

RESEARCH



Chapter - 4





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. V. P. Chovatia, Hon'ble Vice Chancellor monitored and guided the research activities during the reporting period. The 20th Research Council meeting was organized on January 29, 2024 for approval of new research programs and research activities during the year.

Table 4.1: Members of 20th Agricultural Research Council meeting

Sr. No.	Name and Designation	Position
1	Dr. V. P. Chovatia, Hon'ble Vice Chancellor	Chairman
2	Dr. R. B. Madariya, Director of Research & Dean, P.G. Studies	Member Secretary
3	Dr. N. B. Jadav, Director of Extension Education	Member
4	Dr. S. J. Solanki, Director of Agriculture, GoG, Gandhinagar	Member
5	Dr. P. M. Vaghasiya, Director of Horticulture, GoG, Gandhinagar	Member
6	Dr. F. S. Thakar, Director of Animal Husbandry, GoG, Gandhinagar	Member
7	Dr. P. D. Kumawat, Principal & Dean, College of Agriculture	Member
8	Dr. P. M. Chauhan, Principal & Dean, College of Agril. Engg. & Technology	Member
9	Dr. C. D. Lakhani, Principal, PGIABM	Member
10	Dr. D. K. Varu, Principal & Dean, College of Horticulture	Member
11	Dr. V. D. Tarpara, Associate Director of Research, JAU, Junagadh	Member
12	Dr. B. D. Savaliya, Associate Director of Research, JAU, Junagadh	Member
13	Dr. D. S. Hirapara, Associate Director of Research, JAU, Targhadia	Member
14	Dr. V. D. Tarpara, Convener-Social Science Subcommittee	Member
15	Dr. D. S. Kelaiya, Convener-Plant Protection Subcommittee	Member
16	Dr. D. K. Varu, Convener-Horticulture & Forestry Subcommittee	Member
17	Dr. R. M. Javiya, Convener-Crop Improvement Subcommittee	Member
18	Dr. H. D. Rank, Convener-Agril. Engineering Subcommittee	Member
19	Dr. P. D. Kumawat, Convener-Crop Production Subcommittee	Member
20	Dr. H. P. Gajera, Convener-Basic Science Subcommittee	Member
21	Dr. V. V. Rajani, Retired Research Scientist	Member
22	Dr. J. H. Vachhani, Retired Research Scientist	Member
23	Dr. M. G. Valu, Research Scientist (Cotton)	Member
24	Dr. A. G. Pansuriya, Associate Research Scientist (Wheat)	Member
25	Dr. R. M. Javia, Associate Research Scientist (Pulse)	Member
26	Dr. D. M. Jethava, Associate Professor, CoA, Junagadh	Member
27	Dr. G. V. Prajapati, Research Scientist (RTTC)	Member
28	Shri Nileshbhai Oghadbhai Dobariya, At- Boriya, Ta.- Jam Kadorana, Dist.- Rajkot	Member

4.2 Planning and Monitoring

4.2.1 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 discussion between the scientists and the Director of Research in two meetings held during the month of November-2023 and February-2024 for evaluation of expenditure of planned schemes and reallocation of the funds, etc.

4.2.2 State Programs

Monitoring of research work is done through a defined 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 and Associate Directorate of Research, Junagadh & Targhadia

coordinate, monitor and supervise the implementation of research programs 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 Action Committee (two zones), twice in a year, 2) Agricultural Research Subcommittee (seven discipline wise), 3) Joint Agricultural Research Subcommittee (one for all disciplines) and 4) Combined 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 programs, 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 4.2.1: 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	Pulses 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 Research Station, Junagadh and Agril. Research Station, Amreli and 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 Soil Science & Agri. Chemistry, Junagadh
8	12044-01	Research in Bio-technology	1995	Dept. of Biochem., Junagadh





Sr. No.	Budget Head	Scheme Name	Sanction Year	Location
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 Genetics & Plant Breeding, Junagadh
11	12094-00	Research for integrated pest mgmt. in fruit crops	1997	Dept. of Ento., Junagadh
12	12095-00	Strengthening of horticulture research & development activities	1997	Dept. of Horticulture, Junagadh
13	12096-00	Res. on micro irrigation system in Saurashtra region	1997	Dept. of Agronomy, Junagadh
14	12131-00	Research on eco-friendly biological fertilizer	1997	Dept. of Plant Pathology, Junagadh
15	12712-5B	Campus development program (on campus)	2004	Directorate of Res., Junagadh
16	12903-00	Establishing of organic farming cell at Junagadh	2000	Dept. of Agron., Junagadh
17	12905-00	Proposal for research on watershed management	2000	MDFRS, Targhadia; GRS, Dhari & Dept. of SWCE, CAET, Junagadh
18	12907-00	Strengthening of agro-meteorology at JAU	2000	Dept. of Agron., Junagadh
19	12930-00	Establishment of new sub-center for research on cumin	1998	Polytechnic in Agriculture School, Halvad
20	12931-00	Establishment of new research centre on onion crop	2003	Vegetable Research Station, Junagadh & FRS, Mahuva
21	12573-00	Research on tillage technology	2006	Dept. of Agron., Junagadh
22	12574-00	Research on rejuvenation of degraded coastal agro-eco systems of Saurashtra	2006	Research Training & Testing Centre, Junagadh
23	12575-00	Strengthening research in sesamum	2006	Agril. Res. Station, Amreli
24	12101-00	Strengthening of centre of excellence on soil and water management	2006	RTTC, Junagadh; MDFRS, Targhadia; ARS (FC), Mahuva & FRS, Mangrol
25	12576-00	Research on post-harvest technology of important crops of Saurashtra	2006	Dept. of Processing & Food Engg., CAET, Junagadh
26	12582-00	Strengthening of research on genetically modified cotton	2009	Cotton Research Station, Junagadh



Sr. No	Budget Head	Scheme Name	Sanction Year	Location
27	12583-00	Strengthening of wheat research	2009	Wheat Res. Stat., Junagadh
28	12584-00	Strengthening research on castor	2009	Main Oilseeds Research Station, Junagadh
29	12585-00	Strengthening research in sugarcane	2009	Sugarcane Research Station, Kodinar
30	12586-00	Strengthening of research in plantation and fruit crops at A.R.S. (Fruit crops)	2009	Agricultural Research Station (FC), Mahuva
31	12587-00	Conservation of plant biodiversity	2009	Dept. of Genetics & Plant Breeding, Junagadh
32	12588-00	Development of arid and semi-arid fruit crops	2009	Dept. of Horti., Junagadh
33	12590-00	Establishment of Bt cotton research centre at Surendranagar district	2011	Cotton Research Station, Kukada
34	12014-00	Establishment of spices res. centre at Junagadh	2011	Vegetable Research Station, Junagadh
35	12015-00	Establishment of bio-fertilizer unit at Junagadh	2011	Dept. of Plant Pathology, Junagadh
36	12018-00	Establishment of research centre on onion at Talaja Dist.: Bhavnagar	2011	Agriculture Research Station, Talaja
37	12019-00	Strengthening of dry farming research at Jam Khambhaliya	2012	Dry Farming Research Station, Jam Khambhaliya
38	12020-00	Strengthening of dry farming research at Vallbhipur	2012	DFRS, Jam Khambhaliya and Vallbhipur
39	12021-00	Establishment of mango res. project at Talala	2012	Dept. of Horti., Junagadh
40	12022-00	Project on mega seed for quality seed production & distribution	2012	Dept. of Seed Science & Tech., Junagadh
41	12023-00	Micronutrients and sulphur research in soils and plants in Saurashtra region	2012	Dept. of Ag. Chemistry & Soil Science Junagadh
42	12024-00	Centre of remote sensing and geoinformatics in agriculture	2012	Dept. of Soil & Water Conservation Engg., CAET, Junagadh
43	12025-00	Recycling of organic waste for sustainable soil productivity under dry land agri. at Targhadia	2012	Main Dry Farming Research Station, Targhadia





Sr. No	Budget Head	Scheme Name	Sanction Year	Location
44	12026-00	Project for res. on forage crop prod. at Dhari	2012	Grassland Res. Station, Dhari
45	12028-00	Aflatoxin and its management in groundnut in Saurashtra region of Gujarat	2013	Main Oilseeds Research Station, Junagadh
46	12029-00	Molecular mapping of important traits and their transfer through marker assisted selection (MAS) in groundnut and cotton	2013	Dept. of Biochemistry, Junagadh
47	12030-00	Studies on effect of climate change on fruit crops of Saurashtra region	2013	Dept. of Horticulture, Junagadh
48	12031-00	Crop improvement in papaya at Junagadh	2014	
49	12032-00	Integrated pest management in seed spices at Junagadh	2014	Dept. of Entomology, Junagadh
50	12035-00	Rapid generation advancement based modern breeding approaches for industry preferred traits in groundnut	2023	Main Oilseeds Research Station, Junagadh

