RESEARCH

Chapter - IV

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. A. Y. Desai monitored and guided the research activities during the reporting period. 13th Research Council meeting was organized on December 22, 2015 for approval of new research programmes and research activities during the year.

Table 4.1Members of Agricultural Research Council during the year 2015-16

No.	Name	Designation
1	Dr. A. R. Pathak	Vice Chancellor (Chairman)
2	Dr. A. Y. Desai	Director of Research & Dean PG Studies (Secretary)
3	Dr. S. R. Chaudhari	Director of Agriculture, Government of Gujarat, Gandhinagar
4	Dr. R. A. Sherasia	Director of Horticulture, Government of Gujarat, Gandhinagar
5	Dr. Hita Patel	Director of Animal Husbandry, Govt. 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, Agriculture Faculty
9	Dr. N. K. Gontia	Dean, Agricultural Engineering Faculty
10	Dr. A. Y. Desai	Dean, Fisheries Science Faculty
11	Dr. P. H. Tank	Dean, Veterinary Science & Animal Husbandry Faculty
12	Dr. K. A. Khunt	Dean, Post Graduate Institute of Agribusiness Management
13	Dr. M. D. Khanpara	Research Scientist and Convener, Crop Improvement AGRESCO Subcommittee
14	Dr. N. B. Babaria	Professor & Head and Convener, Crop Production AGRESCO Subcommittee
15	Dr. V. N. Patel	Research Scientist and Convener, Plant Protection AGRESCO Subcommittee
16	Dr. A. N. Makwana	Professor & Head and Convener, Horticulture & Agro Forestry AGRESCO Subcommittee
17	Dr. R. A. Gupta	Professor & Head and Convener, Agricultural Engineering AGRESCO Subcommittee
18	Dr. (Miss) M. K. Mandavia	Professor & Head and Convener, Basic Science AGRESCO Subcommittee
19	Dr. R. L. Shiyani	Professor & Head and Convener, Social Science AGRESCO Subcommittee
20	Dr. J. S. Patel	Professor & Head and Convener, Animal Science & Fisheries AGRESCO Subcommittee
21	Dr. K. L. Dobaria	Research Scientist (Groundnut)
22	Dr. B. A. Golakia	Professor & Head (Biotechnology)
23	Dr. R. Subbaih	Professor & Head (Soil & Water Engg.)

24	Dr. K. L. Mathew	Professor & Head (Fisheries)
25	Dr. J. S. Patel	Professor & Head (Medicine)
26	Dr. P.S. Bharodia	Retired Research Scientist (Plant Breeding)
27	Prof. J. B. Savani	Retired Professor (Agricultural Engineering)
28	Shri Sandipbhai S. Thumar	Progressive Farmer, At: Vadal, Ta. & District: Junagadh

13th Research Council Meeting of JAU organized under the chairmanship of Dr. A. R. Pathak, Hon'ble Vice Chancellor, JAU, Junagadh

4.2 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 scheme were solved satisfactorily by discussion between scientists and the Director of Research in two meetings held during the month of December-2015 and February-2016 for evaluation of expenditure of planned schemes and reallocation of the funds, *etc.*

State Programmes

Monitoring of research works is done through a set system in the University. The University jurisdiction is comprises of four agro-climatic zones *viz.* North Saurashtra, South Saurashtra, 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 Subcommittee (eight discipline wise) 3) Joint Agricultural Research Subcommittee (one for all disciplines) and 4) Combined Joint Agricultural Research Subcommittee (one for all 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.

Table 4.2 List of plan and non-plan research projects functioning in the university

(A) Plan Scheme (Sponsored by State Government of Gujarat)

Sr. No.	Budget Head	Scheme Name	Sanction Year	Location
1	12002-00	Strengthening of research in millet	1986	Pearl millet Research Station, Jamnagar
2	12006-00	Strengthening of research in sorghum	1981	Cotton Res. Station, Kukada
3	12007-00	Strengthening of research in pulses	1989	Pulse Res. Station, Junagadh
4	12008-00	Strengthening of research in oilseed (Groundnut)	1986	Oilseed Research Station, Junagadh & Manavadar
5	12009-00	To establish a centre of excellence for cotton research	1986	Cotton Res. Stat., Junagadh and ARS, Amreli & Ratia
6	12013-00	Strengthening of scheme of vegetable research at Junagadh	1995	Vegetable Research Station, Junagadh
7	12027-00	Scheme for management of salt affected soil & poor quality of under-ground water	1988	Dept. of Ag. Chem. & Soil Science, Junagadh
8	12044-01	Research in bio-technology	1995	Dept. of Biochem., Junagadh
9	12078-00	Strengthening of research in dry-farming	1979	DFRS, Targhadia & Ratia
10	12092-00	Strengthening of tissue culture research & development at all campuses	1990	Dept. of Pl. Breeding & Genetics, Junagadh
11	12094-00	Research for integrated pest management in fruit crops	1997	Dept. of Entomology, Junagadh
12	12095-00	Strengthening of horticultural research & development activities	1997	Dept. of Horticulture, Junagadh
13	12096-00	Research on micro irrigation system in Saurashtra region	1997	Dept. of Agronomy, Junagadh
14	12131-00	Research on eco-friendly biological fertilizer	1997	Dept. of Pl. Patho., Junagadh
15	12712-06	Creation of additional posts as per Supreme court orders	1991	CBF, CoA, CAET, Junagadh & CoF, Veraval
16	12712-5B	Campus development programme (on campus)	2004	Office of Director of Research, JAU, Junagadh
17	12903-00	Establishing organic farming cell at Junagadh	2000	Dept. of Agronomy, JAU, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Location
18	12905-00	Proposal for research on watershed management	2000	DFRS, Targhadia; GRS, Dhari & Dept. of SWE, CAET, Junagadh
19	12907-00	Strengthening of agro-meteorology at JAU	2000	Dept. of Agron., Junagadh
20	12930-00	Establishment of new sub-center for research on cumin	1998	Agri. School, Halwad
21	12931-00	Establishment of new research centre on onion crop	2003	Vegetable Res. Station, Junagadh & FRS, Mahuva
22	12573-00	Research on tillage technology	2006	Dept. of Agron., Junagadh
23	12574-00	Research on rejuvenation of degraded coastal agro-eco systems of Saurashtra	2006	Research Training & Testing Centre, Junagadh
24	12575-00	Strengthening research in sesamum	2006	Agril. Res. Station, Amreli
25	12101-00	Centre of excellence on soil and water management	2006	RTTC, Junagadh; DFRS, Targhadia; ARS (FC), Mahuva & FRS, Mangrol
26	12576-00	Research on post-harvest technology of important crops of Saurashtra	2006	Dept. of Processing & Food Engg., CAET, Junagadh
27	12582-00	Strengthening of research on genetically modified cotton	2009	Cotton Research Station, Junagadh
28	12583-00	Strengthening of wheat research	2009	Wheat Res. Stat., Junagadh
29	12584-00	Strengthening research on castor	2009	Oilseed Res. Stat., Junagadh
30	12585-00	Strengthening research in sugarcane	2009	Sugarcane Research Station, Kodinar
31	12586-00	Strengthening of research in plantation and fruit crops at A.R.S. (Fruit Crops)	2009	Fruit Research Station, Mahuva
32	12587-00	Conservation of plant biodiversity	2009	Dept. of Plant Breeding & Genetics, Junagadh
33	12588-00	Development of arid and semi-arid fruit crops	2009	Dept. of Horticulture, Junagadh
34	12590-00	Establishment of Bt cotton research centre at Surendranagar district	2011	Cotton Research Station, Kukada
35	12014-00	Establishment of spices research centre at Junagadh	2011	Vegetable Res. Station, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Location
36	12015-00	Establishment of bio-fertilizer unit at Junagadh	2011	Dept. of Plant Pathology, Junagadh
37	12018-00	Establishment of research centre on onion at Talaja Dist.: Bhavnagar	2011	Agriculture Research Station, Talaja
38	12019-00	Strengthening of dry farming research at Jam Khambhaliya	2012	Dry Farming Res. Station, Jam Khambhaliya
39	12020-00	Strengthening of dry farming research at Vallbhipur	2012	DFRS, Jam Khambhaliya and Vallbhipur
40	12021-00	Establishment of mango research project at Talala	2012	Dept. of Horticulture, Junagadh
41	12022-00	Project on mega seed for quality seed production & distribution	2012	Dept. of Seed Science & Tech., Junagadh
42	12023-00	Micronutrients and sulphur research in soils and plants in Saurashtra region	2012	Dept. of Ag. Chemistry & Soil Science Junagadh
43	12024-00	Centre of remote sensing and geoinformatics in agriculture	2012	Dept. of SWE, CAET, Junagadh
44	12025-00	Recycling of organic waste for sustainable soil productivity under dry land agriculture at Targhadia	2012	Dry Farming Res. Station, Targahdia
45	12026-00	Project for research on forage crop production at Dhari	2012	Grassland Research Station, Dhari
46	12028-00	Aflatoxin and its management in groundnut in Saurashtra region of Gujarat	2013	Oilseed Research Station, Junagadh
47	12029-00	Molecular mapping of important traits and their transfer through marker assisted selection (MAS) in groundnut and cotton	2013	Dept. of Biochemistry, Junagadh
48	12030-00	Studies on effect of climate change on fruit crops of Saurashtra region	2013	Dept. of Horticulture, Junagadh
49	12303-05	Establishment of Gir cattle & Jaffrabadi buffaloes	1996	Cattle Breeding Farm, Junagadh
50	12953-00	Strengthening of livestock & veterinary component	2002	Cattle Breeding Farm, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Location
51	12303-14	Integrated farming system (Integrated farming combining crop livestock bio resources)	2009	Cattle Breeding Farm, Junagadh
52	12303-15	Establishment of bull mother farm of Gir cattle & Jaffrabadi buffaloes	2011	Cattle Breeding Farm, Junagadh
53	12950-00	Establishment and development of research in fisheries	2000	Fisheries Research Station, Okha
54	12577-00	Value added products from fish / shelifish	2006	College of Fisheries, Veraval
55	12578-00	Establishment of inland fishery research centre	2006	Inland Fisheries Research Station, Junagadh
56	12579-00	Establishment of pearl oyster hatchery	2009	Fisheries Res. Station, Sikka
57	12581-00	Feasibility of mass culture of marine red algae *Kappaphycus alvarezii* (Schimitz) on the Saurashtra region at west coast of India	2009	Fisheries Research Station, Okha
58	12016-00	Establishment of aqua-based research and training centre in coastal Saurashtra at Mahuva	2011	Agricultural Research Station (FC), Mahuva
59	12031-00	Crop improvement in papaya at Junagadh	2014	Dept. of Horti., Junagadh
60	12032-00	Integrated pest management in seed spices at Junagadh	2014	Dept. of Entomology, Junagadh
61	12033-00	Evaluation of pharmacological activity of indigenous medicinal plants of Saurashtra region	2014	College of Veterinary & Animal Husbandry, Junagadh
62	12034-00	Identification & documentation of marine fish biodiversity using mitochondrial DNA bar coding at Veraval	2014	College of Fisheries, Veraval

