L.)

The farmers of South Saurashtra Agro Climatic zone growing Bt cotton under irrigated condition are advised to spray growth inhibitor Cycocel / Chloromequat Chloride (CCC) @ 40 ppm at 90 DAS (400 mg / 10 lit. water) for minimizing buds and bolls shedding to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increase in thickness of leaves, number of squares, number of bolls and minimum boll shedding.

4.5 Forestry: NIL

4.6 Plant Molecular Biology

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

Recommendation for the farmers

Effect of NAA on seed cotton (*Gossypium hirsutum* L.) yield

The farmers of South Saurashtra Agro Climatic Zone growing Bt cotton under irrigated condition are advised to spray growth promoter Naphthalene Acetic Acid (NAA) @ 30 ppm (300 mg /10 lit. water) at 50 DAS & 70 DAS for better growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increase in plant height, thickness of leaves, length of sympodia, number of squares and number of bolls.



4.7 Planning and Monitoring

Monitoring

The monthly and quarterly progress reports were collected from the concerned Heads of the schemes which were compiled and submitted to the Government quarterly. The problems of the schemes were solved satisfactorily by discussions between scientists and the Director of Research in two

meetings held during the month of December-2013 and February -2014 for evaluation of expenditure of planned schemes and reallocation of the funds, *etc.*

Agricultural Research Sub Committees (AGRESCO discipline wise):

There are eight sub-committee of research functioning in the University to manage the research activities mentioned herein:

Sub-Committee	Subjects area of research
Crop Improvement	Development of variety and maintenance of germplasm of mandate crops.
Crop Production	Agronomy & Soil Science, Weed Control.
Plant Protection	Entomology & Plant Pathology.
Horticulture & Agro Forestry	Fruit, Vegetable, Flower and Spices.
Agricultural Engineering	Soil and Water Engineering, Farm Power and Machinery, Renewable energy and Rural Engineering, Post Harvest Technology, Agro-Processing & Research Training and Testing Centre.
Fisheries Science	Resource Management, Post Harvest Technology, Aquatic Environment and Aquaculture.
Animal Science	Breeding, Animal Nutrition, Live Stock Production & Management, Anatomy, Medicine & Surgery, Animal Genetics <i>etc.</i>
Basic Science	Biochemistry, Biotechnology, Plant Physiology & Seed Technology.
Social Science	Agricultural Economics, Agril. Extension Education and Agril. Statistics.

The members of the committees are senior scientists of the University working in various department/projects, subject matter specialists and representatives of state line departments. The conveners of all committees are nominated by the Director of Research for two years to organize the meeting and also issuing the proceedings. The meeting of all committees is held annually to discuss and to evaluate the research results. The members also discuss the new technical programmes as well as the recommendations for farmers and scientific community. The scientists presenting the results of various schemes will refine the reports, recommendations and new programmes for ensuing season. The suggestions made in the meetings are incorporated in the reports. The committee is consisting of senior scientists as a member. Hence, the proposals and programmes pertaining to the various disciplines is

discussed critically, debated meticulously and the suggestions and ideas from senior scientists are incorporated. The conveners of various sub committees present the proceedings in the joint AGRESCO meeting.

The Agricultural Research Sub Committees were held during February to March 2014 at Junagadh. Three new crop varieties, 41 recommendations for farmers and 16 recommendations for Scientific Community and 79 new technical programmes were approved. The reports of work carried out in the various research schemes of the University were also presented and approved.

Name of the Sub-Committee	Held at	Date of organization	No. of participant	No. of for Recommendations		New Technical Programme
				Farmer	Scientific	
Social Science	Junagadh	February 12-13, 2014	39	-	-	05
Animal Science	Junagadh	February 12-13, 2014	40	05	03	14
Fisheries Science	Junagadh	February 12-13, 2014	29	04	05	05
Basic Science	Junagadh	February 19-20, 2014	36	02	-	06
Horticulture & Agro forestry	Junagadh	February 19-20, 2014	35	02	01	03
Plant Protection	Junagadh	February 25-26, 2014	44	06	-	14
Agricultural Engineering	Junagadh	February 25-26, 2014	39	07	02	08
Crop Production	Junagadh	March 4-5, 2014	51	15	05	22
Crop Improvement	Junagadh	March 4-5, 2014	47	3*	-	02
Total				3*+41	16	79

* Variety released

Joint AGRESCO:

The meeting of this committee is held annually to finalised research proposals and results discuss in different sub-committees. The committee finalizes the recommendations and new programmes to be undertaken in various disciplines. This committee comprises of the Director of Research, Associate Director of Research, the senior scientists of various disciplines, representatives of line departments *etc* finalize the programmes. The conveners of various AGRESCO present the findings of their respective committees for approval. This committee meeting is presided over by the Hon'ble Vice Chancellor. Joint AGRESCO will finalize the recommendations and new technical programmes for research, which is to be presented in the combined Joint AGRESCO Committees of State Agricultural Universities.

The 10th Joint AGRESCO meeting was held on March 12, 2014 under the Chairmanship of Hon'ble Vice Chancellor, Junagadh Agricultural University, Junagadh. All AGRESCO conveners of various committees presented their reports and approved. Total 210 scientists of various disciplines and Officers of line department of Gujarat States attended the meeting.