(B) Non-plan Scheme (Sponsored by State Government of Gujarat)

Sr. No.	Budget Head	Name of Program	Sanction Year	Location
1	3226	Scheme of design experiment	1980	Dept. of Agril. Stat., Junagadh
2	5002	Scheme for research in bajra	1985	Pearl millet Res. Stat., Jamnagar
				Agril. 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	Pulses Res. Station Junagadh
6	5008	Scheme for oilseed research	1962	Main Oilseeds Research Station, Junagadh
			1973	Agril. Research Station, Amreli
			1985	Pearl millet Res. Stat., Jamnagar
	5008	Scheme for oilseed research	1979	Sugarcane Res. Stat., 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 fiber.	1985	Agril. Research Station, Amreli
			1985	Cotton Res. Station, Khapat
			2002	Cotton Research Station, Junagadh



Sr. No.	Budget Head	Name of Program	Sanction Year	Location
8	5011	Scheme for research in sugarcane	1971	Sugarcane Res. Stat., Kodinar
9	5012	Scheme for res. in grasses forage	1985	Grassland Res. Station, Dhari
10	5013	Strengthening of research in vegetable (Tomato)	1962	Vegetable Research Station, Junagadh
11	5014	Scheme for research and improvement in fruit crops	1961-62	Fruit Res. Station, Mangrol
				Agril. Res. Stat. (FC), Mahuva
				Dept. of Horticulture, Junagadh
12	5018	Scheme for res. studies in agri. economics	1972	Dep. of Agril. Economics, Junagadh
13	5020	Scheme for research in agriculture chemistry & soil science	1972	Dept. of Soil Science & Agri. Chemistry, CoA, Junagadh
14	5025	Project for the research in agronomy and crop husbandry	2005	Dept. of Agronomy, Junagadh
15	5026	Project for the res. in pest control and other entomological aspect	1960	Dept. of Entomology, Junagadh
16	5042	Strengthening of dry farming research station	1965	Dry Farming Res. Stat., Ratia
			1979	Main Dry Farming Research Station, Targhadia
			1967	DFRS, Jam-Khambhalia
			1964	DFRS Vallbhipur
			2011	Cotton Res. Stat., JAU, Kukada
			1975	Grassland & Agril. Res. Station, Dhari
			1947-48	Dept. of Seed Sci. & Tech., Junagadh
			1995	Cotton Res. Stat., JAU, Khapat
17	5044	Project for the res. 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 cytogenesis	1969	Dept. of Genetics & Plant Breeding, Junagadh
	B			
	C			
19	5073	Research in Agricultural Engg.	1962-63	RTTC, Junagadh
20	5075	Establishment of Seed technology cell	1981	Directorate of Research, Junagadh
21	7082-A	National Agriculture Research project	1987	Main Oilseed Research Station, Junagadh
	7082-B		1995	DFRS, Jam-Khambhalia
	7082-B		1988	Pearl millet Res. Stat., Jamnagar
	7082-C		1982	Grassland Res. Station, Dhari





4.2.3 Zonal Research and Extension Action Committee (ZREAC)

This committee is functioning at Zonal level of South Saurashtra and North Saurashtra Agro-climatic Zones and two meetings are organized in the year viz., *kharif* and *rabi*-summer. The research programs/ 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 project. In this meeting, 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 necessary improvement in new technical programs for future research work. The officers from

the line departments are also presenting feedback as 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 2023-24, four meetings of ZREAC were organized; two each at Junagadh and Targhadia. In the ZREAC meetings, **five crop varieties; 34 farmers' recommendations; 28 scientific recommendations and 85 new technical programs** were approved (Table 4.2.2). The feedbacks as well as suggestions were also received from the officers of line departments and KVKs.



Table 4.2.2: Zonal Research Extension Action Committee (ZREAC) meeting

Meeting	Place	Date	No. of Recommendations approved		New Technical Programs
			Farmers	Scientific	
39 th ZREAC (<i>Rabi-summer</i>) of South Saurashtra Agro-climatic Zone	Junagadh	October 17-18, 2023	13	09	14
39 th ZREAC (<i>Rabi-summer</i>) of North Saurashtra Agro-climatic Zone	Targhadia	October 10, 2023	-	-	06
40 th ZREAC (<i>kharif</i>) of South Saurashtra Agro-climatic Zone	Junagadh	January 16-17, 2024	04*+14	13	58
40 th ZREAC (<i>kharif</i>) of North Saurashtra Agro-climatic Zone	Targhadia	January 19, 2024	01*+07	06	07
Total			05*+34	28	85

*No. of crop varieties released.

4.2.3 Agricultural Research Subcommittee (AGRESCO – Discipline-wise)

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

Table 4.2.3: Agricultural Research Subcommittees

Sub Committee	Subject areas of Research
Crop Improvement	Development of variety and maintenance of germplasm of mandate crops of the region
Crop Production	Agronomy, Agricultural Chemistry & Soil Science, Weed Control
Plant Protection	Entomology & Plant Pathology
Horticulture & Forestry	Fruits Science, Vegetables Science, Floriculture & Landscape Architecture, Post-Harvest Technology
Agricultural Engineering	Soil & Water Conservation Engineering, Farm Machinery & Power Engineering, Renewable Energy Engineering, Processing & Food Engineering, Irrigation & Drainage Engineering
Basic Science	Biochemistry, Biotechnology, Plant Physiology, Plant molecular Biology
Social Science	Agricultural Economics, Agricultural Extension Education, Agricultural Engineering Extension Education, animal Husbandry Extension Education, Agricultural Statistics and Agribusiness 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 programs as well as the





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recommendations for farmers and scientific community. The scientists presenting the results of various schemes/ projects will refine the reports, recommendations and new technical programs for next season. The suggestions made in the meetings are incorporated in the reports. Each and every proposal and program pertaining to the various disciplines are discussed critically. The conveners of various sub committees present the proceedings in the Joint AGRESKO meeting.



Various Agricultural Research Sub Committee meetings were held during February to March 2024 at Junagadh. **Five new crop varieties, 35 farmers' recommendations, 27 scientific recommendations**

and 87 new technical programs were approved.

The reports of the work carried out at various research schemes of the university were also presented and approved.

Table 4.2.4: Various 20th AGRESKO (Discipline wise) subcommittee meetings

Sub Committee	Date	No. of Recommendations		New Technical Programs	On-going Research Projects
		Farmers	Scientific		
Social Science	February 13, 2024	01	10	19	06
Basic Science	February 15-16, 2024	-	01	02	25
Agricultural Engineering	February 20-21, 2024	13	03	19	25
Horticulture & Forestry	February 22, 2024	03	-	09	31
Plant Protection	February 27-28, 2024	07	07	14	341
Crop Production	February 29 - March 01, 2024	09	06	20	150
Crop Improvement	March 05-06, 2024	05*+02	-	04	-
		05*+35	27	87	578

*No. of crop varieties released



4.2.5 Joint Agricultural Research Subcommittee (Joint AGRESKO)

Joint Agricultural Research Subcommittee meeting is held annually to discuss research proposals and results. The committee finalizes the recommendations and new technical programs 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. The conveners of various AGRESKO subcommittee present the findings of their respective committees for approval. This committee meeting is presided over by the Hon'ble Vice Chancellor. Joint AGRESKO will finalize the recommendations and new technical programs for research, which is to be presented in the ensuring 20th Combined AGRESKO of State Agricultural Universities.

The 20th Joint AGRESKO meeting of JAU was held at College of Agriculture, JAU, Junagadh on March 22, 2024 under the chairmanship of Dr. V. P. Chovatia, Hon'ble Vice Chancellor, JAU, Junagadh. All AGRESKO conveners of various committees presented their reports and approved. **Five new crop varieties; 33 farmers' recommendations; 28 scientific recommendations and 85 new technical programs were approved in the meeting.**



4.2.6 Combined Agricultural Research Subcommittee (One for four State Agricultural Universities)

This is the apex body to finalize the research recommendations as well as the new technical programs at state level. The meeting is held at the venues in the rotational mode. The members of this committee include Hon'ble Vice Chancellors, Directors of Research, Directors of Extension Education, Associate Directors of Research, Convners of various AGRESKO subcommittees and senior scientists of various disciplines of all State Agricultural Universities. Director of Agriculture and Director of Horticulture are also the members of the committee. Separate sessions are organized discipline-wise, in which conveners of various AGRESKO 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 proceedings and supplied to the all concerned for implementation.

The 20th Combined Meeting of Agricultural Research Council (AGRESKO-2024) of SAUs was held through virtual mode, organized and hosted by Navsari Agricultural University, Navsari during MAY, 10 - 17, 2024. Hon'ble Vice Chancellors of JAU, AAU, NAU and SDAU namely Dr. V. P. Chovatia, Dr. K. B. Kathiria, Dr. Z. P. Patel and Dr. R. M. Chauhan were remained present during the meeting.