(B) Non Plan Scheme (Sponsored by State Government of Gujarat)

Sr. No.	Budget Head	Name of Programme	Sanction Year	Location
1	3226	Scheme of Design Experiment	1980	Dept. of Agril. Statistics, Junagadh
2	5002	Scheme for Research in Bajra	1985	Pearl millet Res. Stat., Jamnagar
				Agricultural Res. Station, Talaja
3	5004	Scheme for Research in Wheat	1995	Wheat Res. Station, Junagadh
				Fruit Res. Station, Mangrol
4	5006	Scheme for Research in Sorghum	2011	Cotton Res. Station, Kukada
5	5007	Project for the Research in Pulses	1975	Pulse Res. Station Junagadh
6	5008	Scheme for Oilseed Research	1962	Oilseeds Res. Station, Junagadh
			1973	Agril. Res. Station, Amreli
			1985	Pearl millet Res. Stat., Jamnagar
			1979	Sugarcane Res. Station, Kodinar
			1979	Oilseed Res. Station, Manavdar
7	5009	Scheme for Strengthening of Research in Cotton Investigation of Fiber Crops other than Cotton, Development of Remie Fibre.	1985	Agricultural Research Station, Amreli
			1985	Cotton Research Station, Khapat
			2002	Cotton Res. Station, Junagadh
8	5011	Scheme for Research in Sugarcane	1971	Sugarcane Res. Station, Kodinar
9	5012	Scheme for Research in Grasses forage	1985	Grassland Res. Station, Dhari
10	5013	Strengthening of Research in Vegetable (Tomato)	1962	Vegetable Research Station, JAU, Junagadh

Sr. No.	Budget Head	Name of Programme	Sanction Year	Location
11	5014	Scheme for Research and Improvement in Fruit Crops	1961-62	Fruit Res. Stat., JAU, Mangrol
				Agril. Res. Stat. (FC), Mahuva
				Dept. of Horti., Junagadh
12	5018	Scheme for Research Studies in Agriculture Economics	1972	Dep. of Agril. Economics, Junagadh
13	5020	Scheme for Research in Agriculture Chemistry & Soil Science	1972	Dept. of Ag. Chemistry & Soil Science, JAU, Junagadh
14	5025	Project for the Research in Agronomy and Crop Husbandry	2005	Dept. of Agronomy, JAU, Junagadh
15	5026	Project for the Research in Pest Control and Other Entomological Aspect	1960	Dept. of Entomology, JAU, Junagadh
16	5042	Strengthening of Dry Farming Research Station	1965	Dry Farming Res. Station, Ratia
			1979	Dry Farming Research Station, Targhadia
			1967	Dry Farming Research Station, Jam-Khambhalia
			1964	Dry Farming Res. Station, Vallbhipur
			2011	Cotton Res. Stat., JAU, Kukada
			1975	Grass Land & ARS, Dhari
			1947-48	Megaseed Project, Sagdividi
			1995	Cotton Res. Stat., JAU, Khapat
			1967	Dept. of Agronomy, Junagadh
17	5044	Project for the Research in Plant diseases and other Pathological Aspect	1985-86	Department. of Plant Pathology, Junagadh
18	5046-A	Study of Biology Investigation & Control of weed control, Botanical garden and Cytogensis	1969	Dept. of Genetics and Plant Breeding, Junagadh
	B			
	C			
19	5073	Research in Agricultural Engineering	1962-63	RTTC, Junagadh

Sr. No.	Budget Head	Name of Programme	Sanction Year	Location
20	5075	Establishment of Seed Technology Cell	1981	Directorate of Res., Junagadh
21	7082-A	National Agriculture Research Project	1987	Oilseed Res. Station, Junagadh
	7082-B	National Agriculture Research Project	1995	Dry Farming Research Station, Jam- Khambhaliya
	7082-B	National Agriculture Research Project	1988	Pearl millet Res. Stat., Jamnagar
	7082-C	National Agriculture Research Project	1982	Grassland Res. Stat., Dhari
22	9091	NARP Scheme Phase-II	1989	Cattle Breeding Farm, Junagadh
23	9091-9	NARP Scheme Phase-II	1989	Cattle Breeding Farm, Zonpur
24	5353	Livestock Research Station	1978	Cattle Breeding Farm, Junagadh
25	7253	Strengthening Research in Veterinary Science & Animal Husbandry	1986	
26	5302	State farm for Gir and Kankarej Cattle	1949	

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 the year *viz.*, *kharif* and *rabi* summer. The research programmes/works carried out in different schemes/projects are presented by scientists in the meeting. The power point presentations are made in the house for thorough discussion and refinement of each ongoing projects. In this meeting, more than 150 scientists from different disciplines as well as officers from line departments are participating and debating on 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 feedbacks well as overall agriculture situations in their regions. They also suggest the inputs for new area of research. It is the multidisciplinary task to evaluate the research results of different disciplines.

During the year 2015-16, four meeting of ZREAC were organized; two each at Junagadh and Targhadia. In both ZREAC meeting, one variety, 33 farmers' recommendations, 26 scientific recommendations and 124 new technical programmes were approved (Table 4.3). The feedbacks as well as suggestions were also received from the officers of line departments.

Table 4.3 Zonal Research Extension Advisory Committee (ZREAC) meeting organized during the year 2015-16

Meeting	Place	Date	No. of Participants	No. of Recommendations approved		New Technical Programmes
				Farmers'	Scientific	
North Saurashtra Agro-climatic Zones (Zone - VI)						
23rd ZREAC *(Rabi-summer)*	Targhadia	November 03, 2015	52	-	-	08
24th ZREAC (*kharif*)	Targhadia	February 04, 2016	47	02	02	11
South Saurashtra Agro-climatic Zones (Zone - VI)						
23rd ZREAC *(Rabi-summer)*	Junagadh	October 08-09, 2015	136	1*+12	06	56
24th ZREAC (*kharif*)	Junagadh	January 28-29, 2016	146	19	18	49
		Total		**1*+33**	**26**	**124**

*Variety released

Agricultural Research Sub Committee (AGRESCO - Discipline wise)

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

Table 4.4 Agricultural Research Sub Committees

Sub Committee	Subject areas 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	Fruits, Vegetables, Flowers and Spices
Agricultural Engineering	Soil & Water Engineering, Farm Machinery & Power, Renewable Energy & Rural Engineering, Processing & Food Engineering and Research, Training & Testing
Fisheries Science	Fisheries Resource Management, Post-harvest Technology, Aquatic Environment, Aquaculture, Fishery Hydrology and Fishery Engineering
Animal Science	Breeding, Animal Nutrition, Livestock Production & Management, Anatomy, Medicine & Surgery, Animal Genetics *etc.*
Basic Science	Biochemistry, Biotechnology, Plant Physiology and Seed Technology
Social Science	Agricultural Economics, Agricultural Extension Education, Agricultural Engineering Extension Education, Animal Husbandry Extension Education, Agricultural Statistics and Agri-business Management

The members of the committees are senior scientists of the university working in various departments/ projects, subjects 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 ensuring 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 are discussed critically. 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 2016 at Junagadh. Three new crop varieties, 30 farmers' recommendations, 34 scientific recommendations and 124 new technical programmes were approved. The reports of the work carried out at various research schemes of the university were also presented and approved.

Table 4.5 Various AGRESCO (Discipline wise) meetings organized during the year 2015-16

Sub Committee	Date	No. of Participants	No. of Recommendations		New Technical Programmes
			Farmers	Scientific	
Social Science	February 18-19, 2016	31	-	02	08
Animal Science	February 18-19, 2016	37	01	10	16
Fisheries Science	February 18-19, 2016	27	02	02	05
Agricultural Engineering	February 25-26, 2016	35	06	02	08
Basic Science	February 25-26, 2016	31	06	06	12
Horticulture & Agro Forestry	March 04, 2016	31	02	-	05
Plant Protection	March 04-05, 2016	40	03	07	37
Crop Production	March 10-11, 2016	44	10	05	28
Crop Improvement	March 10-11, 2016	45	3*	-	07
		Total	**3*+30**	**34**	**126**

*Variety released

Joint Agricultural Research Sub Committee (Joint AGRESCO)

Joint Agricultural Research Sub Committee meeting is held annually to discuss research proposals and results. The committee finalizes the old and new technical 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 ensuring 12th Combined Joint AGRESCO of State Agricultural Universities.

The 12th Joint AGRESCO meeting was held in the seminar hall of College of Agricultural Engineering & Technology, JAU, Junagadh on March 19, 2016 under the chairmanship of Dr. A. R. Pathak, Hon'ble Vice Chancellor, JAU, Junagadh. All AGRESCO conveners of various committees presented their reports and approved. Total 96 scientists of various disciplines and officers of line department of Gujarat states attended the meeting.

Table 4.6 12th Joint AGRESCO meeting of JAU organized during the year 2015-16

Sub Committee	No. of Recommendations		New Technical Programmes
	Farmers	Scientific	
Crop Improvement	3*	-	07
Crop Production	10	05	28
Plant Protection	03	07	36
Horticulture & Agro Forestry	02	-	04
Agricultural Engineering	05	03	07
Animal Science	-	11	16
Fisheries Science	02	02	05
Basic Science	03	09	12
Social Science	-	02	07
Total	**3*+25**	**39**	**122**

*Variety released

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 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 AGRESCO subcommittees and senior scientists of various disciplines of all State Agricultural Universities. Director of Agriculture, Director of Horticulture and Director of Animal Husbandry are the members of the committee. Hon'ble Minister of Agriculture & Cooperation, Govt. of Gujarat also attends the meeting. Separate sessions are organized discipline-wise, in which conveners of various AGRESCO subcommittee present the reports of their respective universities. In the concluding session, the conveners from each subcommittee 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 proce edings and supplied to the all concerned for implementation.