10th Joint AGRESKO meeting of JAU held on March 12, 2014 at Junagadh

Name of the Sub-Committee	No. of Recommendations for		New Technical Programme
	Farmer	Scientific	
Crop Improvement	3*	-	02
Crop Production	15	05	22
Plant Protection	06	-	14
Horticulture & Agro forestry	02	01	03
Agricultural Engineering	07	02	08
Animal Science	05	03	14
Fisheries Science	04	05	05
Basic Science	02	-	06
Social Science	-	-	05
Total:	3*+41	16	79

Combined Joint Agricultural Research Sub Committee (One for four State Agricultural Universities):

This is the apex body to finalize the research recommendations at state level as well as the new technical programmes. The meeting is held annually at the venues in the rotational mode. The members of this committee include Hon'ble Vice Chancellor, Director of Research, Director of Extension Education, Associate Director of Research, Conveners of various AGRESKO Sub Committees, and senior scientists of various disciplines of all State Agricultural Universities. The Hon'ble Chief Secretary, Department of Agriculture and Cooperation, Govt. of Gujarat, Director of Agriculture, Director of Horticulture, Director of Animal Husbandry are the members of this committee. Hon. Minister of Agriculture and Cooperation, Govt. of Gujarat also attends this meeting. Separate sessions are organized discipline-wise, in which conveners of various AGRESKO sub committees present the reports of their respective universities. In the concluding session, the conveners from each sub-committee present the final report of research in the meeting. The output of research in the form of recommendations/ technologies is published in the form of proceedings and supplied to all concerned for implementation.

The Tenth Combined Joint meeting of Agricultural Research Council (AGRESKO-2014) of

SAUs of Gujarat was held at Junagadh Agricultural University, Junagadh during April 9-11, 2014. Dr. C. J. Dangaria, Director of Research, JAU, Junagadh welcomed Shri Rajkumar, Chief Guest and Principal Secretary, Department of Agriculture & Cooperation, Government of Gujarat and Dr. N. C. Patel, Chairman of the inaugural function and Hon'ble Vice Chancellor, Junagadh Agricultural University. He also welcomed Dr. A. R. Pathak, Hon'ble Vice Chancellor, NAU, Navsari; Dr. A. M. Shekh, Hon'ble Vice Chancellor, AAU, Anand; Dr. B. R. Shah, Director of Horticulture, Gujarat State; Dr. A. J. Kachhia Patel, Director of Animal Husbandry, Gujarat State; Dr. J. B. Misra, Director, Directorate of Groundnut Research, Junagadh and Member of the Board of Management, JAU; Dr. P. R. Godhani, Member of the Board of Management, JAU and Prof. R. B. Maravia, Executive Director, Sardar Sarovar Narmada Nigam Limited. He also welcomed the Directors of Research, Directors of Extension Education, Deans of various faculties, Registrars, University officers, Associate Directors of Research, the conveners of different sub-committees, Senior Scientists/Professors of SAUs, officers from line departments of Gujarat state, Progressive farmer and representatives from press & media. He briefly highlighted the background, mandates and summary of the research activities of SAUs.

While giving the opening remarks, Dr. A. R. Pathak, Hon'ble Vice Chancellor, NAU, Navsari

observed that to address the future needs of ever increasing population of country; it is necessary to increase productivity by application of latest technologies involving multidisciplinary approach. Frontier areas of bio technology, nano technology, climate resilient research needs to be strengthened. He also stressed to bridge the gap between farmers and researchers for increasing per capita income.

In the 10th Combined Joint AGRESKO Meeting, three varieties viz., Gram, Gujarat Gram-5 (GG-5); Pigeonpea, Gujarat Junagadh Pigeonpea-1

(GJP-1) and Garlic, Gujarat Junagadh Garlic-5 (GJG-5) were recommended for release in the state. Besides, 39 technologies/ recommendations were made for farmers and 16 recommendations were made for Scientific Community. In addition, as many as 85 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 were also released in 45th meeting of State Seed Sub-Committee held on May 22, 2014 at Gandhinagar.



Inauguration of 10th Combined Joint AGRESKO Meeting of SAUs held on April 09-11, 2014 organized by JAU.

All India Coordinated Research Projects (AICRPs)

Apart from the mechanism of evaluating and monitoring the research programmes/schemes at University level; the projects sanctioned by Indian Council of Agricultural Research, the Annual Workshops and review meetings in different universities in India are organized. In Junagadh Agricultural University, 21 AICRP Projects are operating. The results of each project are regularly

presented in the annual workshops/group meetings. The monitoring of the projects is also carried out by respective Project Directors every year at field level. After five years, the evaluation of performance of each research project is also carried out by QRT Committee comprising of leading senior scientists nominated by the ICAR. The research scientist of the project will present results to the quinquennial review team (QRT). All AICRP projects operating in the Junagadh Agricultural University are regularly reviewed and monitored as per the ICAR norms. They identify and evaluate the performance of the research projects according to national standards.