During 20th Combined AGRESKO meeting, five new crop varieties viz., Groundnut (GG 101, GG 24 and GG 42), Pigeonpea (GT 111) and Endorsement of Pearl Millet Hybrid (GHB 1294) of JAU were recommended for release in the state. Besides, 22 technologies/ recommendations were made for farmers and 30

recommendations were made for scientific community. In addition, as many as 75 new technical programs were formulated to initiate the new research programs for the solutions of the applied and basic problems of agriculture and allied fields.

Table 4.2.5: 20th Combined AGRESKO meeting of SAUs

Sub Committee	No. of Recommendations		New Technical Programs
	Farmers	Scientific	
Crop Improvement	05*	01	01
Crop Production	06	08	13
Plant Protection	03	10	11
Horticulture & Forestry	03	-	08
Agricultural Engineering	10	03	18
Basic Science	-	01	05
Social Science	-	07	19
Total	05*+22	30	75

*No. of crop varieties released

Apart from the mechanism of evaluating and monitoring the research programs / schemes at university level; the projects sanctioned by ICAR, the annual workshop and review meetings in different universities of India are being organized. Total 17 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 presents results to 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.

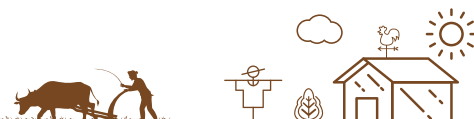




Table 4.2.6 Monitoring of AICRP trial at Junagadh Agricultural University

Name of Project	Department/ Research Station	Date of Monitoring	Name and designation of member of monitoring
AICRP on PEASEM	Dept. of Renewable Energy Engg., CAET, Junagadh	April 20-22, 2023	Quinquennial Review Team
AICRP on Pearl millet	Pearl millet Research Station, JAU, Jamnagar	October 02, 2023	Dr. S. K. Jain, I/c AICRP & Division Head (GPB); Dr. Seema Sharma, Associate Professor (Agronomy), Dr. R. S. Sharma, Assistant Professor (Pl. Patho.) and Dr. R. S. Bajia, STA (Entomology), RARI, Durgapura, Jaipur
AICRP on FIM	Dept. of Farm Machinery & Power Engg., CAET, Junagadh	October 03, 2023	Dr. K. N. Agrawal, Project Coordinator AICRP on FIM
AICRP on Sesame	Agricultural Research Station, JAU, Amreli	October 05-06, 2023	1. Dr. Rajani Bisen, Geneticist; Dr. A. K. Pandey, Entomologist and Dr. K. N. Gupta, Pathologist, PCU, Jabalpur 2. Dr. C. Harishudan, Agronomist, Vridhachalam 3. Dr. D. R. Mishra, Breeder, Dhenkanal
AICRP on Cotton	Agricultural Research Station, JAU, Amreli	October 09, 2023	1. Dr. G. T. Behere, Head (Crop Protection); Dr. Shailesh Gawande, Senior Scientist and Dr. Rahul Phuke, Senior Scientist, ICAR-CICR, Nagpur 2. Dr. A. Veeraputhiran, Professor; TNAU, Srivilliputtur 3. Dr. A. Subramani, Professor, TNAU, Coimbatore 4. Sh. Basavaraj Huggi, M/s Rama Agri Genetics(I), Pvt. Ltd.
AICRP on Groundnut	Main Oilseeds Research Station, JAU, Junagadh	October 17, 2023	1. Dr. Prasanna Rajesh, Pl. Br. And Dr. K. Vemana, Pathologist, ARS, Kadiri 2. Dr. K. Maheshwara Reddy, Agronomist, RARS, Tirupati 3. Dr. Kiran kumar Reddy, Soil scientist, ICAR-DGR, Junagadh
AICRP on Castor	Main Oilseeds Research Station, JAU, Junagadh	December 07, 2023	1. Dr. P. Duraimurugan Principal Scientist & Co-PI (Ento.) and Dr. T. Manjunath Sr. Scientist (Pl. Br.), ICAR-IIOR, Hyderabad 2. Dr. Y. Pavan kumar Reddy, Agronomist, ANGRAU, Ananthapuramu, A.P.

Name of Project	Department/ Research Station	Date of Monitoring	Name and designation of member of monitoring
AICRP on PEASEM	Dept. of Renewable Energy Engg., CAET, Junagadh	January 19-20, 2024	Dr. Rakesh Sharda, Project Coordinator, AICRP on PEASEM, CIPHET, Ludhiana
AICRP on Wheat	Wheat Res. Station, JAU, Junagadh	February 16, 2024	Dr. Vikas Gupta, PS; Dr. Ravindra Kumar and Dr. Niraj Kumar, Sci., ICAR-IIWBR Karnal
AICRP on Chickpea	Pulses Research Station	February 21-23, 2024	Dr. Shailesh Tripathi, Project Coordinator Indian Institute of Pulses Research, Kanpur

Table 4.2.7: List of AICRPs functioning in the university (ICAR 75 % & State Govt. 25 %)

Sr. No.	Budget Head	Scheme	Sanction Year	Location
1	2002-00	AICRP on Pearl millet	1969	Pearl millet Res. Stat., Jamnagar
2	2004-00	AICRP on Wheat	1987	Wheat Research Station, Junagadh
3	2008-01G	AICRP on Groundnut	1987	Main Oilseeds Research Station, Junagadh
4	2008-1C	AICRP on Castor	1968	
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 Engg., CAET, Junagadh
9	2030-01	AICRP on Long term fertilizer experiments	1999	Dept. of Soil Science & Agri. Chemistry, CoA, Junagadh
10	2040-00	AICRP on Farming (Old-Cropping System Res.) (CSR Sub Centre)	1989	Department of Agronomy, CoA, Junagadh
11	2042-01	AICRP on Dryland agriculture	1971	Main Dry Farming Research Station, Targhadia
12	2076-02	AICRP on Seeds (Crops) (Old BSP-NSP seed technology research)	2023 (1984)	Dept. of Seed Science and Technology, Junagadh
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 Engg., CAET, Junagadh





Sr. No.	Budget Head	Scheme	Sanction Year	Location
17	2258-A	AICRP on Irrigation Water Management (old-Ground Water Utilization)	2004	Dept. of Soil & Water Conservation Engg., CAET, Junagadh

4.2.8 External Funded Research Projects

The university is also undertaking various external funded 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 4.2.8: List of External Funded Research Projects functioning in the university

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
1	18005-10	Genetically enhanced micronutrient-dense pearl millet grains for improved human nutrition in the India	2010	ICRISAT, Hyderabad	Main Pearl millet Research Station, Jamnagar
2	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 Agril. Economics, Junagadh
3	18005-04, 05 & 15	Agricultural demonstration activities in SSP command area Phase-II	2010	SSNNL, Govt. of Gujarat	DFRS, Vallbhipur, Agri. School, Halvad and Cotton Res. Stat., Kukada
4	18005-18	Establishment of model organic farm	2015	GoG	Dept. of Agron., Junagadh
5	18005-01	Experimental agro-met advisory services	1996	GoI	Dept. of Agronomy, Junagadh/MDFRS, Targhadia
6	18126-02	Centrally sponsored scheme (Spices)	2006	GoI	Vegetable Res. Station, Junagadh
7	18127-00	Seed production in agricultural crops and fisheries	2006	GoI	(Oilseed-Megaseed) Junagadh
8	18127-00	Seed production in agril. crops and fisheries (Oilseeds-Megaseeds)	2006	GoI	Main Oilseed Research Station and Dept. of Seed Sci. & Tech., Junagadh
9	18803-01 to 12	Megaseed revolving fund	2006		
10	18804-01 to 04	Seed production in agricultural crops	2006		

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
11	18005-06	Forecasting agril. output using space, agro meteorology and land based observations (FASAL)	2011	GoI	Dept. of Agronomy, Junagadh
12	2012	All India network research project on onion and garlic	2009	ICAR-Network	Vegetable Res. Station, Junagadh
13	2030-2	Soil test based fertilizers application for targeted yield of Bt cotton in Saurashtra region of Gujarat	2010	ICAR-Network	Dept. of Soil Science & Agri. Chem., Junagadh
14	2042-02	National initiative on climate resilient agriculture - dry land	2011	ICAR-Network	MDFRS Targhadia
15	2002-5	Implementation of protection of plant varieties and farmer's rights legislation	2002	ICAR-Network	Pearl millet Research Station, Jamnagar
16	2027-04	Network project on market intelligence	2013	ICAR-Network	Dept. of Agril. Eco., Junagadh
17	2004-1	Project for frontline demonstration in wheat		ICAR-Network	Wheat Research Station, Junagadh
18	2008-3	Project for frontline demonstration in sesame	2007	ICAR-Network	Agriculture Res. Station, Amreli
19	2008-12	Scheme for breeder seed production of oilseeds crops (ICAR revolving fund)	2007	ICAR-Network	Main Oilseed Research Station, Junagadh
20	2009-6	Front line demonstration on cotton	2001	ICAR-Network	Cotton Research Station, Junagadh
21	2076-3	Central sector special food grain production of breeder seed (Revolving fund)	-	ICAR-Network	Pulses Research Station, Junagadh
22	2254	Study storage losses of food grains	2013	ICAR-Network	Dept. of PFE, CAET, Junagadh
23	2374-1	FLD on Chickpea	-	ICAR-Network	Pulses Research Station, Junagadh
24	2374-6	FLD on Pigeon pea			
25	2504-00	Revolving fund horticulture (Nursery)	-	ICAR-Network	Dept. of Horti., Junagadh
26	2704-40	Project for frontline demonstration on groundnut	1999	ICAR-Network	Main Oilseed Res. Station, Junagadh/ ARS, Amreli





Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
27	2704-43	Project for frontline demonstration in pearl millet	1989	ICAR-Network	Main Pearl millet Research Station, Jamnagar
28	2002-07	Consortia research platform (CRP) on biofortification	2014		
29	18132	Creation of seed-hubs for increasing indigenous production of pulses in India	2016	ICAR-Network	Dept. of Seed Science & Tech., Junagadh
30	2009-09	Testing of Bt. Cotton	2017	ICAR	Cotton Research Station, Junagadh
31	18246-91	River flow simulations integrating satellite data in forested catchment	2017	GoG	CAET, JAU, Junagadh
32	18009-34	Seed infrastructure under NMOOP	2017	GoG	Agril. Res. Station, JAU, Amreli
33	2009-07	Insecticide Resistance Management: Dissemination of pink bollworm management strategies	2018	ICAR-Network	Cotton Research Station, Junagadh
34	18132-02	Creation of Seed-Hubs for Enhancing Quality Seeds availability of major Oilseeds crops - Groundnut under NFSM - Oilseed mission	2018	GoI	Dept. of Seed Science & Tech., Junagadh
35	2260-3	Development of Protocols for Procurement, Safe Storage and Milling Outturn of Major Pulses	2019	ICAR-Network	CAET, JAU, Junagadh
36	2008-19	Mainstreaming of Sesame germplasm for productivity enhancement through genomics assisted core development and trait discovery	2020	ICAR-Network	Agricultural Research Station, Amreli
37	18247-35	Product testing for pesticides residue to promote organic farming and export of Agricultural produce (RKVY)	2019	RKVY	Department of Biotechnology, Junagadh
38	18247-36	Seed Replacement Rate Enhancement	-	RKVY	Dept. of Seed Sci. & Tech., Junagadh
39	18247-37	Centre of Excellence for quality testing of cotton	2019	RKVY	Cotton Research Station, Junagadh

Sr. No.	Budget Head	Scheme Name	Sanction Year	Sponsoring Agency	Location
40	18247-41	Commercial Exploitation of Date palm through Tissue culture	2019	RKVY	Dept. of Genetics & Plant Breeding, Junagadh
41	18247-43	Strengthening of seed multiplication farm	2019	RKVY	Dept. of Seed Sci.e & Tech., Junagadh
42	18008-70	Identification of Marker and Genomic Regions Associated with Aflatoxin Resistance in Peanut	2021	ICRISAT, Hyderabad	Main Oilseed Res. Station, Junagadh
43	18246-96	Modeling of water fluxes and ground water discharge using 1D-2D coupled model and in situ measurements in the Gir forest catchment	2021	GoI	CAET, JAU, Junagadh

4.3 Crop Improvement

Crop Improvement includes development of new crop varieties and maintenance of germplasm of mandate crops of the region.

The breeder seeds of different crops were produced

to fulfill the demand of private and public sectors as per the national and state indents under coordination of concern crop scientist are given in following table. The required nucleus seeds of different crops were also produced for the breeder seed production in the ensuing season.

Table 4.3.1 Production of Nucleus / Breeder Seeds

Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total (q)
				National	State	
1	Groundnut	SBXI (J-11)	0.10	0.00	0.00	0.10
		GG-2	3.30	0.00	30.00	33.30
		GG-5	2.70	0.00	20.10	22.80
		GG-7	5.10	20.10	10.20	35.40
		GG-8	0.50	0.00	0.00	0.50
		GJG-9	10.20	150.00	50.10	210.30
		GJG-31	2.10	70.10	3.00	75.20
		GJG-32	50.10	710.00	300.00	1060.10
		GJG-33	1.50	15.00	6.00	22.50
		GG-35	15.00	150.00	90.00	255.00
		GAUG-10	10.20	100.00	50.10	160.30
		GG-11	3.60	0.00	60.00	63.60
		GG-16	0.50	0.00	0.00	0.50
		GJG-17	1.50	0.00	50.10	51.60
		GJG-18	1.50	10.20	0.00	11.70





Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total (q)
				National	State	
		GJG-19	2.10	10.20	0.00	12.30
		GG-20	20.10	70.10	600.00	690.20
		GG-21	1.80	0.00	5.10	6.90
		GJG-22	25.10	120.00	510.00	655.10
		GG-23	15.00	90.00	50.10	155.10
		GJG HPS-1	0.50	0.00	0.00	0.50
		GJG HPS-2	1.50	5.10	0.00	6.60
		GG-37	15.10	50.10	50.10	115.30
		J-87	0.10	0.00	0.00	0.10
		GG-41	2.10	3.00	1.00	6.10
		GG-38	3.60	0.00	20.10	23.70
		GG-39	10.20	0.00	0.00	10.20
		GG-40	10.20	1.20	0.00	11.40
		Sub Total	215.30	1575.10	1906.00	3696.40
2	Pearl millet	GHB 538 Improved	-	-	0.77	0.77
		GHB 1294	0.064	-	0.17	0.234
		GHB 1225	0.006	-	1.70	1.706
		GHB 1231	0.009	-	5.45	5.459
		GHB 1129	0.016	-	3.85	3.866
		Sub Total	0.095	-	11.94	12.035
3	Sesame	G.Til 2	0.50	0.12	4.78	5.400
		G.Til 3	0.30	0.15	2.53	2.980
		G.Til 4	0.30	3.15	2.36	5.810
		GJT 5	0.30	2.50	1.00	3.800
		G.Til 6	0.30	2.60	2.60	5.500
		G.Til 10	0.10	-	0.90	1.000
		G.Til 11	0.10	-	-	0.100
		Purva 1	0.05	-	1.09	1.140
		Sub Total	1.95	8.52	15.26	25.73

Sr. No.	Crop	Variety	Nucleus Seed (q)	Breeder Seed (q)		Total (q)
				National	State	
4	Chickpea	GG 1	0.40	-	-	0.40
		GG 2	1.50	1.50	9.00	12.00
		GJG 3	7.00	110.00	20.00	137.00
		GG 4	0.40	-	-	0.40
		GG 5	8.00	185.00	80.00	273.00
		GJG 6	5.00	2.00	50.00	57.00
		GG 7	3.00	25.00	-	28.00
		GKG 1	3.00	0.50	15.00	18.50
		GG 8	2.00	-	12.00	14.00
		Sub Total	30.30	324.00	186.00	540.30
5	Pigeon pea	GJP 1	0.22	-	8.00	8.22
		Sub Total	0.22	-	8.00	8.22
6	Black gram	GU 1	0.50	0.30	8.50	9.30
		Sub Total	0.50	0.30	8.50	9.30
7	Wheat	GW 366	2.00	54.00	4.00	60.00
		GJW463	3.40	43.20	41.80	88.40
		GW 496	-	-	75.20	75.20
		Lok 1	-	-	30.00	30.00
		Sub Total	5.40	97.20	151.00	253.60
8	Cotton	G. Cot 38	0.005	-	-	0.005
		GJC-102	0.005	-	-	0.005
	Cotton: Parents of G. Cot. Hy.-24 and 26 BG II	GJHV-503	0.602	-	0.602	1.204
		GJHV-517	0.782	-	0.782	1.564
		Sub Total	1.394	-	1.384	2.778
Grand total						4548.36

Estimated Production data

The crop seeds produced in the farms were processed at Megaseed processing plant. The processed good quality truthful/ certified/ foundation seeds were sold to farmers under the trade name of "Gir Sawaj" and its detail is given in below table. Very good response was observed among the farmers to avail this facility.