The 12th Combined Joint meeting of the Agricultural Research Council (AGRESCO) of State Agricultural Universities of Gujarat and Kamdhenu University was held at Navsari Agricultural University, Navsari during 11-13 April, 2016 under the Chairmanship of Dr. C. J. Dangaria, Hon. Vice Chancellor, NAU, Navsari. Shri. Mansinhbhai K. Patel, Chairman, Gujarat State Federation of Co-operative Sugar Factories ltd. Gandinagar graced the inaugural function as inaugurator and chief guest. Dr. A. R. Pathak, Hon'ble Vice Chancellor, JAU, Junagadh and Dr. N. C. Patel, Hon. Vice Chancellor, AAU, Anand were the guest of honor and Dr. R. A. Sherashiya, Director of Horticulture, Government of Gujarat was the special guest. Besides, Dr. A. N. Sabalpara, Director of Research and Dean PGS, NAU, Navsari and

Dr. G. R. Patel, Director of Extension Education, NAU, Navsari, Directors of Research of all SAUs, Principals and Deans of various faculties of SAUs, officers from Line Department of Gujarat state, the Associate Directors of Research, the conveners of different sub-committees of SAUs, the senior scientists/professors of SAUs attended the meeting.

Dr. A. R. Pathak, Hon. Vice Chancellor, JAU, Junagadh expressed his views on agriculture research and need for investment in agriculture research which has more returns than any other enterprise. He added that the challenges and problems faced by farmers should be at the focal point for undertaking research programmes. Considering the difficulty in unbiased biosafety testing in Genetically Modified crops, he recommended the use of Marker Assisted Selection as an option for GM crops, which is otherwise less exploited in SAUs. Further, he emphasized the need for undertaking research in frontier areas of nanotechnology, value addition in fruit crops, drip irrigation; especially in mango orchards, diversification in mango varieties and supply of organic inputs including seeds and proper demonstrations of organic farming to the farmers for the success of organic farming.

In the 12th Combined Joint AGRESCO meeting, three varieties *viz.* Wheat (GJW-463), Onion (GJWO 3 & GJRO 11) were recommended for release in the state. Besides, 24 technologies/ recommendations were made for farmers and 36 recommendations were made for scientific community. In addition, as many as 127 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.

All India Coordinated Research Projects (AICRP)

Apart from the mechanism of evaluating and monitoring the research programmes / schemes at university level; the projects sanctioned by ICAR, the annual workshop and review meetings in different universities in India are organized. 21 AICRP projects are operating in the university. The monitoring of the projects is also carried out by respective Project Director 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 infront of the quinquennial review team (QRT). All AICRP projects operating in the 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.

Table 4.7 Monitoring of AICRP trial at JAU, Junagadh

Name of Project	Department/ Research Station	Date of Monitoring team visit	Name and designation of member of monitoring
AICRP - Pearl millet	Pearl millet Research Station, JAU, Jamnagar	September 18, 2015	1. Dr. H. T. Patil, Prof. and Dr. P. P. Girase, Asstt. Prof., MPKV, Dhule 2. Dr. H. R. Bisnoi, Assoc. Res. Sci. and Dr. R. C. Meena, Asstt. Prof., Mandor, Jodhpur 3. Dr. B. S. Tandi, Professor (Ento.), RARI, SKNAU, Jaipur

Name of Project	Department/ Research Station	Date of Monitoring team visit	Name and designation of member of monitoring
AICCIP	Cotton Research Station, JAU, Junagadh	October 28, 2015	1. Dr. Amala Balu, Breeder, TNAU, Coimbatore 2. Dr. Aladakatti, Agronomist, UAS, Dharwad 3. Dr. B. Dhara Jothi, Entomologist, CICR, RS, Coimbatore
AICRP- National Seed Project (Crops) Seed Technology Research	Pearl millet Research Station, JAU, Jamnagar	November 02, 2015	1. Dr. P. K. Chandrakar, Principal Scientist, IGKVV, Raipur 2. Dr. Chunilal, Principal Scientist, DGR, Junagadh 3. Dr. D. T. Deshmukh, Nodal Officer, PDKV, Akola 4. Dr. R. A.Chauhan, Asstt. Res. Sci., NAU, Navsari
AICRP - Pearl millet	Pearl millet Research Station, JAU, Jamnagar	November 05, 2015	Dr. H. P. Yadav. Project Coordinator, Mandor, Jodhpur
AICRP - Pigeon pea	Pulses Research Station, JAU, Junagadh	November 10, 2015	Dr. I. P. Singh, Project coordinator (Pigeon pea), IIPR, Kanpur
AICRP - Castor	Main Oilseeds Research Station, JAU, Junagadh	December 11, 2015	1. Dr. Santhalakshmi Prasad, Principal Sci. (Patho.), IIOP, Hydrabad 2. Dr. S. S. Solanki Breeder, RAU, Mandor, Jodhpur
AICRP - Pigeon pea	Pulses Research Station, JAU, Junagadh	December 15, 2016	Dr. M. B. Sharma, Sr. Sci.; Mr. Akumla Longchar, Sci.; Dr. Parth Das, Sci.; Mr. Lowrence Kithan Sci. and Dr. Beman Dey, Sci., SASRD, Nagaland University, Medziphema
AICRP - Vegetable Crops	Vegetable Research Station, JAU, Junagadh	January 11, 2016	Dr. T. Chaubey, Sr. Scientist, Indian Institute of Vegetable Res., Varanasi
AICWIP	Wheat Research Station	February 12, 2016	1. Dr. P. C. Mishra, Principal Scientist, Powerkheda 2. Dr. A. P. Agarwal, Sr. Sci., Bilaspur 3. Dr. B. M. Patel, Assoc. Res. Sci., Vijapur 4. Dr. Pramod Prasad, Sr. Sci., Shimla 5. Dr. C. N. Mishra, Sr. Sci., Karnal
AICRP - Chickpea	Pulses Research Station, JAU, Junagadh	March 01, 2016	Dr. S. J. Singh, Director; Mr. O. P. Sarma, Sr. Sci. (Patho.) and Mr. Vipin kumar, Asstt. Res. Sci.(Ento.), RARI, Durgapura

Table 4.8 List of AICRPs functioning in the university (ICAR 75% & State Govt. 25%)

No.	Budget Head	Scheme	Sanction Year	Location
1	2002-00	AICRP on earl millet	1969	Pearl millet Res. Station, Jamnagar
2	2004-00	AICRP on Wheat	1987	Wheat Res. Station, Junagadh
3	2008-01G	AICRP on Groundnut	1987	Oilseed Res. Station, Junagadh
4	2008-1C	AICRP on Castor	1968	Oilseed Res. Station, Junagadh
5	20-1SM	AICRP on Sesame	1986	Agricultural Res. Station, Amreli
6	2009-00	AICRP on Cotton	1967	Cotton Res. Station, Junagadh
7	2013-01	AICRP on Vegetable	1988	Vegetable Res. Station, Junagadh
8	2258-D	AICRP on Farm Implements & Machinery	2015	Dept. of Farm Machinery & Power, CAET, Junagadh
9	2030-01	AICRP on Long Term Fertilizer Experiments	1999	Dept. of Ag. Chemistry & Soil Science, CoA, Junagadh
10	2040-00	AICRP on Cropping System Research (CSR sub centre)	1989	Department of Agronomy, CoA, Junagadh
11	2042-01	AICRP on Dry Land Agriculture	1971	Dry Farming Research Station, Targhadia
12	2076-02	AICRP on BSP-NSP Seed Technology Research	1984	Pearl millet Research Station, Jamnagar
13	2258-00	AICRP on Post-harvest Technology	1980	Dept. of Processing & Food Engg., CAET, Junagadh
14	2374-00	AICRP on Chickpea	1993	Pulses Research Station, Junagadh
15	2374-05	AICRP on Pigeon pea	2000	Pulses Research Station, Junagadh
16	2258-B	AICRP on Plasticulture Engineering & Technologies	2005	Dept. of Renewable Energy & Rural Engg., CAET, Junagadh
17	2258-A	AICRP on Ground Water Utilization	2004	Dept. of Soil & Water Engg., CAET, Junagadh
18	2305-03	Network Project on Buffalo at CBF	2001	Cattle Breeding Farm, Junagadh
19	2303-08	Gir Germ Plasm unit	2009	Cattle Breeding Farm, Junagadh
20	2303-09	Gir Data Recording unit	2009	Cattle Breeding Farm, Junagadh

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.