Name of Project	Department/ Research Station	Date of monitoring team visit	Name and designation of member of monitoring team
AICRP on Plasticsulture Engineering and Technology	Department of Renewable Energy and Rural Engineering CAET, JAU, Junagadh	April 3-6, 2013	Dr. P. R. Bhatnagar, Project Co-coordinator, CIPHET, Ludhiana
Germplasm Unit (Gir) & Data Recording Unit	Cattle Breeding Farm, JAU, Junagadh	April-5 and 6, 2013	Dr. Umesh Singh, PI, Indigenous Cattle Project Directorate on Cattle, Meerut
All India Co-ordinated Research Project on Groundnut	Main Oilseeds Research Station, JAU, Junagadh	September- 2013	Dr. A. J. Patil, Principal Groundnut Breeder,
			Dr. S. C. Patel, Groundnut Breeder,
			Dr. M. S. Shirge, Entomologist, Agricultural Research Station, Jalgaon.
			Dr. Narendra Kumar, Scientist Plant breeder, Directorate of Groundnut Research, Junagadh.
AICRP on Sesame and Niger	Agricultural Research Station, JAU, Amreli	October 03,04 2013	Dr. S. G. Parameshwarappa, Sesame Breeder, AICRP on Sesame, University of Agricultural Sciences, Dharwad (K. K.) and Convener of monitoring team.
			Dr. A. K. Pandey, Entomologist, AICRP on Sesame and Niger, Jabalpur (M. P.) and Member of monitoring team.
			Prof. H. S. Mahajan, Agronomist (Sesame), Oilseeds Research Station, M.P.A. University, Jalgaon and Member of monitoring team.
			Dr. V. Ravicharan, Asstt. Prof. (Pl. Pathology), Regional Research Station, TNAU, Vriddhachalam and Member of monitoring team.
Seed Technology Research	Main Pearl Millet Research Station, JAU, Jamnagar	October 07, 2013	Dr. Rakesh Seth, Convener and Principal Scientist, IARI, Regional Station, Karnal.
			Dr. S. Natarajan, Senior Scientist, DSR, Mau.
			Dr. Lakshmi Kant, Senior Scientist, Plant Breeding, VPKAS, Almora.

			Dr. A. K. Shinde, Deputy Director Research, Breeder Seed, KKV, Dapoli
AICRP on Plasticulture Engineering and Technology	Department of Renewable Energy and Rural Engineering CAET, JAU, Junagadh	October 7-9, 2013	Members of all centers of the scheme as well as DDG (Engg), ADG, PC, CIPHET, Ludhiana
AICRP on Cotton	Cotton Research Station, JAU, Junagadh	October 27-28, 2013	Dr. S. Manickam, Breeder, CICR, Nagpur
			Dr. K. Sankaranarayanan, Agronomist, CICR, Coimbatore
			Dr. K. B. Pawar, Pathologist, MPKV, Pune
			Dr. P. R. Janwar, Entomologist
Seed Technology Research	Main Pearl Millet Research Station, JAU, Jamnagar	December 13, 2013	Dr. S. N. Sharma, Professor Emeritus and Principal investigator, NSP Crops, Jaipur
Germplasm Unit (Gir) & Data Recording Unit	Cattle Breeding Farm, JAU, Junagadh	February-18 and 19, 2014	Dr. Umesh Singh, PI, Indigenous Cattle Project Directorate on Cattle, Meerut
All India Coordinated wheat Research Project	Wheat Research Station, JAU, Junagadh	February 19, 2014	Dr. Indusharma Project Director (Wheat)
All India Coordinated wheat Research Project	Wheat Research Station, JAU, Junagadh	February 20, 2014	Dr. P. C. Mishra, ADR & Principal Scientist
			Dr. S. Acharya, ADR, SDAU, SK Nagar
			Dr. J. B. Singh Sr. Sci. (Plant Breeding)
			Dr. S. I. Patel, Assistant Research Scientist (Plant Patho.)
			Dr. R. S. Chokar, Sr. Sci. (Agronomy)
All India Co-ordinated Research Project on Groundnut	Main Oilseeds Research Station, JAU, Junagadh	January 17-18, 2014	Dr. K. S. Varaprasad, Project Director
			Dr. A. J. Prabhakaran, P.I., AICRP, Castor and Principal Scientist, Directorate of Oilseeds Research, Hyderabad

Adhoc Research Projects

The university is also undertaking various adhoc research projects of ICAR, Govt. of India, Govt. of Gujarat, and Private Agencies. According to their terms and conditions, research work is carried out and research report is submitted to concern funding agency.

4.8 Water Technology

Recommendation for the farming community Study on watershed development activities conducted in dark zone area of Junagadh district

The Planners, Designers, NGOs, Field Officers, and Government Departments of Junagadh

district are recommended to use daily rainfall-runoff prediction equations for estimating daily runoff which are derived by JAU Junagadh using practically derived SCS Curve number (73.03) and adopting Remote Sensing approach. The groundwater contribution for the district can be taken as 12.67% of the above estimated runoff for efficient watershed planning. Additionally the updated Land Capability Classification for Ozat catchment in Junagadh can be taken as provided in the below table.

A) Rainfall - Runoff Relationships for Ozat Catchments (Daily basis)

No.	Catchment Name	Rainfall (x) - Runoff (y) Equation*	R ²
1	Ambajal Catchment	$y = 0.6403x - 11.459$	0.9237
2	Motagujariya Catchment	$y = 0.4599x - 5.9043$	0.8317
3	Zanjeshri Catchment	$y = 0.5525x - 7.7979$	0.8971
4	Dhrafad Catchment	$y = 0.5748x - 8.2758$	0.8706
5	Ozat Weir-2 Catchment	$y = 0.366x - 3.4271$	0.7299
6	Ozat Weir-Shapur Catchment	$y = 0.4994x - 5.9403$	0.8571
7	Ozat Weir-Vanthli Catchment	$y = 0.459x - 5.1273$	0.8493
8	Ozat River Catchment	$y = 0.5366x - 7.3009$	0.8591

* Rainfall and Runoff are in mm

Updated Land Capability Classification for Ozat Catchment

No	Particular	Area, km ²	Per cent (%)	Remark
1	CLASS - I	975.34	69.22	Cultivable land
2	CLASS - II	7.67	0.54	
3	CLASS - IV	131.16	9.31	
4	CLASS - V	14.42	1.02	Uncultivable land
5	CLASS - VI	233.12	16.54	
6	Village	20.52	1.46	
7	River, Reservoir	26.93	1.91	
	Total	1409.16	100.00	

Geometry of wetting pattern under trickle irrigation

The following three models developed by JAU can be used to decide the lateral and emitter spacing in drip irrigation design for a particular emitter discharge in loamy soil.