Table 4.3.2 Production of ‘Gir Sawaj’ brand truthful, foundation and certified seeds of field crops under mega- seed and Seed Hub projects

Sr. No.	Crops	Production (q)		
		Truthful	Foundation	Certified
1	Groundnut	964.38	470.75	1830.50
2	Chickpea	643.50	76.80	945.60
3	Sesame	32.59	-	-
4	Wheat	2917.50	-	-
5	Cotton	40.00	-	-
6	Castor	42.00	-	-
7	Cumin	24.00	-	-
8	Coriander	30.00	-	-
9	Soybean	624.40	-	-
10	Mungbean	10.00	-	-
11	Urdbean	12.72	-	-
12	Pigeon pea	105.00	12.00	307.20
13	Sugarcane Setts	1925.51	-	-
14	Sorghum	3.50	-	-
Total		7375.51	559.55	3083.30
Grand Total				11018.36

4.3.1 New crop varieties

Total five new crop varieties viz. Groundnut (GG 101, GG 24 and GG 42), Pigeonpea (GT 111) and Endorsement of Pearl Millet Hybrid (GHB 1294) of JAU were recommended for release for the benefit of the farmers during the year 2023-24.

Groundnut: Gujarat Groundnut 101 (GG 101: Sorath Keshav)

The farmers of Gujarat state growing groundnut during kharif season are recommended to grow high yielding Spanish bunch groundnut variety Gujarat Groundnut 101 (GG 101: Sorath Keshav). This variety has recorded mean pod yield of 2860 kg/ha, which was 33.96 and 24.26 per cent higher than the check varieties, GJG 9 (2135 kg/ha)



Groundnut: Gujarat Groundnut 24 (GG 24: Sorath Urja)

The farmers of Gujarat state growing groundnut during kharif season are recommended to grow Virginia bunch groundnut variety Gujarat Groundnut 24 (GG 24: Sorath Urja). This variety has recorded mean pod yield of 2555 kg/ha, which was 20.37, 21.97 and 56.42 per cent higher over the check varieties, GJG 22 (2122 kg/ha), GG 20 (2095 kg/ha) and Kaushal (1633 kg/ha), respectively. This variety has also recorded higher kernel yield, oil yield, number of pods per plant and oil content over the check varieties. This variety was found comparable to the check varieties against late leaf spot, rust, stem rot, collar rot diseases and damage due to leaf defoliator.



Groundnut: Gujarat Groundnut 42 (GG 42: Sorath Shaan)

The farmers of Gujarat state growing groundnut during kharif season are recommended to grow Virginia runner groundnut variety Gujarat Groundnut 42 (GG 42: Sorath Shaan). This variety has recorded mean pod yield of 2393 kg/ha, which was 12.51, 27.14 and 50.98 per cent higher over the check varieties, GG 41 (2127 kg/ha), GJG 17 (1883 kg/ha) and Somnath (1585 kg/ha), respectively. This variety has also recorded higher kernel yield, oil yield, number of pods per plant and shelling per cent over the check varieties. This variety was found comparable to the check varieties against late leaf spot, rust, stem rot, collar rot diseases and damage due to leaf defoliator.



Pigeon pea: Gujarat Tur 111 (GT 111: Sorath Ratan)

Farmers of Gujarat state growing pigeon pea are recommended to grow medium maturing (177 days) variety Gujarat Tur 111 (GT 111: Sorath Ratan). It recorded 2197 kg/ha average seed yield, which was 6.6, 18.3, 14.5 and 15.9 per cent higher over check varieties GJP 1, AGT 2, BDN 2 and GT 104, respectively. Seeds of this variety are of cream colour and large in size (12.88 g/100 seeds). This variety is moderately resistant against wilt, resistant against SMD and phytophthora blight diseases, with low pod borer and seed damage due to pod fly.



Pearl millet Hybrid: Gujarat Hybrid Bajra 1294 (GHB 1294: Maru Moti) (Endorsement)

The kharif pearl millet growing farmers of Gujarat state are recommended to grow early maturing hybrid GHB 1294 (Maru Moti). This hybrid recorded average 2717 kg/ha grain yield which was 20.0 % higher than check hybrid GHB-538. It has also recorded average 7306 kg/ha dry fodder yield which was 46.8 % higher than check hybrid GHB-538. The proposed hybrid is resistant against diseases like downy mildew, blast and rust and tolerant against pest like shoot fly, stem borer and heliothis larvae.



4.3.2 Recommendation for Scientific Community

Heat stress mitigation through seed priming in wheat

The farmers of South Saurashtra Agro-climatic Zone growing wheat are recommended to grow variety GW 366 in late sowing condition with seed priming of salicylic acid 50 ppm (Hormonal Priming) (50 ml/l) for 14 hours followed by shade drying recorded the highest grain and biological yield per plant to mitigate heat stress.



4.4 Crop Production

Crop Production group mainly includes Agronomy, Agricultural Chemistry & Soil Science and Weed Control. Recommendations related to nutrient management, cultural practices, irrigation management and weed management are the different aspects of crop production.

Analysis of soil, irrigation water and plant is carried out with well-equipped laboratories at Department of Biotechnology, Agricultural Chemistry and Krishi Vigyan Kendras (KVKs) of JAU at reasonable price and its detail is given below.

Table 4.4.1 Analysis of Soil, Plant and Irrigation Water Sample

Sr. No.	Detail	No. of Sample analyzed
1	Soil sample analysis	3845
2	Irrigation water analysis	2074
3	Plant sample analysis	1473
	Total	7392

4.4.1 Recommendation for Farmers

4.4.1.1 Nutrient Management

Evaluation of some cow-based bio-enhancers and botanicals for organic cultivation of *rabi* onion

The farmers of South Saurashtra Agro-climatic Zone growing *rabi* onion under organic farming are recommended to apply FYM 10 t/ha to obtain higher yield and net realization.

The farmers who are interested in cow-based farming are recommended to apply FYM 5 t/ha along with Panchagavya 3 % spray at 30, 45 and 60 DAS or FYM 5 t/ha along with Jivamrut 500 l/ha with irrigation at sowing, 30 and 45 DAS.



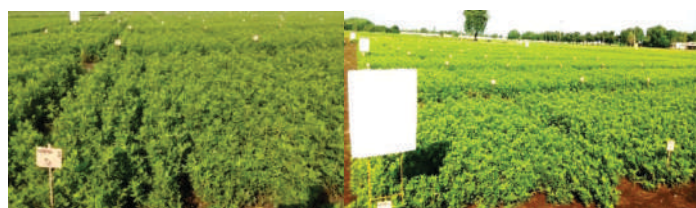
Effect of fresh cow dung on yield and yield attributes of garlic

The farmers of South Saurashtra Agro-climatic Zone growing garlic are recommended to apply slurry (cow dung: water - 1:3) of 1500 kg/ha fresh cow dung (up to 5 days) with irrigation at the time of sowing for getting higher yield, net return and improving soil fertility.



Effect of foliar application of water soluble macro and micro nutrients fertilizers on growth, yield and quality of *kharif* groundnut

The farmers of South Saurashtra Agro-climatic Zone growing *kharif* groundnut are recommended to apply RDF 75 % (9.37:18.75:37.50 N: P₂O₅:K₂O kg/ha) + 1.5 % (150 g/10 liter water) WSF (19-19-19-N:P:K) at 45 and 60 DAS + 1.0 % (100 g/10 liter water) Multi-micro Mixture Grade -IV (Zn-6.0 %, Fe-4.0 %, Cu-0.5 %, Mn-1.0 % and B-0.5 %) at 50 and 65 DAS as a foliar spray for obtaining higher yield and net return.



Nutrient management in Bt cotton under rainfed condition (Vallabhipur)

The farmers of Bhal region growing Bt cotton under rainfed condition are recommended to apply 80-40-80-20 kg N-P₂O₅-K₂O-S/ha for obtaining higher yield and net return. The nitrogen should be applied in three splits *i.e.* 25 % as basal at the time of sowing, 50 and 25 % as top dressing at 35-40 and 60-65 days after sowing, respectively by drilling at 10 cm soil depth.





4.4.1.2 Cultural Practices

Multi-tier cropping system to enhance resource utilization, profitability and sustainability of Bt cotton (*Gossypium hirsutum*) production system

The farmers of South Saurashtra Agro-climatic Zone growing Bt cotton are recommended to grow the crop in paired rows (80:160:80 cm) and two rows of groundnut (40 cm distance) OR two rows of soybean (40 cm distance) OR one row of soybean + one row groundnut (40 cm distance) as intercrop between two pairs of Bt cotton for getting higher net return.



Recycling of cotton stalks and its effect on yield and soil health

The farmers of North Saurashtra Agro-climatic Zone growing Bt cotton are recommended to apply Ex-situ composting of cotton stalks using shredder and addition of 10 kg N/ha through urea + compost culture @ 5 kg/ha at the time of sowing along with 80 kg N + 40 kg P_2O_5 + 250 kg gypsum/ha for obtaining higher yield and net return as well as sustaining soil health under rainfed conditions. The nitrogen should be applied in three split i.e. 25 % as basal at the time of sowing, 50 and 25 % as top dressing at 35-40 and 60-65 days after sowing, respectively by drilling at 10 cm soil depth.