Table 4.9 List of Adhoc Research Projects functioning in the university

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
1	18008-43	Development and Promotion of Promising Varieties/ Lines with High Yield and High Oil Content with Enhanced O/L Ratio for Enhancing Production and Quality of Groundnut Oil in Drought-Prone Environments to Boost the Income of Small and Marginal Groundnut Farmers in India.	2011	ICRISAT, Hyderabad	Oilseed Research Station, Junagadh
2	18057	Harnessing Opportunities for Productivity Enhancement (HOPE) of Millet.	2009	ICRISAT, Hyderabad	Pearl Millet Res. Stat., Jamnagar/ Dept. of Economics, Junagadh
3	18005-10	Genetically Enhanced Micronutrient-Dense Pearl Millet Grains for Improved Human Nutrition in the India"	2010	ICRISAT, Hyderabad	Pearl Millet Research Station, Jamnagar
4	18246-99	Screening of High Biomass Populations Breeding Lines and Hybrids in Gujarat	2013	ICRISAT, Hyderabad	Pearl Millet Research Station, Jamnagar
5	18246-97	Multi location trial of Sorghum-2015	2015	ICRISAT, Hyderabad	Grassland Research Station, Dhari
6	18246-98	Heterotic Pool Formulation in Pearl millet	2015	ICRISAT, Hyderabad	Pearl Millet Research Station, Jamnagar
7	18053	Scheme for Creating Permanent Machinery for Studying the Cost of Cultivation/ Production of Principal Crops Grown in Gujarat State(Non Plan under DAG)	1984	DAG, Govt. of Gujarat	Dept. of Economics, CoA, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
8	18024-09	QTL Mapping and Development of SCAR marker for Fusarium wilt and Macrophomina root rot in Castor	2015	GSBTM, Govt. of Gujarat	Dept. of Biochemistry, CoA, Junagadh
9	18005-04, 05 &15	Agricultural Demonstration Activities in SSP Command Area Ph-II	2010	SSNNL, Govt. of Gujarat	DFRS, Jam Khambh-aliya/ Vallbhipur, Agri. School, Halwad
10	18311-12	Mapping and Marine Fish Biodiversity along the Veraval Coast Using mtDNA Barcoding.	2012	GSBTM, Govt. of Gujarat	College of Fisheries, Veraval
11	18019-04	Effect of sulphate of potash (SOP) with and without FYM on yield and quality of summer groundnut	2015	Gujarat Council of Sci.&Tech.	Dept. of Ag. Chem. & Soil Science, Junagadh
12	18005-18	Establishment of Model Organic Farm	2015	Director of Agri., GoG	Dept. of Agronomy, Junagadh
13	18005-01	Experimental Agro-met Advisory Services	1996	GOI	Dept. of Agronomy, Junagadh/ Dry Farming Res. Station, Targhadia
14	18126-02	Centrally Sponsored Scheme (Spices)	2006	GOI	Vegetable Res. Stat., Junagadh
15	18127-00	Seed Production in Agricultural Crops and Fisheries	2006	GOI	(Oilseeds-Megaseeds) Junagadh
16	18127-00	Seed Production in Agricultural Crops and Fisheries (Oilseeds-Megaseeds)	2006	GOI	(Oilseeds-Megaseeds) Junagadh
17	18803-01 to 12	Megaseed Revolving Fund	2006	GOI	(Oilseeds-Megaseeds) Junagadh
18	18804-01 to 04	Seed Production in Agricultural Crops	2006	GOI	(Oilseeds-Megaseeds) Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
19	18005-06	Forecasting Agricultural Output Using Space, Agro meteorology and Land Based Observations (FASAL)	2011	GOI	Dept. of Agronomy, Junagadh
20	18303-08	Strengthening of Feed Testing Laboratory at CBF	2013	GOI	Cattle Breeding Farm, Junagadh
21	18025-04	Effect of Optically Active Substances on Diversity in Phytoplankton Community Structure of Gujarat.	2013	GOI	Fisheries Research Station, Okha
22	18025-05	Ocean State Forecast Validation and Research (off Okha and Veraval coasts of Gujarat).	2013	GOI	Fisheries Research Station, Okha
23	18003-10	Utilization of Chickpea Genome Sequence for Crop Improvement	2014	GOI	Pulse Research Station, Junagadh
24	18246-94	Enzymatic pre-treatment in the processing of pigeon pea	2014	GOI	Dept. of PFE, CAET, Junagadh
25	18055	Estimation of Coconut Yield and Production in the State of Gujarat	2015	GOI	Dept. of Economics, JAU, Junagadh
26	2012	All India Network Research Project on Onion and Garlic	2009	ICAR-Network	Vegetable Res. Station, Junagadh
27	2030-2	Soil Test Based Fertilizers Application for Targeted Yield of Bt Cotton in Saurashtra region of Gujarat	2010	ICAR-Network	Dept. of Ag. Chem. & Soil Science, Junagadh
28	2042-02	National Initiative on Climate Resilient Agriculture-Dry land	2011	ICAR-Network	Dry Farming Res. Stat., Targhadia
29	2044-14	National Initiative for Climate Resilient Agriculture-Ground Water	2011	ICAR-Network	Dept. of SWE, CAET, Junagadh
30	2002-03	National surveillance programme for aquatic animal diseases	2013	ICAR-Network	College of Fisheries, Veraval
31	2002-5	Implementation of Protection of Plant Varieties and Farmer's Rights Legislation	2002	ICAR-Network	Pearl millet Research Station, Jamnagar

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
32	2305-05	National Initiative on Climate Resilient agriculture (NICRA)-Cattle.	2012	ICAR-Network	Cattle Breeding Farm, Junagadh
33	2027-04	Network Project on Market Intelligence.	2013	ICAR-Network	Dept. of Economics, Junagadh
34	2004-1	Project for Frontline Demonstration in Wheat		ICAR-Network	Wheat Research Station, Junagadh
35	2008-3	Project for Frontline Demonstration in sesame	2007	ICAR-Network	Agriculture Research Station, Amreli
36	2008-11	Need Based Research on AICRP on Castor	-	ICAR-Network	Oilseed Research Station, Junagadh
37	2008-12	Scheme for Breeder Seed Production of Oilseeds Crops ICAR Revolving Fund	2007	ICAR-Network	Oilseed Research Station, Junagadh
38	2009-1	Remittance of TMC-MM-1 (Cotton)	2007	ICAR-Network	Cotton Research Station, Junagadh
39	2009-6	Front Line Demonstration on cotton	2001	ICAR-Network	Cotton Research Station, Junagadh
40	2076-3	Central Sector Special Food Grain Production of Breeder Seed (Revolving Fund)	-	ICAR-Network	Pulse Research Station, Junagadh
41	2076-5	R & D efforts on Hybrid Selected Crops	2002	ICAR-Network	Pearl Millet Research Station, Jamnagar
42	2254	Study Storage Losses of Food Grains	2013	ICAR-Network	Dept. of PFE, CAET, Junagadh
43	2255	AICRP on GWU under TSP component	-	ICAR-Network	Dept. of SWE, CAET, Junagadh
44	2255-A	AICRP on PHT		ICAR-Network	Dept. of PFE, CAET, Junagadh
45	2256	Assessment of Harvest and Post-Harvest Losses of Major Crops	2013	ICAR-Network	Dept. of PFE, CAET, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
46	2259	Testing Fees for Conduct of AICMIP	2002	ICAR-Network	Pearl Millet Res. Stat., Jamnagar/ Agril. Res. Stat., Talaja
47	2374-1	FLD on Chickpea	-	ICAR-Network	Pulse Research Station, Junagadh
48	2374-6	FLD on Pigeon pea	-	ICAR-Network	Pulse Research Station, Junagadh
49	2504-00	Revolving Fund Horticulture (Nursery)	-	ICAR-Network	Dept. of Horticulture, Junagadh
50	2704-40	Project for Frontline Demonstration on Groundnut	1999	ICAR-Network	Oilseed Res. Station, Junagadh/ Agril. Res. Stat., Amreli
51	2704-43	Project for Frontline Demonstration in Pearl millet	1989	ICAR-Network	Pearl millet Research Station, Jamnagar
52	2002-07	Consortia Research Platform (CRP) on Biofortification	2014	ICAR-Network	Pearl millet Research Station, Jamnagar
53	2004-2	Shuttle breeding for developing wheat genotypes for warmer areas	2015	ICAR-Network	Wheat Research Station, Junagadh
54	18246-95	Initial varietal trial in Pearl millet &*Chenchrus setigerus* in kharif-2015	2015	ICAR-Network	Grassland Research Station, Dhari
55	2030-07	Transcriptone and proteome analysis for identification of candidate genes responsible for pistillate nature in castor	2015	ICAR-Network	Dept. of Biochemistry, Junagadh
56	2030-08	Transcriptone analysis in coriander for identification of candidate genes against stem gall disease	2015	ICAR-Network	Dept. of Biochemistry, Junagadh
57	2030-09	Genome and transcriptone sequencing of cumin (cuminum cyminum) to reveal insight of its genomic archeticulture	2015	ICAR-Network	Dept. of Biochemistry, Junagadh

4.3 Crop Improvement

4.3.1 New crop varieties

Three varieties *viz.* Wheat (GJW-436), Red Onion (GJRO-11) and White Onion (GJWO-3) were recommended for farmers of the state during 2015-16.

Wheat: Gujarat Junagadh Wheat 463 (GJW 463)

The wheat variety Gujarat Junagadh Wheat 463 has recorded 5575 kg/ha grain yield under early sown condition which was 28.1, 30.0, 21.7 and 12.9 per cent higher over check varieties GW 496 (3338 kg/ha), LOK 1 (4287 kg/ha), GW 366 (4565 kg/ha) and GW 190 (4938 kg/ha), respectively. Whereas, the proposed variety has recorded 5091 kg/ha grain yield under timely sown condition which was 13.4, 6.9, 1.1 and 6.2 per cent higher grain yield over check varieties GW 496 (4479 kg/ha), LOK 1 (4763 kg/ha), GW 322 (5037 kg/ha) and GW 366 (4792 kg/ha), respectively. It possesses amber seed like GW 496. This variety is tolerant against rust disease. The Gujarat Junagadh Wheat 463 wheat variety was approved for growing area of the state.

Red Onion: Gujarat Junagadh Red Onion-11 (GJRO-11)

The variety recorded bulb yield of 336.29 q/ha, which was 16.0, 27.3 and 21.3 per cent higher over check varieties, AGFL Red (289.9 q/ha), Pilli Patti (264.2 q/ha) and Talaja Red (277.3 q/ha), respectively. This variety was found less pungent (pyruvic acid, 1.22 µM/g) as compared to check varieties AGFL-Red and Talaja-Red and the bulbs of this variety were medium in size with flat globe shape and red in colour. The proposed variety was found good as compared to check varieties against diseases and insect-pest reactions. The proposal was approved by the house for South Gujarat too.

White Onion: Gujarat Junagadh White Onion-3 (GJWO-3)

The white onion variety recorded bulb yield of 398.06 q/ha, which was 20.8, 11.3 and 7.8 per cent higher over check varieties, PWF-131 (329.54 q/ha), GWO-1 (357.75 q/ha) and qualifying variety GAWO-2 (369.26 q/ha), respectively. The proposed variety bulbs contain higher total soluble solid (13.15%) as compared to check varieties *viz.,* PWF-131 (12.80%), GWO-1 (12.88%) and GAWO-2 (12.18%). Bolting per cent and jointed bulb per cent were less as compared to check varieties and the bulbs of this variety were medium in size with flat globe shape and white in colour preferred by industry. The proposal was approved by the house for whole Gujarat.

4.4 Crop Production

Recommendation for Farmers' Community

Nutrient Management

Effect of potassium fertilizer on castor hybrid

The farmers of South Saurashtra Agro-climatic Zone growing irrigated castor are recommended to apply potash @ 50 kg K_2O/ha (25 kg/ha as basal and 25 kg/ha at 45 days after sowing)

along with recommended dose of nitrogen and phosphorus (120-50 N-P_2O_5 kg/ha) for obtaining higher seed yield and net return.