Case: a) If moisture data before irrigation is not monitored

Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use the following expression for determining the wetting dimensions if moisture information is not available

$$W = 0.516 V^{0.393} (K_s/q)^{0.062} \quad (R^2=0.983)$$

$$Z = 0.069 V^{0.303} (K_s/q)^{-0.060} \quad (R^2=0.965)$$

Where W = Diameter of wetted spread on the ground surface, m; q= emitter discharge in lph; V = volume of water application, l, and K_s = saturated hydraulic conductivity, m/sec; and Z= depth of wetting front below the emitter, m.

Case: b) If moisture data before irrigation is monitored then

The Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use the following expression for determining the wetting dimensions if moisture information is available

$$R = \Delta\theta^{-452.978} v^{0.393} q^{-0.062} K_s^{\text{دلائی اویجی دو}} \quad (R^2=0.983)$$

$$Z = \Delta\theta^{-439.643} v^{0.303} q^{0.060} K_s^{\text{عمی لا ہی ایجی}} \quad (R^2=0.965)$$

Where R = Radius of wetted spread on the ground surface, cm; q= emitter discharge in ml/h; V = volume of water application ml; and K_s = saturated hydraulic conductivity, cm/h; and Z= depth of wetting front below the emitter, cm.

Case: c) If time of application is mentioned

The Planners Designers, NGO's, Field officers and Govt. Departments are recommended to use revised Debral (2012) model for greater accuracy for determining the wetting dimensions if time of irrigation is known:

$$W = 15.081 t^{0.418} q^{0.448} K_s^{0.091} \quad (R^2=0.960)$$

$$Z = 27.185 t^{0.303} q^{0.363} K_s^{0.174} \quad (R^2=0.965)$$

Where W= Diameter (m); q = emitter discharge cumec; t = time of application sec; K_s = saturated hydraulic conductivity, m/sec; Z = depth of wetting

front below the emitter (m).

Recommendation for the scientific community Geometry of wetting pattern under trickle irrigation

The scientists of South Saurashtra Agro-climatic Zone are advised to keep the following suggestions while using the following developed equations by various scientists for predicting the wetting geometry in loamy soils.

- Healy and Warrick (1981) model predicted wetting geometry (width ($R^2 = 0.3141$) and depth ($R^2 = 0.1918$) at lower discharges with poor accuracy and failed to predict at higher emitter discharges (> 8 lph).
- Philips (1984) model predicted wetting geometry (both width and depth) at lower and higher emitter discharges with good accuracy.
- Accuracy of original Debral (2012) dimensional analysis model is low in predicting wetting geometry (both depth below the emitter ($R^2 = 0.845$) and width at the surface ($R^2 = 0.895$)).
- BEN-ASHER Hemi Spherical Model (1985) predicted both depth ($R^2 = 0.962$) and width ($R^2 = 0.9774$) with good accuracy.
- Steady state Wooding model (1968), Steady state Raats model and moment analysis approach predicted both steady width with low accuracy.

Ambient temperature trend analysis for the North Saurashtra region in view of climate change

1. Weekly maximum temperature showed significantly increasing trend in MSW 8, 14, 15 and 18 where as significantly decreasing trend was observed in MSW 28, 37 and 39. Generally 28th MSW (9th July to 15th July) is the initial stage of groundnut, cotton and other kharif crops. Whereas MSW 37 and 38th (10th Sept. to 23rd Sept.) is the pegging stage of groundnut.

2. Weekly minimum temperature showed significantly increasing trend in MSW 3, 8, 9, 12, 13, 15, 19, 44, 45, 48, 51 and 52. The MSW 44-45th (Oct. 29 to Nov. 11th) is the mid season of cotton crop. MSW 48 (Nov. 26th to 2nd Dec) and MSW 51 and 52 (Dec. 17th to 30th Dec) is the germination and booting stage of wheat and growing and flowering stage of cumin, respectively.

4.9 Agricultural Rural Development Studies: NIL

4.10 Agri-business Development: NIL

4.11 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 pure breed of *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 are in operation. 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 then this research station maintains about 500 heads of *Gir* Cattle and 250 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 134 hectare of land 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.

During the year 2013-14, total 11,321 frozen doses from *Gir* bulls and 18,704 frozen semen doses from *Jaffrabadi* bulls were produced at the semen station at Cattle Breeding Farm. Out of these 4390 doses of *Gir* were used for Artificial Insemination in field, 807 doses were use for Artificial Insemination on farm and 580 doses were sold to Artificial Insemination workers. Similarly for *Jaffrabadi* buffaloes, 5950 doses were used for Artificial Insemination in field, 50 doses were used for Artificial Insemination on farm and 2630 doses of *Jaffrabadi* bulls, were sold to Artificial Insemination workers.

During the year 2013-14, 51 *Gir* breeding bull calves were distributed among various *Gram Panchayat* for breeding the rural *Gir* population. Similarly during the year 10 *Jaffrabadi* growing males were sold to the different *Gram Panchayat* for breeding the *Jaffrabadi* buffaloes.