OR

Incorporate cotton stalks using mobile chopper and apply one irrigation for decomposing along with 80 kg N + 40 kg P_2O_5 + 250 kg gypsum/ha for obtaining higher yield and net return as well as sustaining soil health under rainfed conditions. The nitrogen should be applied in three split i.e. 25 % as basal at the time of sowing, remaining 50 and 25 % as top dressing at 35-40 and 60-65 days after sowing, respectively by drilling at 10 cm soil depth.



Methodology for preparation of compost from cotton stalks using shredder:

The farmers are advised to recycle of cotton stalk (which are either burned or wasted) by chopping into small pieces of 5-6 cm using cotton shredder and composting with addition of compost culture @ 500 g per tone, urea (N @ 0.5 %), cow dung @ 20 % as well as Azotobactor and PSM @ 500 g each per tone during first turning of cotton stalk to get enriched compost within 120 days having higher content of all plant nutrients.

4.4.2 Recommendation for Scientific Community

Calibration and validation of CERES model (DSSAT 4.6) for different cultivars of wheat under different sowing time

CERES-Wheat model of DSSAT family was calibrated and validated for GW 499, GW 451 and GJW 463 cultivars of wheat.

The model simulations of grain yield of wheat were validated with less than 10 percent error. The genetic coefficients are recommended for use in optimization for crop management and yield prediction of wheat crop as under.



Symbol	Description	GW 499	GW 451	GJW 463
PHINT	Phyllochron interval (days)	73.4	71.2	72.8
P1V	Vernalization coefficient	0.5	0.4	0.5
P1D	Photoperiodism coefficient	1.80	1.90	2.00
P5	Grain filling duration coefficient	3.25	3.15	3.10
G1	Kernel number coefficient	5.55	5.60	5.50
G2	Kernel weight coefficient	4.20	4.35	4.25
G3	Spike number coefficient	5.25	5.35	5.30

DSSAT model can be used for predicting wheat grain yield and phenological events under various agro-climatic conditions. The model may also be used to improve and evaluate the current practices of wheat growth management to increase the crop production.

Calibration and validation of CERES model (DSSAT 4.6) for different cultivars of wheat under different sowing time

It is informed to the scientific community that wheat crop under South Saurashtra Agro-climatic condition can be sown around 15th November (Minimum temperature 15 to 17 °C and Maximum temperature 32 to 34 °C) and prefer varieties GW 499, GW 451 and GJW 463 for getting higher yield and net return.



Dynamics of weed flora in major *rabi* crops

It is informed to scientific community that information on weed dynamics in wheat, chickpea and coriander during *rabi* season is as below:

- Total sixteen existing weed species of eleven different families were identified and observed during *rabi* season. From total sixteen species of

weeds, the families constituted as Amaranthaceae (02), Asteraceae (03), Chenopodiaceae (01), Cyperaceae (01), Euphorbiaceae (01), Leguminosae (01), Liliaceae (01), Poaceae (03), Portulacaceae (01), Solanaceae (01) and Tiliaceae (01).

- Total weeds in floristic composition were *Cyperus rotundus*, *Asphodelus tenuifolius*, *Echinochloa colona*, *Eluopus villosus*, *Dactyloctenium aegyptium*, *Digera arvensis*, *Eclipta alba*, *Euphorbia hirta*, *Parthenium hysterophorus*, *Indigofera glandulosa*, *Portulaca oleracea*, *Corchorus olitorius*, *Tridax procumbens*, *Physalis minima*, *Amaranthus spinosus* and *Chenopodium album*.
- Highest weeds were observed of families; Asteraceae ≥ Poaceae > Amaranthaceae.
- Cyperus rotundus*, *Asphodelus tenuifolius*, *Chenopodium album*, *Echinochloa colona*, *Physalis minima*, *Digera arvensis*, *Eluopus villosus*, *Indigofera glandulosa*, *Eclipta alba* and *Euphorbia hirta* were found to be the most common weed species in *rabi* season.
- The most dominant succession of *Cyperus rotundus*, *Asphodelus tenuifolius* and *Echinochloa colona* and *Digera arvensis* were noted throughout season.
- Echinochloa colona* with wheat, *Asphodelus tenuifolius*, *Indigofera glandulosa* and *Physalis minima* with chickpea and coriander; *Cyperus rotundus* with all crops throughout *rabi* season were associated than other weed species.
- Dry weight of weeds increased over time. The lowest weed dry weight was registered in wheat,



followed by coriander and the highest weed dry weight at all the stages was recorded in chickpea.

- Among the crops, monocots > dicots > sedges in wheat, monocots > sedges > dicots were observed in chickpea and coriander. Among weed management practices, monocots > dicots > sedges in unweeded, monocots in weed free, monocots > sedges in HW and monocots > sedges > dicots order in herbicidal treatment was observed.
- The weed late to emerge was observed i.e., *Eluopus villosus* up to 15 DAS.
- Uprooting of weeds at 15 days interval decreased periodical weed dry weight, followed by two hand weeding and application of pre- & post-emergence herbicides. Whereas, the undisturbed weedy condition progressively increased weed dry weight.
- Number of weeds decreased with time. The weed count at all the stages was more or less same in wheat, chickpea and coriander.
- Removal of existing weeds put forth the emergence of new weeds. HW at 15 & 30 DAS and application of pre- & post-emergence herbicides were almost equally effective in suppressing weed count. Whereas, undisturbed condition reduced weed count over time, but had the highest weed count at all the stages as compared to weed control methods.
- The most densely weeds viz., *Asphodelus tenuifolius*, *Echinochloa colona* and *Cyperus rotundus* and least densely were *Tridax procumbens*, *Chenopodium album* and *Corchorus olitorius*.
- Removal of weeds at 15 days interval increased yields of wheat, chickpea and coriander. Manual weeding and herbicidal weed control were found equally effective in increasing crop yield.
- Weed species vary according to crop and weed management practices.



Dynamics of weed flora in major *kharif* crops

The scientific community is informed that information on weed dynamics in groundnut, soybean and pearl millet during *kharif* season is as below:

- From total nineteen weeds species, families constituted as Aizoaceae, Amaranthaceae, Asteraceae, Commelinaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Lythraceae, Poaceae, Portulacaceae, Solanaceae and Tiliaceae. Highest weeds observed of families; Poaceae > Asteraceae > Euphorbiaceae.
- Total weeds in floristic composition were *Cyperus rotundus*, *Echinochloa colona*, *Eluopus villosus*, *Dactyloctenium aegyptium*, *Digitaria sanguinalis*, *Digera arvensis*, *Eclipta alba*, *Euphorbia hirta*, *Indigofera glandulosa*, *Tridax procumbens*, *Leucas aspera*, *Phyllanthus niruri*, *Corchorus olitorius*, *Commelina benghalensis*, *Portulaca oleracea*, *Ammannia baccifera*, *Parthenium hysterophorus*, *Physalis minima* and *Trianthema portulacastrum*.
- The most dominant succession of *Cyperus rotundus*, *Echinochloa colona*, *Commelina benghalensis*, *Leucas aspera* and *Digera arvensis* were noted throughout season.
- *Echinochloa colona* and *Eluopus villosus* with pearl millet, *Indigofera glandulosa* with groundnut and soybean; *Cyperus rotundus* throughout the *kharif* season were associated.



- Among the crops, monocots > dicots > sedges in pearl millet, dicots > sedges > monocots were observed in soybean and groundnut. Among weed management practices, dicots > monocots > sedges in unweeded, monocots in weed free and HW and monocots > sedges > dicots order in herbicidal treatment was observed.
- The herbicidal treatments have lowest monocot weeds up to 30 DAS.
- Dry weight of weeds increased over time. Uprooting of weeds at 15 days interval decreased periodical weed dry weight, followed by hand weeding and herbicidal treatments. Whereas, the undisturbed weedy condition progressively increased weed dry weight.
- Number of weeds decreased with time. Weed species vary according periodical stages, crops and weed management practices.
- The most densely weeds viz., *Echinochloa colona* and *Cyperus rotundus* and least densely were *Tridax procumbens*, *Parthenium hysterophorus* and *Trianthema portulacastrum*.
- The weeds late to emerge were *Digitaria sanguinalis* up to 15 DAS, *Eluopus villosus* up to 30 DAS and *Ammannia baccifera* up to 45 DAS.
- Removal of existing weeds put forth the emergence of new weeds specially weed i.e., *Ammannia baccifera* and *Cyperus rotundus*.
- *Ammannia baccifera* found dominating around 45 DAS in weed free condition when the rainfall amount was more.
- The *Phyllanthus niruri* dominant only in earlier season, hence it has completed life cycle within 30-45 DAS.