Nutrient management in Bt cotton under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone (AES-10) growing Bt cotton are recommended to apply 20 kg P_2O_5, 40 kg K_2O and 20 kg sulphur (150 kg gypsum/ha) along with recommended dose of nitrogen (80 kg N/ha) for obtaining higher yield and net return as well as maintaining soil fertility under rainfed condition.

Effect of potassium and sulphur on growth and yield of wheat crop

The farmers of South Saurashtra Agro-climatic Zone growing wheat are recommended to apply 60 kg potash and 40 kg sulphur (through gypsum) per hectare as basal in addition to recommended dose of N and P (120-60 N-P_2O_5 kg/ha) to wheat crop for getting higher yield and net return.

Effect of multi-micronutrient formulations on okra

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* okra in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (150-50-50 N-P_2O_5-K_2O kg/ha) to okra for getting higher yield and net return.

Efficacy of multi-micronutrient formulations in improving crop production in Bt cotton

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton in medium black calcareous soil are recommended to apply micronutrients as per soil test value as basal in addition to recommended dose of fertilizers (240-50-150 N-P_2O_5-K_2O kg/ha) to Bt cotton for getting higher yield and net return.

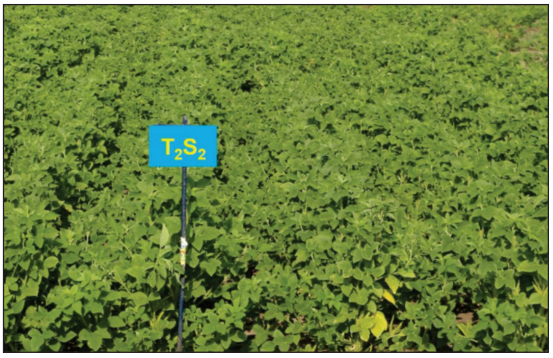
Alternatively, foliar spraying of multi-micronutrient formulation Grade IV (Fe-Mn-Zn-Cu-B, 4.0-1.0-6.0-0.5-0.5 %) @ 1% at 45, 60, 75 and 90 DAS in addition to recommended dose of fertilizers (240-50-150 N-P_2O_5-K_2O kg/ha) is recommended to Bt cotton for getting higher yield and net return.

Package of Practices

Effect of sowing time and spacing on summer cluster bean

The farmers of South Saurashtra Agro-climatic Zone growing summer cluster bean are

recommended to sow the crop in second week of February at 45 cm x 15 cm spacing for obtaining higher yield and net realization.



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

The farmers of South Saurashtra Agro-climatic Zone adopting groundnut (*kharif*)-chickpea (*rabi*) cropping sequence under organic farming are recommended to apply FYM (1.25 t/ha) + castor cake (139 kg/ha) to groundnut and vermin-compost (667 kg/ha) + castor cake (222 kg/ha) to chickpea in furrow before sowing for securing higher net realization and maintaining soil fertility.

Development of organic farming packages for system based high value crops (Groundnut-Onion)

The farmers of South Saurashtra Agro-climatic Zone adopting Groundnut (*kharif*) - Onion (*rabi*) cropping sequence are recommended to apply 50% RDF (6.25-25 N-P_2O_5 kg/ha) for groundnut and 37.5-60-50 N-P_2O_5-K_2O kg/ha for onion + 50% RDN as FYM to groundnut (1250 kg/ha) and onion (7500 kg/ha) for securing higher groundnut equivalent yield and net realization along with maintenance of soil fertility.

Farmers interested in adopting Groundnut (*kharif*) - Onion (*rabi*) cropping sequence under organic farming are recommended to follow nutrient management system as 50% RDN as FYM (1250 and 7500 kg FYM/ha for groundnut (*kharif*) and onion (*rabi*), respectively) + biofertilizer (*Rhizobium* / *Azotobacter* @ 1250 ml/ha) for N + rock phosphate to meet P requirement of crops (100 kg/ha in groundnut and 600 kg/ha in onion) + PSB (1250 ml/ha) for higher groundnut equivalent yield and net income along with maintenance of soil fertility.

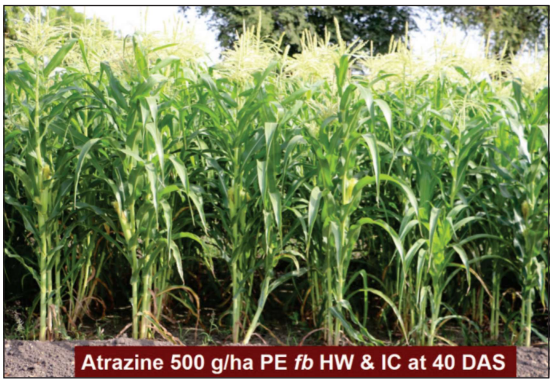
Identification of suitable row ratio for sesame with pigeon pea and soybean intercropping system

The farmers of North Saurashtra Agro-climatic Zone growing sesame with intercropping system in *kharif* are recommended to sow pigeon pea as an intercrop with sesame in the row ratio of 2:1 with 60 cm distance between two rows to get higher yield and net return.

Weed Management

Integrated weed management in summer sweet corn

The farmers of South Saurashtra Agro-climatic Zone growing sweet corn in summer season are recommended to apply atrazine 500 g/ha (50% WP 20 g/10 l) as pre-emergence followed by one interculturing and hand weeding at 40 DAS for effective weed management along with higher yield and net realization.



Recommendation for Scientific Community

Weed management in pre-monsoon groundnut

The effective weed management along with higher yield and net return from pre-monsoon groundnut can be achieved by pre-plant incorporation of pendimethalin 38.7% CS @ 0.75 kg a.i./ha followed by interculturing and hand weeding at 40 DAS under South Saurashtra Agro-climatic Zone.

Integrated weed management in *kharif* pearl millet

The application of atrazine @ 0.4 kg/ha as post emergence at two leaf stage of weed followed by one hand weeding at 35 days after sowing for effective weed management in *kharif* pearl millet was found as effective as pre-emergence application of atrazine @ 0.5 kg/ha followed by one hand weeding at 35 days after sowing under North Saurashtra Agro-climatic Zone.

Bio-efficacy of different herbicides for broad spectrum weed management in chickpea

The application of pendimethalin 30% EC 1.0 kg a.i./ha as a pre-emergence followed by hand weeding at 25-30 days after sowing gave higher yield with effective weed management in chickpea. However, pendimethalin 38.7% CS 1.0 kg a.i./ha as a pre-emergence followed by hoeing at 30-35 days after sowing found economical under South Saurashtra Agro-climatic Zone.

Soil test based fertilizer recommendation for targeted yield of pigeon pea crop

The nutrient requirements for production of one quintal pigeon pea seed was assessed as 6.09, 1.98 and 1.78 kg; N, P_2O_5 and K_2O, respectively. The fertilizer prescription equation are as: for N (FN: 5.46 T - 0.25 SN - 0.16 FYM), P (FP_2O_5:4.11 T - 1.34 SP - 0.15 FYM) and K (FK_2O : 11.93 T - 0.51 SK - 0.45 FYM) with FYM. Targeted yield concept could be effectively adopted to bring in site specificity in fertilizer use and achieve high yields of pigeon pea in the medium black calcareous soils of Saurashtra region of Gujarat.

Establishment of critical limit of sulphur for Bt cotton in medium black calcareous soils

The critical limit for sulphur application to Bt cotton crop grown on calcareous soils of Saurashtra, was found as 15 ppm in soil and 0.475 per cent in cotton plant at 60 DAS.

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 Farmers' Community

Plant Pathology

Management of alternaria leaf blight of groundnut

The farmers of south Saurashtra growing summer groundnut are advised to apply three sprays of mancozeb 75 WP 0.2% (27 g/10 liter of water) at 35, 50 and 65 days after sowing for effective and economical management of alternaria leaf blight of groundnut.

Refining integrated disease management in groundnut

The farmers of south Saurashtra growing *kharif* groundnut are advised to apply seed treatment with tebuconazole 25 WG @1.5 g/kg seed or seed treatment with Trichoderma viride 1% WP 10 g/kg seed, furrow application of T. viride at the time of sowing and broadcasting at 40 DAS @ 4 kg enriched in 50 kg FYM and two sprays of tebuconazole 25.9 SC @10 ml/ 10 l at 15 days interval from initiation of foliar disease for effective and economical management of collor rot, stem rot, tikka and rust disease.

Efficacy of seed dressing chemicals against wilt and root rot complex of cotton

The farmers of south Saurashtra are advised to treat the cotton seeds with a ready mixture of carboxin 37.5% + thiram 37.5% DS @ 3.5 g/kg seeds before sowing for economical and effective control of wilt and root rot complex and to improve seed cotton yield.

Recommendation for Scientific Community

Agricultural Entomology

Field efficacy of newer insecticides against sucking pests of cumin

Spray of imidacloprid 17.8 SL 0.004% (2.24 ml/10 l water) or spinosad 45% SC 0.009% (2.0 ml/10 l water) or acetamiprid 20% SP 0.004% (2.0 g/10 l water) at the appearance of pests was found effective and economical for control of aphids and thrips in cumin.

Residue was not detected in cumin at harvest of imidacloprid 17.8 SL 0.004% or spinosad 45% SC 0.009% or acetamiprid 20% SP 0.004%.

Management of sucking pests through seed treatments in cluster bean

Seed treatment with imidacloprid 600 FS @ 10 ml/kg seed or thiamethoxam 30 FS @ 10 ml/kg seed found effective and economical for control of whitefly of cluster bean var. Pusa Navbahar.

Field efficacy of newer insecticides against inflorescence pests of mango

For effective management of inflorescence pests of mango viz., hopper, thrips and flower bug, two sprays of spinosad 45 % SC 0.018% (4 ml/10 l water) or carbosulfan 25 % EC 0.05% (20 ml/10 l water) or acetamiprid 20 % SP 0.01% (5 g/10 l water) at 15 days interval starting from pests infestation were found effective.

Survey of various pests in mango orchard

The incidence of leaf gall midge, mango hopper, shoot borer and thrips were found enormously during the month of September to October, January to March, July to September and August to December, respectively.

Maximum population of leaf gall midge and mango hopper was noticed in Chalala and Mendarda area, while shoot borer and thrips were found maximum in Talala area of Saurashtra region.