Performance of *Gir* and *Jaffrabadi* herds at CBF during the year 2013

No.	Particulars	<i>Gir</i> herd	<i>Jaffrabadi</i> herd
1	Total Lact. Milk yield (Lit.)	2198	1905
2	300 D.Milk yield (Lit.)	1873	1760
3	Lactation days	365	333
4	Dry days	130	167
5	Calving interval(days)	417	454
6	Age at 1 st Calving (days)	1414	1437
7	Age at 1 st Heat (days)	1124	1117
8	Service period (days)	137	150
9	No/of service/AI/Conception	2.1	1.33
10	Overall mortality (%)	2.8	3.4



List of elite cows producing more than 3000 Lit of milk in 300 days of lactation

No.	Name of the Cow	B. No.	Order of lact	300 d Milk Yield (Lit)
1	Padma	92/05	2	4138.4
2	Kiran	38/04	4	3837.5
3	Hiren	51/05	2	3764.6
4	Sima	38/00	3	3793.2
5	Tara	47/94	3	3500.0
6	Priti	116/98	4	3470.1
7	Bhagwati	31/97	5	3264.6
8	Sapana	89/97	3	3545.0
9	Putali	30/00	6	3257.0
10	Taramati	72/01	3	3133.5
11	Charulata	69/02	2	3013.9
12	Gunjan	31/02	3	3475.4
13	Kalpana	53/04	3	3078.0
14	Vaishali	121/05	3	3100.0
15	Uday	19/04	1	3161.2
16	Prasanna	90/06	2	3032.2
17	Virani	44/03	2	3356.7
18	Mumtaj	77/03	2	3501.6
19	Gargi	53/07	2	3021.7
20	Sunidhi	120/05	3	3476.1
21	Patanjali	70/06	1	3376.0

A.I. Performance in the field during the year 2013-14

No.	Name of the Centre	AI done in Gir Cow	Cows conceived	AI done in Jaffrabadi Buffalo	Buffaloes Conceived
1	Shedaya	168	106	141	87
2	Pipli	168	93	177	88
3	Loez	350	210	1021	529
4	Movana	318	157	470	262
5	Surva	357	206	304	159
6	Mandlikpur	389	206	542	232
7	Sherdi	199	67	324	82
8	Hadmadiya	155	68	94	38
9	Ghumli	110	53	118	54
10	Gundala	133	59	154	77
11	Chaparda	203	93	285	134
12	Porbander	26	28	358	145

'13	Khorasa	72	38	105	60
14	Dolasa	181	76	150	58
15	Mandavad	16	0	0	0
	Total...	2845	1460	4243	2005

In the area under operation of these centres 4,821 *Gir* cow calves and 13,158 *Jaffrabadi* buffalo calves, were born till date. These calves are breed specific and of 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 ₹ 30/- per dose and the following number of semen doses of the bulls are available at the research station 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	Bhagaro	6807
2	Bhavik	366	Laxman	3433
3	Rupak	778	Moti	6853
4	Pankaj	2752	Haresh	2553
5	Bhola	2091	Sunder	3022
6	Raj	1737	Raja	3094
7	Krishna	114	Nagaraj	2170
8	Milan	2513	Dhinglo	5043
9	Sarang	3092	Bholenath	3371
	Total...	14,651		36,372

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 Panchayat* 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 Establishment of Artificial Insemination Training Centers in Saurashtra, are the extension schemes

functional at the center. About 1500 farmers, 630 women farmers, 90 extension workers visited this station and were provided technical guidance.

During the year 2013-14, Mini Cattle Feed Plant (Roughage Processing Plant and Block making machine) produced 67,500 Kg of palette fodder based feed and 1,560 Blocks of dry fodder-mollaces and urea mixed blocks were prepared and fed to the animals, utilizing agricultural byproduct like ground nut haulms and wheat bhusa which were converted in to enriched palletted Cattle Feed.



Jaffrabadi Buffalo bull



Gir bull

This group has released two recommendations for farmers' and three scientific recommendations, which are briefed here in. During the year, 14 new experiments were conducted on genetic improvement, animal nutrients, animal production and health.

Recommendation for farmers

Morbidity and mortality in *Gir* cattle herd

In South Saurashtra region, in an organized dairy farm of *Gir* cattle:

1. Overall annual mortality averages around 6 per cent in the herd. Higher mortality occurs from birth to 1 month of age especially, during November-December months on account of colibacillosis and pneumonia.
2. Mastitis, colibacillosis, fever and pneumonia are major health disorders in *Gir* cattle.

Therefore, dairy farmers of *Gir* cattle are advised to take all possible care and precautions during first month of calthood especially during November-December months to keep incidence of diseases and mortality at the minimum.

Morbidity and mortality in *Jaffrabadi* buffalo herd

In South Saurashtra region, in large dairy farm of *Jaffrabadi* buffaloes:

1. Overall annual mortality averages around 11 per cent in the herd. Higher mortality occurs from birth to 1 month of age group especially, during September-October months on account of colibacillosis and pneumonia.
2. Colibacillosis, fever, mastitis and gastroenteritis are major health disorders in *Jaffrabadi* buffaloes.

Therefore, dairy farmers of *Jaffrabadi* buffalo are advised to take all possible care and precautions during first month of calthood especially during September-October to keep incidence of diseases and mortality at the minimum.

Information for scientific community

Estimation of bulk milk Somatic Cell Count (SCC) from the raw milk of *Gir* cattle and *Jaffrabadi* buffalo

The scientific community is informed that average bulk tank milk somatic cell count - BTMSCC/ml milk of *Gir* cows (720,278 SCC/ml) and *Jaffrabadi* Buffaloes (623,625 SCC/ml) were lower than the US standards for "Grade A" milk (750,000 SCC /ml) without significant effect of season and time of milking in organized dairy farm.

Incidence of parasitic infections in bovines in and around Junagadh city

The veterinary professionals are informed that cattle and buffalo in and around Junagadh region were found predominately infected with *Toxocara vitulorum*, *Fasciola* spp., strongyles, *Strongyloides papillosus*, amphistomes, coccidia (*Eimeria* spp. and *Cryptosporidium* spp.) and *Buxtonella sulcata* (ciliates) parasites.