Effect of plant growth retardants on growth, yield attributes and yield of kharif groundnut

It is informed to the scientific community that in kharif groundnut foliar application of Chlormequate Chloride 1000 ppm at 45 and 60 DAS gave higher groundnut pod and haulm yield.



Evaluation of soil texture of Junagadh district

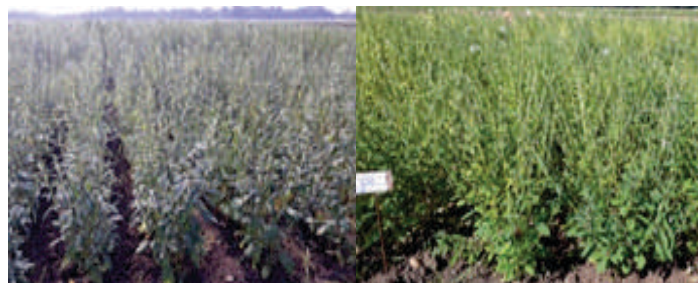
It is informed to scientific community that, soil texture of Junagadh district is clayey, consisting of soil separate viz. sand 29.05 %, silt 24.67 % and clay 46.23 % i.e. 64 % area of soils of Junagadh district. Among the different talukas, Malia, Mangrol and Visavadar talukas soils falls under clay loam texture, while, in Vanthali, Bhesan, Keshod, Manavadar, Mendarda and Junagadh talukas soils falls under clayey texture.

Effect of FYM with and without phosphorus on groundnut (GG 20) yield

It is informed to scientific community that in *kharif* groundnut application of FYM 10 t ha⁻¹ along with 20 kg P₂O₅ ha⁻¹ every year gave higher yield and net return and also increases phosphorus content and uptake by pod and haulm. Application of FYM 10 t ha⁻¹ along with 20 kg P₂O₅ ha⁻¹ every year also increasing the phosphorus level in soil as compared to control.

Screening of sesame varieties/germplasm lines for yield performance under organic condition in *kharif* season

The scientific community is informed that under Saurashtra region of Gujarat sesame varieties/germplasm lines G.Til 4, G. Til 10, AT 375, GJT 5, AT 371, AT 314, G.Til 3 and AT 377 gave high seed yield in *kharif* season under organic condition.



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. Plant protection mainly includes two groups i.e. Entomology and Plant Pathology.

During the year 2023-24, Department of Plant Pathology has produced and distributed bio-agents under the trade name "*Gir Sawaj*" as shown in table below. Department also produced and distributed products like *Rhizobium*, *Azotobacter* and PSB liquid bio-fertilizer to farmers, State Departments, other Govt. bodies etc. at reasonable price.

Table 4.5.1 Production of 'Gir Sawaj' brand bio-agent and liquid bio-fertilizer

Sr. No	Name of Product	Quantity
1	<i>Gir Sawaj-Trichoderma</i> (kg)	2176
2	<i>Gir Sawaj-Rhizobium</i> (liter)	674
3	<i>Gir Sawaj-Azotobacter</i> (liter)	413
4	<i>Gir Sawaj-PSB</i> (liter)	893
5	<i>Gir Sawaj-KMB</i> (liter)	153

Department of Entomology has produced various microbial agents under the trade name "*Gir Sawaj*" e.g. viruses, bacteria, fungi, protozoans and nematodes are being used in IPM program as shown in below table. Among viral pathogens, nuclear polyhedrosis viruses of *Helicoverpa* (HNVP),

Spodoptera (SNPV), entomopathogenic fungi *Beauveria bassiana*, fruit fly trap, fruit fly lure, pheromone trap, pheromone lure are widely used for insect control. These pathogens are highly specific to their host and being considered environmentally safe.

Table 4.5.2 Production of ‘Gir Sawaj’ brand microbial agents, traps, lure etc.

Sr. No.	Name of Product	Quantity
1	Gir Sawaj <i>Beauveria</i> (Kg)	747
2	Gir Sawaj <i>Metarhizium</i> (Kg)	2,567
3	Gir Sawaj HNPV (litre)	142
4	Gir Sawaj SNPV (litre)	71
5	Gir Sawaj Trichocard (No.)	604
6	Gir Sawaj Fruit fly trap (No.)	11,566
7	Gir Sawaj Fruit fly lure for fruit crops (Nos.)	17,828
8	Gir Sawaj Fruit fly lure for vegetable crops (Nos.)	2135
9	Gir Sawaj Pheromone trap (No.)	8919
10	Gir Sawaj Pheromone Lure (Pink bollworm) (Nos.)	13,476
11	Gir Sawaj Pheromone Lure (<i>Helicoverpa</i>) (Nos.)	2,728
12	Gir Sawaj Pheromone Lure (<i>Spodoptera</i>) (Nos.)	624
13	Gir Sawaj Pheromone Lure (Brinjal shoot and fruit borer) (Nos.)	37
14	Gir Sawaj MDP Technology for Pink bollworm (100 gm Tube)	08
15	Gir Sawaj MDP Technology for Brinjal shoot and fruit borer (100 gm Tube)	37
16	Gir Sawaj Chrysopa eggs (1 bottle =1000 eggs)	1,114
17	Gir Sawaj Honey (500 gm bottle)	244

4.5.1 Recommendation for Farmers

4.5.1.1 Entomology

Effect of different poison baits against fall army worm *Spodoptera frugiperda* (J. E. Smith) infesting maize

The farmers of Gujarat growing maize are

recommended to apply poison baits of thiodicarb 75 WP 250 g or emamectin benzoate 5 SG 100 g mixed with 5 kg jaggery and 25 kg maize flour in 8 litre of water/ha in whorl of plants, first at the initiation of pest infestation and second application at 20 days after first application for effective management of fall armyworm.

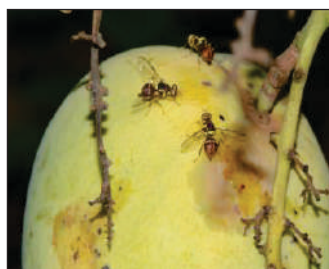


CIB & RC format

Year	Crop	Pest	Pesticides/ Biopesticides with formulation	Dosage	Application schedule
				Quantity of formulation g or ml/kg seed, kg or l/ha	
2024	Maize	<i>Fall armyworm, S. Frugi-perda</i>	Thiodicarb 75 WP	250 g	First application at initiation of pest infestation, second application at 20 days after first application
			Emamectin benzoate 5 SG	100 g	

Standardization of number of pheromone traps for management of mango fruit fly, *Bactrocera dorsalis* (Hendel)

The farmers of South Saurashtra having mango orchards are recommended to install 30 methyl eugenol parapheromone traps per hectare at pea sized fruit stage and three meter height from ground level for effective management of fruit fly and the lure to be changed three times at an interval of 40 days.

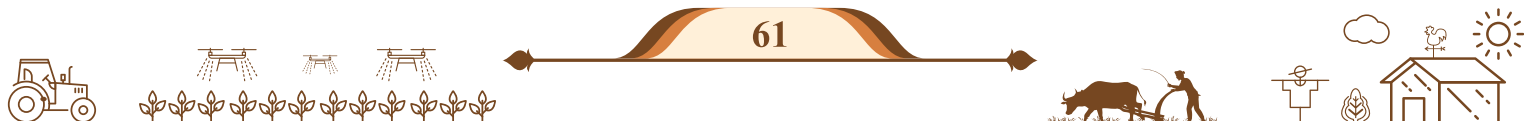


4.5.1.2 Plant Pathology

Evaluation of ready-mix fungicides as a seed treatment against soil borne diseases of groundnut

Farmers of Gujarat growing *kharif* groundnut are recommended to apply seed treatment with carboxin

37.5 + thiram 37.5 WS @ 3 g/kg seed or carbendazim 25 + mancozeb 50 WS @ 3 g/kg seed or penflufen 13.28 + trifloxystrobin 13.28 FS @ 3 ml/kg seed as ready-mix fungicide for effective management of aflarot, collar rot and stem rot in groundnut.



CIB & RC format

Year	Crop	Pest	Pesticides/ Biopesticides with formulation	Dosage	Application schedule	Remark(s)
				Quantity of formulation g or ml/kg seed, kg or l/ha		
2024	Groundnut	Aflarot, collar rot, stem rot	Carboxin 37.5 + Thiram 37.5 WS	3 g	Seed treatment per kg at the time of sowing	These pesticides are registered with CIB & RC for use in ground nut crop for management of this disease.
			Carbendazim 25 + Mancozeb 50 WS	3 g		
			Penflufen 13.28 + Trifloxystrobin 13.28 FS	3 ml		

4.5.2 Recommendation for Scientific Community

4.5.2.1 Entomology

Effect of different poison baits against fall army worm *Spodoptera frugiperda* (J. E. Smith) infesting maize

Two applications of poison baits in whorl of plants containing indoxacarb 15.8 EC 125 ml, 5 kg jaggery and 25 kg maize flour in 8 L of water/ha, first at the initiation of pest infestation and second application at 20 days after first application found effective against fall armyworm infesting maize.