Plant Pathology

Management of alternaria leaf blight of groundnut

Three sprays of difenconazole 25EC 0.025% (10 ml/10 l. of water) at 35, 50 and 65 days after sowing was found effective and economical for management of alternaria leaf blight of groundnut grown in summer season.

Integrated management for wilt disease of chickpea

Seed treatment of *Trichoderma harzianum* 1% WP @ 4 g/ kg of seed or carboxin 37.5 + thiram 37.5 DS (Ready mix Vitavex powder) @ 2 g/kg seed alongwith soil application of T. harzianum 1% WP @ 4.0 kg/ha at the time of sowing in furrow was found effective against chickpea wilt under irrigated condition.

Management of foliar and fruit spot diseases in bottle gourd

Four sprays of difenconazole 25 EC 0.025 % (10 ml/10 l. of water) or hexaconazole 5 EC 0.005 % (10 ml/10 l. of water) at 10 days interval after appearance of the disease was found effective and economical for management of foliar and fruit spot diseases of bottle gourd grown in *kharif* season.

4.6 Horticulture and Agro Forestry

Recommendation for Farmers' Community

Effects of chemical fertilizers and vermicompost on yield and quality of banana (*Musa paradisiaca* L.) cv. Grand Naine.

Farmers of South Saurashtra Agro - climate Zone cultivating banana cv. Grand Naine are

advised to apply total 300g nitrogen and 4kg vermicompost per plant in four equal split at 2nd, 3rd, 4th and 5th month after planting; along with recommended dose of phosphorus 90g and 200g potash per plant at 3rd month after transplanting, while 5 kg FYM as basal dose at transplanting for getting good quality, higher yield and higher return.

Feasibility of organic farming in coconut (*Cocos nucifera*) under saline water irrigation condition.

The farmers of South Saurashtra Agro-climatic Zone interested organic cultivation of coconut cv. West Coast Tall (WCT) are advised to apply FYM @ 60 kg per tree under saline irrigation (EC 10-14 dSm^{-1}) condition for obtaining higher return and improving soil fertility.

4.7 Agricultural Engineering

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

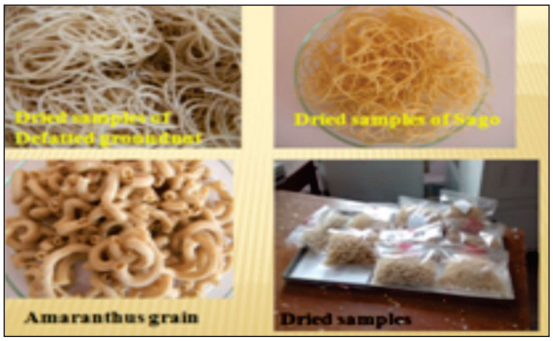
Recommendation for Farmers' Community

Evaluation of different mulches for Sapota crop under drip irrigation

Farmers of South Saurashtra Agro-climatic Zone growing sapota (*kalippati*) are advised to adopt drip irrigation (2 drippers per plant up to 2 years and after that 4 dripper per plant, dripper discharge of 4 lph) covered with black plastic mulch of 100 micron and irrigate every alternate day at 0.6IW/ETc (or apply water 14, 34, 48, 34, 8, 11 and 9 liters per day per plant during January-February, March-April, May, June, July-August, September-October and November-December, respectively) for acquiring higher yield and net return of sapota over no mulch.

Preparation of extruded products from flour of amaranth grain, sago and defatted groundnut.

Food processors are advised to prepare quality cold extruded pasta by blending defatted groundnut flour, amaranth flour and sago flour (as a binder) in the ratio of 20, 70 and 10 % respectively followed by sun drying for 14 hours in summer months or in solar cabinet dryer for 1hour at 55 ^{0}C. The product can be stored in transparent polyethylene (LDPE) bags of 75 micron to retain the good quality at least up to two months of storage period.



Development of power operated sapota cleaner.

The farmers are recommended to use power operated sapota cleaner developed by Junagadh Agricultural University for cleaning and shining sapota surface after harvesting. This machines saves 90 per cent cost of cleaning as compared to manual cleaning. Machine capacity is 575 kg/h.

Effect of different structures on protection of cumin crop against adverse climate.

The farmers of South Saurashtra agroclimatic zone are recommended to adopt plastic (LDPE-50 micron) low tunnel (sing tunnel size: 4x2x1m) covered with 30% shade net at both the ends for cultivation of cumin. This type of structure protects the crop from adverse climate, insects/pests, diseases and results in better quality and higher yield of cumin. It can be used for seed production also.

Recommendation for Scientific Community

Response of Groundnut to supplemental irrigation.

The farmers of North Saurashtra Agro-climatic Zone growing groundnut GG-20 are advised to apply supplemental irrigation at soil moisture deficit of about 40 % (about 20% soil moisture content) for obtaining higher productivity, maximum net returns and improving crop and field water use efficiency under dry farming conditions.

Performance of MIS in Canal Command Area.

- Irrigation planners are advised to use either the regression formula or ANN approach for determining seasonal runoff from the seasonal rainfall for Uben command area:

  $Y = 0.010X^{1.118}$, $R^2 = 0.754$..... and

  ANN model architecture 1 - 6 – 1 with $R^2 = 0.82$, $\eta_{model} = 80\%$
- Irrigation planners are advised to adopt the following optimal cropping pattern under surface irrigation system for Uben command area.
- Under surface irrigation system, 250 ha groundnut and 2250 ha green gram during the *kharif* season and 50 ha wheat and 1529 ha onion during the *rabi* season can be irrigated to get maximum return with cropping intensity of 163.15.
- Irrigation planners are advised to adopt the following optimal cropping pattern under drip irrigation system for Uben command area.
- Under drip irrigation system, 2475 ha groundnut and 25 ha green gram during the *kharif* season and 50 ha wheat and 1992 ha onion during the *rabi* season i.e. an additional 463 ha area can be brought under irrigation in *rabi* season by constructing 315 intermediate storage structures having 260 m3 capacity each to serve one chuck (8 ha area).

Type of Irrigation system in Command Area	Season	Crop	Crop Area (ha)	Cropping Intensity (%)	Remark
Surface	*Kharif*	Ground nut	250	163.15	—
		Green gram	2250		
	Rabi	Wheat	50		
		Onion	1529		
Pressurized	*Kharif*	Ground nut	2475	181.68	315 intermediate storage structures having 260 m^3 capacity (9m X 9m X 3.2m) each to serve a chuck of 8 ha area will bring additional area of 462 ha in Rabi season under irrigation
		Green gram	25		
	Rabi	Wheat	50		
		Onion	1992		

Assessment of microbial floral strength during post-harvest handling of mango, custard apple and lemon.

The presence of harmful fungus and bacteria during transportation stage was observed maximum amongst all stages of post-harvest handling in mango, custard apple and lime fruits and found increasing in subsequent stages. Therefore, farmers and traders are recommended to take control measures to check microbial growth prior to transportation.

4.8 Basic Science

Basic Science group consists of plant pathology, bio-chemistry and plant molecular biology are given here in.

Recommendation for farmers' Community

Effect of foliar spray of micro-nutrients on growth and yield parameters of summer groundnut

The farmers of South Saurashtra Agro-climatic Zone growing summer groundnut are advised to apply the foliar spray of zinc sulfate 0.5% (2.5 Kg ha-1 in 500 liter water) at 35 and 70 DAS for higher vegetative growth, pod yield and net return.

Effect of plant growth regulators and detopping on yield of Bt cotton (*Gossypium hirsutum* L.) under rainfed condition

The farmers of North Saurashtra Agro-climatic Zone growing Bt cotton in *kharif* season are advised for detopping at 75 DAS + spray of ethrel (Ethylene-39 %) 50 ppm (1.3 ml/10 liter water) at 90 DAS for obtaining higher yield and net return. This is due to higher values of tap root length, number of monopodia and number of sympodia per plant and improved quality of seed i.e. ginning percentage, increase uniformity ratio, elongicity percentage and tenacity.

Effect of plant growth regulators and detopping on morpho-physiological components of yield in cotton (*G. hirsutum* L.)

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton under irrigated condition are recommended for detopping the cotton plant at 75 DAS for balance growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increases in thickness of leaves, length, number of sympodia, plant spread and number of bolls.

Recommendation for Scientific Community

Effect of date of sowing and pre-treatment of seeds with GA3 on seed germination and seedling vigour of cumin (*Cuminum cyminum* L.)

It is informed to the scientific community that sowing of cumin seed in the third week of November along with pre-soaking treatment of 50 mg/l gibberellic acid (GA_3) for12 hrs to cumin seed at ambient temperature increases germination with enhanced seedling vigour in cumin.

The study of fresh seed dormancy in sesame

It is informed to scientific community that the fresh seed dormancy of sesame variety G Til-10 is broken after storage for a month (30 days) after harvest followed by drying, this increases the seed germination percentage and seedling vigour.

Effect of plant growth regulators and detopping on morpho-physiological components of yield in cotton (*G. hirsutum* L.)

The scientific community is informed for detopping the cotton plant at 75 DAS with foliar spray of growth inhibitor maleic hydrazide (MH)* 30 ppm (0.3g /10 lit. water) at 90 DAS for balance growth to obtain higher seed cotton yield and net return. This is due to high chlorophyll content, increases in thickness of leaves, length, no. of sympodia, plant spread and no. of bolls.

*Use of MH is banned by Government of India.

The effect of storage conditions, packing materials and seed treatments on viability and seedling vigour of onion (*Allium cepa* L.) seeds

It is informed to scientific community that onion seed may be stored in cold storage (70^0 C + 20^0 C) condition packed with cloth bag or polythelene bag (500 gauge) with seed treatment (Carbendazim 2g/kg seed or mancozeb 2g/kg seed or thirum 3g/kg seed or neem leaf powder 10g/kg seed) or without seed treatment for a period of two years without deterioration in germination and seedling vigour.

Seed viability in soybean (*Glycine max* (L.) Merr.) under different storage conditions and seed treatments

It is informed to scientific community that soybean seed may be stored under cold storage (70^0 C + 20^0 C) condition in cloth bag with seed treatment of mancozeb 2g/kg seed or carbendazim 2g/kg seed or neem leaf powder 10 g/kg seed for a period of two years without deterioration in germination and seedling vigour.

Qualitative and quantitative evaluation of seed vigour and viability by Tetrazolium test in pearl millet [*Pennisetum glaucum* (L.) R. Br.]