Abattoir survey of reproductive abnormalities in Jaffrabadi buffaloes (*Bubalus bubalis*)

It is informed to scientific community that about half of the culled Jaffrabadi buffaloes have acquired cervical affections, which include kinked cervix (72.6%) and cervical ectropion (25.8%) as major abnormalities which should be noted as a point of concern by scientific community.

4.12 Engineering & Technology

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

Standardization of packaging technology of fresh guava fruits

The farmers, processors and exporters are recommended to adopt packaging technique developed by Junagadh Agricultural University for increasing the shelf life of guava fruit up to 18 days at room temperature by packing in 50 μ polyethylene bag at a vacuum level of 700 mm Hg.

Standardization of packaging technology of processed guava fruits



PACKAGING OF GUAVA FRUITS USING VACUUM PACKAGING MACHINE

The farmers, processors and exporters are recommended to adopt hot air drying technique developed by Junagadh Agricultural University for preparing of guava powder by drying of fresh guava slices (3 mm thick) pretreated with 1 % CaCl_2 + 2 % Potassium Meta bi Sulphate (KMS) solution for 10 minutes at 60⁰ C drying air temperature and 1.25 m/s air velocity in drying period of 17 hours. The powder prepared by this method can be stored up to 80 days at room temperature by packing in 50 μ polyethylene bag at a vacuum level of 700 mm Hg.

Preparation of custard apple powder by freeze drying methods



LOADING OF DRYING TRAYS IN THE DRYING CHAMBER.

The processors and exporters are recommended to adopt freeze drying technique developed by Junagadh Agricultural University for preparing custard apple powder by freeze drying of fresh custard apple pulp (1.5 kg) pretreated with 5 % maltodextrine at -40⁰ C temperature with a drying



1.1 FRESH AND MATURE CUSTARD APPLE FRUIT



1.2 PEELING OF CUSTARD APPLE FRUIT



1.3 CORING CUSTARD APPLE PULP



1.4 HOMONIZED CUSTARD APPLE PULP PRETREATED WITH MALTODEXTRIN

period of 41 hours. The custard apple powder obtained by this method has better product quality and could be stored up to 90 days at room temperature when packed in 50 μ polyethylene bag at a vacuum level of 700 mm Hg.

Extraction of enzymes from potato peels substrate using *Bacillus* group of bacteria

Potato processors and entrepreneurs are recommended to adopt a process technology developed by Junagadh Agricultural University for the production of alpha-amylase and protease enzymes through microbial and biochemical methods from bio waste (potato peel) using *Bacillus subtilis* bacteria. This process is beneficial (BCR 7.54:1) as



compared to readymade available enzymes in market.

4.13 Fisheries Science

Recommendation for fish farmers

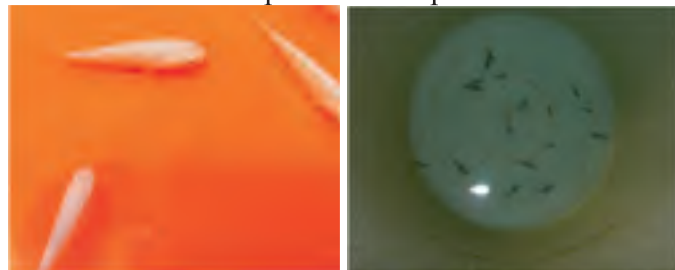
Evaluation of stocking density of carp fry in rearing pond

Fish farmers of Saurashtra region are recommended to stock rohu fry @1.00 lakh per hectare in rearing ponds for obtaining better growth and survival rate.



Effect of different levels of protein diet on the growth and survival of *Mugil cephalus* (Linnaeus) fry

Fish farmers of Saurashtra are recommended to feed gray mullet *Mugil cephalus* fry reared in seawater with 35% protein incorporated diet in first



45 days for obtaining higher growth and survival.

Effect of different salinities on density of *Chaetoceros calcitrans*

Hatchery owners of Saurashtra region are recommended to use 30 PPT saline water to grow *Chaetoceros calcitrans* for higher yield.

Effect of monospecies and mixed species' diet on growth and survival of pearl oyster (*Pinctada fucata*)

Hatchery entrepreneurs of Saurashtra region are recommended to use 50% *Isochrysis galbana* and 50% *Chaetoceros calcitrans* as a feed for pearl oyster rearing.



Information for scientific community

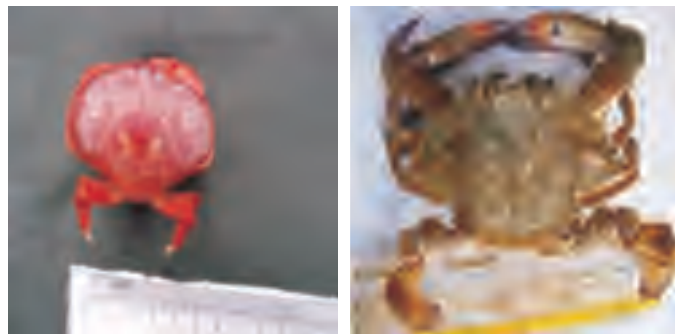
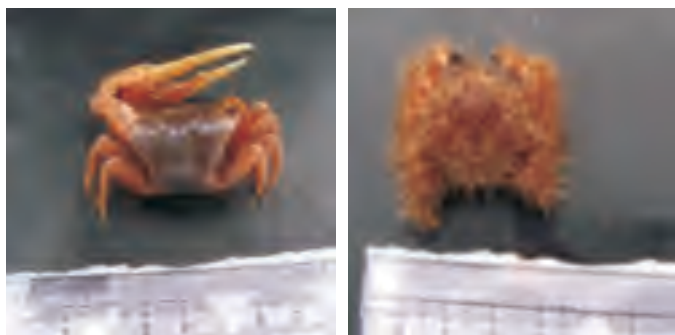
Qualitative and quantitative analysis of phytoplankton of Sikka region

The Sikka coast, located in Gulf of Kachchh, Gujarat harbours 36 genera/species of phytoplankton, among which, *Amphora* spp., *Bacillaria paradoxa*, *Biddulphia mobilensis*, *Chaetoceros calcitrans*, *Chaetoceros curvisetus*, *Coscinodiscus granii*, *Ditylum sol*, *Gyrosigma* spp., *Nitzschia closterium*, *Pleurosigma* spp. and *Rhizosolenia* spp. were found abundant. Hence, it is recommended to scientific community to target these species for further biodiversity studies.