It is informed to scientific community that pearl millet seed may be stored in air tight plastic containers for a period of 16 months without deterioration in germination seedling vigour.

Performance of neem products on the storability of mungbean [*Vigna radiata* (L.) Wilczek]

It is informed to scientific community that mungbean seed may be stored in normal condition packed in HDPE bags (500 gauge) with seed treatment of cloth bag or polythelene bag (500 gauge) with seed treatment (Neem seed kernel powder 5 to 10 g/kg seed or neem cake 5–10 g/kg seed) for a period of two years without deterioration in germination and seedling vigour.

4.9 Veterinary Science & 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 300heads 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 20,087 for Gir bulls and 37,403 for Jaffrabadi bulls. During the year 2015 total 45,511 frozen doses from Gir bulls and 44,836 frozen semen doses from Jaffrabadi bulls were produced at the semen station at Cattle Breeding Farm. Out of these 3715 doses of Gir were used for AI in field, 665 doses were used for AI on farm and 1130 doses were sold to AI workers. Similarly for Jaffrabadi buffaloes 6070 doses were used for AI in field, 110 doses were used for AI on farm and 50 doses of Jaffrabadi bulls, were sold to AI workers. At the end of the year 2015 total 60088 frozen semen doses of Gir and 76009 frozen semen doses of Jaffrabadi buffalo are in stock and available for sale. 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.

During the year 2015 in all 22 Gir breeding bull calves were distributed among various Grampanchayat for breeding the rural Gir population. Similary during the year 31 Jaffrabadi growing males were sold to the different Grampanchayat for breeding the Jaffrabadi buffaloes. In the area under operation of these centers 3920 Gir daughter calves and 5976 Jaffrabadi Buffaloes female calves, were born till date. These calves are breed specific and excellent genetic worth to farmers in increasing milk production in the region.

Table 4.10 Performance of Gir and Jaffrabadi herds at CBF during the year 2015

Sr. No.	Particulars	Gir herd	Jaffrabadi herd
1	Total Lact. Milk yield (lit.)	2544	2151
2	300 D. Milk yield (lit.)	2052	1880
3	Lactation days	366	342
4	Dry days	76	152
5	Calving interval (days)	450	480
6	Age at 1st Calving (days)	1407	1597
7	Service period (days)	176	167
8	No. of service / AI / Conception	1.7	1.47
9	Overall mortality (%)	3.3	3.3

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

Sr. No	Name of Cow	B. No.	Order of Lactation	300 D Milk Yield (lit.)
1	Tara	47/94	3	3500.0
2	Sapana	89/97	3	3545.0
3	Mala	17/08	1	2711.0
4	Simran	52/08	1	2509.0
5	Patanjali	70/06	1	3376.0
6	Putali	33/00	6	3257.3
7	Parita	65/01	3	3248.0
8	Shobhana	53/00	3	2723.3
9	Bhairavi	71/00	3	2581.8
10	Shilpi	59/01	1	2991.2
11	Panchakali	15/02	2	2964.5
12	Charulata	69/02	2	3013.9
13	Gunjan	31/02	3	3475.4
14	Devi	37/04	2	2989.6
15	Diwali	69/04	4	2870.8
16	Kiran	38/04	4	3837.5
17	Hiren	51/05	2	3764.6
18	Pinki	27/04	2	2776.2
19	Virani	44/03	2	3356.7
20	Mumta	77/03	2	3501.6
21	Dulari	82/05	2	2585
22	Parinita	26/08	2	2599.2
23	Monalisa	29/09	1	2963.6
24	Mona	65/04	1	2510.8
25	Uday	19/04	1	3061.2
26	Prasana	90/06	2	3032.2
27	Chandra	47/04	3	3012.2
28	Sunidhi	120/05	3	3476.1
29	Shivani	56/06	3	3319.1

Table 4.12 Semen doses available for sale and distribution

Sr. No.	*Gir* Bulls		*Jaffrabadi* 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	15998
4	Pankaj	3505	Haresh	1790
5	Bhola	2014	Sundar	3014
6	Raj	2834	Raja	4965
7	Sarang	6586	Nagraj	3339
8	Krishna	70	Dhinglo	11649
9	Milan	6232	Bholenath	1839
10	Shiv	230	Nayan	8484
11	Umang	6526	Madhav	7269
12	Damodar	8364	Abhijeet	4655
13	Baladev	4960	Ronak	2650
14	Bhagirath	6165	Alok	95
15	Savan	4231	-	-
16	Sahadev	885	-	-
17	Hatim	4624	-	-
18	Paras	510	-	-
	Total	**60088**	**Total**	**76009**

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 Panchayst 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 1909 farmers, 544 women farmers, 75 extension workers

visited this station and were provided technical guidance.

During the year 2015, Mini Cattle Feed Plant (Roughage Processing Plant and Block making machine) produced 57,100 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 enrich pelleted Cattle Feed.

During the year 2015, a unit of vermin-compost was established under which 10 beds were constructed. The production of vermin-compost has been started from December 2015. Similarly cow urine unit have also been established to cater the need of the different research stations for conducting experiments on organic farming.

Recommendation for Scientific Community

Preliminary evaluation of antibacterial activity of extracts of *Cassia auriculata, Prosopisjuliflora* and *Annona squamosa*

Alkaloid rich fractions of *Prosopis juliflora* leaves can be a good drug entity against resistant bacteria due to its antibacterial property against various bacteria including Methicillin-Resistant *Staphylococcus aureus.*

Survey on indigenous plants use for medicinal purpose in animals in Junagadh region

Farmers of Junagadh, Mendarda and Vanthali taluka are commonly using *Adansonia digitata* (Gorakh ambli) for gastric problems, *Elephantopus scaber* (Ghaa Jadvu) and *Clerodendrum phlomidis* (Arni) for wound healing, *Psoralea corylifolia* (Baauchi) for skin infection, *Enicostemma littorale* (Mamejvo) for internal parasites and *Tecomella undulata* (Ragat rohido) for fracture healing in animals.

Assessment of Blood cells' Immunocompetence around Parturition in Gir cows and Jaffarabadi buffaloes

During peripartum period phagocytic activity and lymphocyte proliferation responses are lower in Gir cows as compared to Jaffarabadi buffaloes.

Haemato-biochemical profiles of horses in and around Junagadh

In Kathiawari horses, total granulocyte per cent and MCHC (g/dl) are higher in females and lymphocyte per cent higher in males.

Diagnosis of *Babesia bigemina* and *Trypanosoma evansi* in bovines in and around junagadh: traditional vs molecular detection and assessment of risk factors

In cattle and buffaloes PCR is the most effective technique in diagnosis of subclinical and latent infections of *Babesia spp.* (Sensitivity, 100%; Specificity, 82.90%) and *Trypanosme spp.* (Sensitivity, 100%; Specificity, 95.92%).

Study of parasitic infections/infestations in animals presented at TVCC, Junagadh

The major parasites recorded in domesticated animals in and around Junagadh are as below:

Name of Parasite	Animal species
Buxtonella sulcata, *Eimeria* spp., *Fasciola gigantica, A*mphistomes, *Babesia* spp.	Cattle , Buffaloes
Eimeria spp.	Goat, Bird
Strongyle , *Babesia* spp.	Horse
Hook Worm, *Babesia* spp., Demodex	Dog
Trypanosoma evansi	Camel

Effect of replacement of graded levels of maize with raw and detoxified mango seed kernel (*Mangifera indica*) in conventional concentrate mixture on *in vitro* rumen fermentation pattern

Total phenol content in raw mango seed kernels is reduced by 60.00 per cent and 70.40 per cent by boiling in water and treatment with 1.00 per cent calcium hydroxide, respectively. Based on *in vitro* studies, treated mango seed kernel can replace 100 per cent maize in ISI grade-II concentrate mixture for cattle.

Aetio-Pathological studies on broiler mortality in and around Junagadh

E. coli infection is the major cause (31.21 per cent) of mortality in broilers of 16-30 days (22.55 per cent) during winter (22.40 per cent) in and around Junagadh.

Study on Postnatal Development of Adrenal Gland in Gohilwadi Goat (*Capra hircus*)

Adrenal gland of day old Gohilwadi kid has definite foetal, cortex and medulla, while adult adrenal exhibits the structures of typical zones of cortex and medulla. Width of definite cortex increases, while that of foetal zone decreases with increasing age.

4.10 Fisheries Science

Recommendation for Fish Farmers

Study of density dependent growth and survival of Macrobrachium rosenbergii (scampi)

Fish farmers are recommended to stock freshwater prawn Macrobrachium rosenbergii (Scampi) seeds @ 20,000 per hectare in grow-out ponds for obtaining better growth, survival rate and economic returns.

Aspects of biology and fishery of Scylla serrata and Portunuspelagicus in and around Sikka

Fishermen community engaged in Crab fishing are advised to avoid capture of berried female Crabs having orange, greenish, brownish or blackish eggs for sustainable Crab resource.

Recommendation for Scientific Community

Impact of insectivorous Birds on Fish Drying Grounds at Veraval

Fishes dried on open grounds during the fishing season are infested with maggots and adults of technids fly attracting of several insectivorous birds especially cattle egret, which play an important role in the natural control of the infested pests.

Study of seaweed diversity at selected intertidal areas of Saurashtra and Diu (UT)

In the coastal belt of Saurashtra and Diu, 117 seaweed species are available (Intertidal and drifted) of which 38 Chlorophyceae, 34 Phaeophycea and 45 species of Rhodophyceae are found during September to April. The economically important species from Chlorophyceae group are 14, Phaeophyceae group 07 and Rhodophyceae group 15.

4.11 Home Science / Social Science

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

Agricultural economists worked on different research projects *viz.* farm cost studies of important crops in Gujarat state, economic analysis of groundnut productivity differentials in Saurashtra region of Gujarat, economic analysis of coconut in Saurashtra region of Gujarat state, scheme for creating a permanent machinery for studying the cost of cultivation/ production of principal crops in Gujarat state and network project on market intelligence. Price forecast reports of different crops *viz.* groundnut, cotton, castor, cumin, maize, potato and arhar were published in 50 clippings of leading newspapers 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., Ahmedabad. 13 messages of price forecast have been disseminated during February to November, 2015, which accounts to a total of 9,32,555 voice mail sms.

Recommendation for Scientific Community

An Economic Analysis of Groundnut Productivity Differentials in Saurashtra Region of Gujarat

Increase in the frequency of contact of extension functionaries with farmers throughout the crop season for crop specific information would reduce the productivity differences in groundnut crop. Increase in provision of incentives is needed for mechanization, micro irrigation system and to develop the assured irrigation sources to boost up the productivity. The availability of institutional credit should increase adequately to adjust the prevailing inflation level to enhance the productivity level.

Effective Number of Replications for Field Experiment on Wheat Crop in Saurasthra (Triticum aestivum L.)

For effective control of soil variation, an experiment plot having 12 basic units each of 0.90 m2 with size 4.0 m x 2.7 m (4x3 units) were found optimum with minimum 2 replications are recommended for scientific community to conduct field experiment on wheat crop at Junagadh. Accepted by the house

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 4.13 Production of truthful seeds of field crops under mega seed project during the year 2015-16

Sr. No.	Crops	Production (q)
1	Groundnut	836.77
2	Chickpea	202.50
3	Sesame	73.40
4	Wheat	1250.20
5	Cotton	20.00
6	Castor	20.00
7	Cumin	18.00
8	Coriander	112.50
9	Soybean	66.74
10	Mung bean	16.29
11	Urdbean	49.76
12	Pigeon pea	133.00
13	Sugarcane setts	1742.00
14	Fenugreek	00.40
15	Garlic	56.00
16	Onion	40.00
17	Fennel	03.00
18	Papaya seeds	0.52
19	Sunhemp	10.59
20	Dhaincha	0.17
21	Vegetable seeds	13.25
	Total	**4665.07**

Table 4.14 Production of planting material of horticultural and other crops during the year 2015-16

Sr. No.	Planting Material	Production (Nos.)
1	Fruit crop graft	9974
2	Fruit crops saplings	19,407
3	Seedlings	75567
4	Ornamentals	25441
5	Medicinal plants	7000
	Total	**1,37,986**

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 ensuring season.

Table 4.15 Production of Nucleus / Breeder Seeds during the year 2015-16

Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total (q)
				National	State	
1	Groundnut	GG-2	-	-	106.75	106.55
		GG-5	0.30	-	24.60	24.90
		GG-7	1.80	-	15.00	16.80
		GG-8	0.60	15.60	-	16.20
		GJG-9	1.90	25.80	54.90	82.60
		GJG-31	-	25.50	14.40	39.90
		GG-20	8.00	-	1487.15	1495.15
		GG-21	-	19.50	-	19.50
		GJG-22	2.60	-	152.46	155.06
		GJGHPS-1	0.30	-	20.70	21.00
		GG-11	0.60	-	43.20	43.80
		GG-16	2.80	4.80	-	7.60
		GJG-17	0.60	-	44.25	44.85
		GAUG-10	-	-	26.10	26.10
		Sub Total	**19.50**	**91.20**	**1989.31**	**2100.01**
2	Pearl millet	Hybrid seeds	-	-	7.70	7.70
		Parent seeds	-	-	0.99	0.99
		Sub Total	**-**	**-**	**8.69**	**8.69**
3	Sesame	G.Til-1	0.10	0.10	1.40	1.60
		G.Til-2	0.45	0.70	3.32	4.47
		G.Til-3	0.15	1.00	8.24	9.39
		G.Til-4	0.07	0.42	2.58	3.07
		G.Til-10	0.20	5.00	4.40	9.60
		Purva	0.02	-	0.35	0.37
		Sub Total	**0.99**	**7.22**	**20.29**	**28.50**
4	Chickpea	GG 1	1.25	16.50	14.00	31.75
		GG 2	4.13	8.00	12.53	24.66
		GJG 3	2.72	26.00	32.75	61.47
		GG 4	3.35	32.77	-	36.12
		Sub Total	**11.45**	**83.27**	**59.28**	**154.00**
5	Wheat	GW 366	13.50	129.40	13.00	155.90
		LOK-1	-	-	78.00	78.00
		GW-496	-	-	36.40	36.40
		Sub Total	**13.50**	**129.40**	**127.40**	**270.30**
		Grand Total	**45.44**	**311.09**	**2204.97**	**2561.50**

4.13 Others

4.13.1 Front Line Demonstration (FLD) conducted on farmers' field during the year 2015-16

Crop scientists have successfully organized front line demonstration on farmers' fields in addition to the FLDs organized by KVKs of JAU.

Table 4.16 Summery of information of Improved Varieties during the year 2015-16

Sr. No.	Crop	Improved variety	No. of FLDs	Total area under FLD (ha)	Yield in IP (q/ha)	Yield in FP (q/ha)	Increase in yield (%)
1	Groundnut	GJG-22	6	2.40	20.75	19.17	8.35
		GJG-31	5	2.00	25.15	23.25	8.17
2	Wheat	DBW-110	10	10	50.35	47.55	5.56
3	Vegetable & Spices	Gujarat Coriander-2	10	4.0	12.84	10.68	20.27
		Gujarat Fenugreek-2	1	0.4	15.00	13.00	15.38
		Guj. Cumin-4	4	1.60	11.29	9.45	19.44
		Guj. Garlic-4	3	1.20	75.23	67.67	11.18
		Guj. Ajwan-2	1	0.4	8.70	7.50	16.00
4	Pearl millet	GHB 538	11	05.50	38.55	36.80	4.77
		GHB 558	49	24.50	34.82	32.95	4.60
		GHB 732	48	24.00	39.82	38.07	4.62

Table 4.17 Summery of Information of Improved Technology during the year 2015-16

Sr. No.	Crop / other	Improved technology	No. of FLDs	Total area under FLD (ha)	Yield in IP (q/ha)	Yield in FP (q/ha)	Increase in yield (%)
1	Groundnut	Whole package	24	9.6	22.66	20.55	10.27
		Crop Production	5	0.50	19.17	16.16	18.84
2	Castor	Whole package	15	6.00	34.95	29.48	18.60
3	Wheat	Crop Production	5	0.50	58.86	48.76	21.23
4	Pigeon pea	Crop Production	13	2.08	19.77	15.85	24.81
		Package Technology	10	10	12.50	10.42	20.00
5	Chickpea	Package Technology	15	15	15.56	12.83	14.19
6	Cotton	ICM	50	20	19.95	18.06	10.92
7	Sesame	Whole package	14	5.60	10.26	7.60	35.10
8	Groundnut + Pigeon pea	Intercropping	10	4.00	30.17	16.83	80.13
9	Castor + Groundnut	Intercropping	10	4.00	49.22	23.44	110.0

Note: Improved technology includes crop production, plant protection, horticulture, fisheries, animal science, basic science, social science and agricultural engineering

4.13.2 Production of *Sawaj* brand bio-agent

The department of Plant Pathology has produced and provided *Sawaj* brand produces like *Rhizobiu, Azotobacter* and PSB liquid bio-fertilizer to the State Department of Agriculture for distribution to farmers as an integrated part of Krushi Mahotsav kits and sold directly to farmers at reasonable price. The department has also produced and distributed bio-agent *Trichoderma harzianum* under the brand name *Sawaj-Trichoderma* for the management of various soil borne disease especially stem and pod rot of groundnut in the Saurashtra region.

Table 4.18 Production of *Sawaj* brand bio-agent and liquid bio-fertilizer during the year 2015-2016

Sr. No	Name of Product	Quantity
1	*Sawaj-Trichoderma* (Kg)	58262
2	*Sawaj-Rhizobium* (Bottle- 500 ml)	2520
3	*Sawaj-Azotobacter* (Bottle- 500 ml)	2857
4	*Sawaj*-PSB(Bottle- 500 ml)	4552

4.13.3 Commercial products of bio-control

During the year 2015-16, various microbial agents e.g. viruses, bacteria, fungi, protozones and nematodes are being used in IPM programme. Among viral pathogens, nuclear polyhedrosis viruses of *Helicoverpa* (*Ha*NPV), *Spodoptera* (*Sl*NPV), entomopathogenic fungi *Beayveria bassiana,* Trichocard, fruit fly trap and fruit fly lure are widely used for insect control. These pathogens are highly specific to their host and being considered environmentally safe.

Table 4.19 Production of microbial agents, fruit fly traps & fruit fly lure during the year 2015-16

No.	Name of product	Quantity
1	*Beauveria* (kg)	37110
2	HNPV (bottle 250 ml)	173
3	SNPV (bottle 250 ml)	158
4	Trichocard (Nos.)	1802
5	Fruit fly traps (Nos.)	1913
6	Fruit fly lure (Nos.)	2632

Table 4.20 Fisheries Production during the year 2015-16

Research Station	Particulars	Nos.
Fisheries Research Station, JAU, Sikka	Seed of pearl oyster (D stage larvae)	13.2425 crore

Table 4.21 Analysis of Soil & Irrigation Water Sample during the year 2015-16

Name of Research Station/ Department	Number of Samples	
	Soil	Irrigation Water
Department of Agriculture Chemistry & Soil Science	3446	3062
Department of Biochemistry	295	130
Main Dry Farming Research Station, Targhadia	75	50
Krishi Vigyan Kendra, Amreli	413	33
Total	**4229**	**3275**

Table 4.22 New research programmes sanctioned during the year 2015-16

Sr. No.	Agency	No. of Research Programmes	Amount (Rs. In Lakh)
1	ICAR	05	277.28
2	Govt. of India	02	13.28
3	Govt. of Gujarat	01	04.57
4	Other Agencies	23	129.92
5	ICRISAT	01	01.00
	Total	**32**	**426.05**

4.13.14 RKVY Project

One project under RKVY was implemented in Junagadh Agricultural University during the year 2015-16 as per details given below:

Project-1: Production of groundnut breeder seed at farmers' field

Physical Progress:

- Breeder seed programme of groundnut variety GG-20 and GJG-22 were taken in 76.00 and 5.00 acres respectively at farmers' fields during *kharif*-2015.
- Total 775.60 quintal of groundnut breeder seeds was produced under the project.

Financial Progress:

- The assistance has given Rs. 900 per quintal breeder seed procured.
- Out of fund allocation 7.20 lakh, the expenditure incurred 6.98 lakh during 2015-16 under the project.

Online HRD Programme

It is recommended to Staff members of JAU to use the online HRD programme developed by Junagadh Agricultural University to obtain the permission from concerned authority for participating or attending the programmes as per statute 121 Item No. 28.