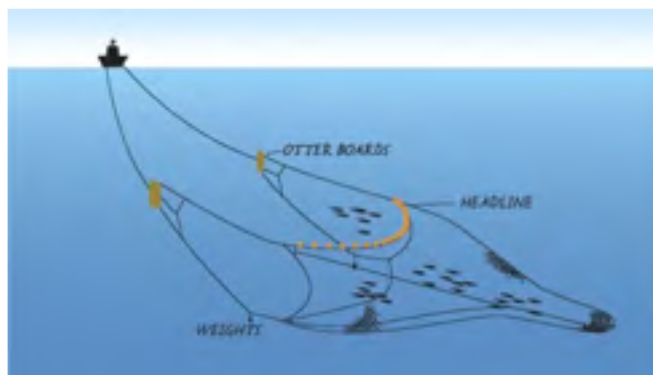
Diversity and distribution of brachyuran crab at off shore Sikka

The Sikka Coast, located in Gulf of Kachchh, Gujarat harbours 22 species of Brachyuran crab, among which, *Pilumnus vesperilio*, *Atergatis integerrimus*, *Scylla serrata*, *Charybdis acutifrons*, *Parasesarma pictum*, *Menippe rumphii*, *Ocypode ceratophthalmus* and *Portunus pelagicus* were found abundant. Hence, it is recommended to scientific community to target these species for further biodiversity studies.



Study of catch composition of trawl net operated along the Veraval coast, Gujarat

A total of 90 marine species (70 finfish and 20 shell fish) were recorded in the trawl net fishery. Ribbon fish, thread fin bream, squid, lizard fish and cuttle fish forms a major proportion of catch. Hence, it is recommended to scientific community to consider these species for further catch spectrum analysis.



Analysis of plankton in brackish water shrimp culture pond

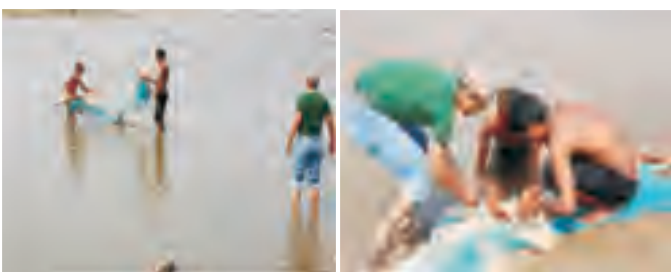
Ten genera of phytoplankton viz., *Chaetoceros*, *Skeletonema*, *Pleurosigma*, *Gyrosigma*, *Scenedesmus*, *Oscillatoria*, *Navicula*, *Nitzschia*, *Coscinodiscus* and *Chlamydomonas* and four genera of zooplankton viz., *Moina*, *Brachionus*, *Keratella*

and *Pseudodiaptomus* are commonly observed in brackish water shrimp culture ponds of the Saurashtra region. Hence, it is recommended to scientific community to consider these species as feed in shrimp culture.



Survey for cultivable sea water shrimps seed along Jafrabad and Mahuva coast

The fisheries scientists are recommended that cultivable shrimp seeds of *Metapenaeus kutchensis*, *Fenneropenaeus merguensis*, *Fenneropenaeus indicus* and *Penaeus monodon* are available during month of September to January at Mahuva, while at Jafrabad coast during April to May for shrimp farming purpose.



4.14 Social 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, economic analysis of processed onion products in Saurashtra, scheme for creating a permanent machinery for studying the cost of cultivation/production of principal crops in Gujarat state, establishing and networking of agricultural market intelligence centers in India and harnessing opportunities for productivity enhancement (HOPE) of sorghum and millets in Sub-Saharan Africa and South Asia. Price forecasts of different crops *viz.*, groundnut, sesame, blackgram, cotton, castor, pigeonpea, chickpea, wheat, mustard and cumin were published for benefits of farmers in English and Gujarati news papers. 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. It has 71,735 farmers on board. Twenty messages of price forecast have been disseminated during June to March, 2014, which accounts to a total of 14,34,700 Voice Mail SMS. Market Intelligence was also disseminated through letters, E-mail messages and hard copies in training/meetings. Also, the commodity report on castor, pigeonpea and potato has been prepared and submitted to the PI of the project. The data base for 10 major commodity regarding area, production, productivity, monthly market prices and export-import of have being updated and price forecast reports were put on JAU, Website. This group also approved five new technical programmes.

4.15 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.

Production of truthful seeds of field crops under mega seed project during year 2013-14

No.	Crop	Production (q)
1	Groundnut	1070.43
2	Pearl millet	0.36
3	Chickpea	1075.79
4	Sesame	132.22
5	Wheat	4064.18
6	Cotton	32.50
7	Castor	01.63
8	Cumin	290.26
9	Coriander	43.20
10	Soybean	57.58
11	Mungbean	201.80
12	Uradbean	58.35
13	Pigeon pea	220.40
14	Sugarcane setts	803.60
15	Fenugreek	00.10
16	Ajwain	04.90
17	Garlic	56.00
18	Fennel	03.00
19	Papaya seeds	0.38
20	Cluster bean (Guar gum)	21.28
21	Paddy	10.00
22	Vegetable seeds	01.75
	Total...	8,149.71
23	Planting Materials:	
	A) Fruit crops graft Nos.	1,25,121
	B) Fruit crops saplings Nos.	19,151
	C) Seedlings Nos.	4,760
	Total...	1,49,032



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.



Production of Nucleus / Breeder seeds during year 2013-14

No.	Crop	Variety	Nucleus Seed	Breeder Seed (q)		Total (q)
				National	State	
1	Groundnut	GG-2	0.17	-	79.12	79.29
		GG-5	0.19	-	65.05	65.24
		GG-7	0.05	3.00	22.70	25.75
		GG-8	0.36	8.10	-	8.46
		GG-9	0.81	1.00	45.70	47.51
		GAUG-10	-	-	15.00	15.00
		GG-11	0.08	-	58.65	58.73
		GG-16	0.08	29.80	-	29.80
		GG-20	0.56	50.00	1226.00	1276.56
		GG-21	-	2.00	11.80	13.80
		GJG-22	0.09	-	18.65	18.74
		GJG-31	-	21.00	16.50	37.50
		GJGHPS-1	0.15	-	48.30	48.45
		Sub Total	2.68	114.90	1649.67	1767.25
2	Pearl millet	GHB-538	-	-	1.57	1.57
		GHB-757	-	-	0.39	0.39
		GHB-715	0.01	-	0.11	0.12
		GHB-558	-	-	0.08	0.08
		GHB-905	-	-	2.48	2.48
		Sub Total	0.01	-	4.63	4.64
3	Sesame	G.Til-1	0.07	0.50	1.70	2.27
		G.Til-2	0.52	2.90	6.30	9.22
		G.Til-3	0.33	-	5.40	5.73
		G.Til-4	0.06	-	0.80	0.86
		G.Til-10	0.10	1.72	1.75	3.52
		Purva-1	0.02	-	0.08	0.10
		Sub Total	1.10	5.12	16.03	22.25
4	Chickpea	GG-1	4.00	-	31.50	35.50
		GG-2	6.00	29.00	49.25	84.25
		GG-3	6.06	61.25	36.90	104.21
		GG-4	3.02	22.00	-	25.02
		Sub Total	19.08	112.25	117.65	248.98
5	Wheat	GW-366	7.00	145.70	74.30	227.00
		GW-496	-	-	73.20	73.20
		Lok-1	-	-	75.60	75.60
		Sub Total	7.00	145.70	223.10	375.80
6	Castor	GC-3	-	-	1.40	1.40
Grand Total			29.87	377.97	2012.48	2420.32

4.16 Others

4.16.1 Front line demonstration organized on farmers' field during year 2013-14

Crop scientists have successfully organized total 282 Front Line Demonstrations on farmers' fields in addition to the FLDs organized by KVKs of JAU.

No.	Name of Crop	No. of FLD
1	Groundnut	30
2	Chickpea	48
3	Sesame	15
4	Castor	15
5	Wheat	32
6	Pearl millet	88
7	Cotton	40
8	Spices	14
Total...		282

4.16.2 Production of Sawaj-Trichoderma, Sawaj-Azotobacter, Sawaj-Rhizobium and Sawaj-PSB

The Department of Plant Pathology has produced and provided 378 liters (189 bottles) of *SAWAJ-Rhizobium*, 1778 liters (889 bottles) of *SAWAJ-Azotobacter* and 1023 liters (513 bottles) of *SAWAJ-PSB* liquid bio-fertilizers to the State Department of Agriculture for distribution to farmers as an integrated part of *Krushki Mahotsava* Kits and sold directly to farmers at reasonable price (₹ 60/bottle). The department has also produced and distributed 53,236 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.



4.16.3 MoUs

The University has signed five MoUs with following institutions/organization for collaborative Research & Education as well as seed production during 2013-14.

1. Punjab Agricultural University, Ludhiyana.
2. Gujarat Technology University, Gandhinagar.
3. Aspee Agricultural Research & Development Foundation, Mumbai.
4. Maharana Pratap University of Agriculture and Technology, Udaipur.
5. Ronak Seeds Pvt. Ltd., Ahmedabad.

Among the different MoUs, Vegetable Research Station, Junagadh Agricultural University, Junagadh has made non-exclusive license agreement between Junagadh Agricultural University, Junagadh and Ronak Seeds Pvt. Ltd., Ahmadabad for the production and marketing of improved vegetable varieties of Okra GJO-3 and Brinjal GJB-2 & GJB-3.



4.16.4 New research programmes sanctioned during year 2013-14

No.	Agency	No. of Research Programmes	Amount (₹ In Lakh)
1	ICAR/GOI	04	205.47
2	Other Agencies	24	102.31
3	Govt. of Gujarat	04	160.74
4	ICRISAT	01	2.40

4.16.5 RKVY Projects

Total five projects under RKVY were implemented in Junagadh Agricultural University during the year 2013-14 as per details given below. The civil work in following projects is near to completion or in progress.

Project-1. Expansion of facilities for Agricultural Education



Project-2. Expansion of boys hostel facilities for U.G./P.G. Students



Project-3. Establishment of Advance Training Centre for Farmers at Amreli



Project-4. Construction of Educational building of Agro ITI at Mahuva



Project-5. Improving facilities for shrimp and finfish seed production at Fisheries Research Station, Okha