Standardization of number of pheromone traps for pink bollworm, *Pectinophora gossypiella* (Saunders) in cotton

Installation of 50 sex pheromone traps per hectare at crop canopy level after 40 days of sowing for effective management of cotton pink bollworm and the lure to be changed three times at an interval of 40 days.



Effect of biorationals against aphid, *Lipaphis erysimi* (Kalt.) infesting mustard

Apply two sprays of *Beauveria bassiana* 1.15 WP (1×10^8 cfu/g) at 0.007 % (60 g/10 L of water) or neem oil (10000 ppm) at 0.004 % (40 ml/10 L of water) first spray when pest cross ETL level (1.5 aphid index/plant) and second spray at 10 days after first spray for effective management of mustard aphid.



Effect of date of sowing and acaricides against yellow mite, *Polyphagotarsonemus latus* (Banks) infesting cluster bean

Sowing of cluster bean crop during fourth week of February and two sprays of diafenthiuron 50 WP 0.05 % (10 g/10 lit of water) or fenpyroximate 5 EC 0.005 % (10 ml /10 lit of water), first spray at initiation of the pest and second at 20 days after first spray found effective against mobile stage of yellow mite, *Polyphagotarsonemus latus* (Banks) infesting cluster bean.



Evaluation of different insecticides against thrips in groundnut

Two sprays of spinetoram 11.7 SC 0.012 % (10 ml/10 L of water) or spinosad 45 SC 0.014 % (3 ml/10 L of water) or cyantraniliprole 10.26 OD 0.010 % (10 ml/10 L of water), first spray at the initiation of pest infestation and second at 10 days after first spray for the management of thrips in groundnut.



Bio-efficacy of ready-mix insecticides against capsule borer, *Dichocrosis punctiferalis* infesting castor

Two sprays of chlorantraniliprole 10 + lambda cyhalothrin 5 ZC (4 ml/10 L of water) or novaluron 5.25

+ emamectin benzoate 0.9 SC (15 ml/10 L of water) or novaluron 5.25 + indoxacarb 4.5 SC (16 ml/10 L of water) first spray at the initiation of pest infestation and second at 15 days after first spray for the management of castor capsule borer.



4.5.2.2 Plant Pathology

Integrated management practices to minimize *Aspergillus flavus* infection in groundnut

Seed treatment with mancozeb 75 WP 3 g/kg of seed + chlorpyrifos 20 EC 25 ml/kg of seed at the time of sowing + furrow

application of *Trichoderma harzianum* 1.00 % WP (2×10^6 cfu/g min.) 2.5 kg in 500 kg of FYM/ha at the time of sowing + soil drenching of chlorpyrifos 20 EC 5 ml/lit of water at 30 and 60 days after sowing to reduce the aflatoxin infection in groundnut.



Management of pearl millet blast (*Pyricularia grisea*) disease

Two sprays of azoxystrobin 11 + tebuconazole 18.30 SC 0.05 % (17.00 ml/10 L of water) or tebuconazole 50 + trifloxystrobin 25 WG 0.05 % (6.50 g/10 L of water) first at initiation of disease and second spray after 15 days of first spray for the management of blast disease in pearl millet.

Management of pearl millet blast by using chemical and bio agents

Spray of *Pseudomonas fluorescens* 1.00 WP 1 × 10⁸ cfu/g min. (100 g/10 l of water) at 20 days after sowing (DAS) and second spray of tebuconazole 50 + trifloxystrobin 25 WG 0.04 % (5.33 g/10 L of water) at 35 DAS or two sprays of tebuconazole 50 + trifloxystrobin 25 WG 0.04 % (5.33 g/10 L of water) at 20 and 35 DAS for the management of blast disease in pearl millet.

Effect of different fungicides for the management of blight and powdery mildew in fennel

Three sprays of azoxystrobin 11 + tebuconazole 18.30 SC 0.044 % (15 ml/ 10 L water) or metiram 55 + pyraclostrobin 5 WP 0.18 % (30 g/10 L water) or tebuconazole 50 + trifloxystrobin 25 WG 0.045 % (6 g/10 L water) first spray at initiation of disease and subsequent two sprays at an interval of 20 days for the management of *Alternaria* blight of fennel.



4.6 Horticulture and Forestry

Horticulture and Forestry carry out the research on fruits science, vegetables science, post-harvest technology of fruits & vegetables, floriculture & Landscape Architecture and research on spices. This also includes the development of new fruit and vegetable crop varieties.

Planting material of fruit crops, seedling and Ornamentals & Medicinal plants are provided to the farmers and stake holders at dispatching centre of Junagadh, Mangrol and Mahuva as per below table



Table 4.6.1 Production of planting material of horticultural and other crops

Sr. No.	Planting Material	Production (Nos.)
1	Fruit crop graft	18386
2	Fruit crops saplings	44082
3	Seedlings	34527
4	Ornamentals & Medicinal plants	50858
	Total	147853

4.6.1 Recommendation for Farmers.

Response of different rootstocks under saline irrigation condition in tomato

The farmers of South Saurashtra Agro-climatic Zone growing tomatoes are recommended to use var. GT-6 grafted on Arka Vikas with use of saline irrigation water up to 2.0 dS/m EC for higher yield and net return.



Nutrient management in tomato under polyhouse

The farmers of Gujarat growing tomato under polyhouse are recommended to apply RDF (25.0-12.5-12.5 N-P₂O₅-K₂O kg/ 1000 m²) + *Panchgavya* 3 % (3 spray at 45, 60 and 75 days after transplanting) to obtain higher yield and net return.



Propagation of a rare and medicinally important declining shrub species *Agnimantha (Premna serratifolia L.)* by hardwood cuttings

The nurserymen of Gujarat are recommended to use plant growth regulator either IBA @ 450 ppm (73.33 % sprouting) or IAA @ 450 ppm (70.67 % sprouting) [i.e. 450 mg in one litre water] for 15 minutes dipping for better propagation in hardwood cuttings of *Agnimantha (Premna serratifolia L.)*.



4.7 Agricultural Engineering

The Agricultural Engineering group accomplished the studies on design, development & fabrication of

agricultural machinery, equipment, tools, sources of renewable energy, processing of agricultural goods and conservation of water etc.

The “Testing and Training Center of Farm Machinery” under the Department of Farm Machinery and Power, CAET, JAU, Junagadh was established in August, 2008 by the State Govt. with the financial support from the Central Govt. under Rashtriya Krishi Vikas Yojna (RKVY). It is on the line of testing of agricultural machines carried out by Farm Machinery Testing and Training Institutes (FMTTIs), established by the Govt. of India. This Center is one of the twenty five institutions approved by the Department of Agriculture & Co-operations, Ministry of Agriculture, GoI in the direction of ensuring supply of quality agricultural machinery and equipment under Government programs. Various types of equipments produced by the manufacturer of the state and national level have been received for evaluation of their work performance and feasibility.

Table 4.7.1: No. of Farm Machineries/ Implements/ equipments (category wise) tested at testing centre of FMPE, CAET

Category	Name of Equipment / Machine	No. of Equipment / Machine Tested
A	Land development, tillage & seedbed preparation equipment	60
B	Sowing and planting equipment	12
C	Intercultivation equipment	0
D	Plant protection equipment	10
E	Harvesting and threshing equipment	26
F	Equipment for residue management	11
G	Post-harvest and agro processing equipment	01
Total		120

4.7.1 Recommendation for Farmers

Yield response of drip fertigation for wheat-green gram crop sequence

The farmers of South Saurashtra Agro-climatic Zone growing wheat are recommended to apply 75 % of NPK of RDF (120 N:60 P₂O₅:60 K₂O kg/ha) through drip fertigation only (with no basal doze) adopting the following drip system and irrigation schedules to wheat crop in 8 equal splits at 6 days interval after 12 days of sowing to get higher grain yield and net return.





Specifications of drip irrigation system and its operating time for wheat crop				
Drip irrigation system details	Nos. and depth of irrigation and drip irrigation system operating time for wheat crop during winter season			
	DAS	No. of irrigations	Irrigation depth (mm)	Operating time/ irrigation
Lateral type =Inline	0	1	40	3 h & 23 Minutes
Inline drip size =16 mm (OD)	0-10	1	30	2 h & 32 Minutes
Dripper rate 4 =lph	10-40	5	20	1 h & 41 Minutes
Dripper spacing =0.5 m	41-70	5	22	1 h & 51 Minutes
Lateral spacing =0.675 m	71-90	3	24	2 h
Nos. of crop rows per drip line =3	> 90	2	26	2 h & 12 Minutes

It is also recommended to sow green gram crop in paired row (0.3 m x 0.375 m) after harvesting of wheat crop without any cultivation operation and to apply 75 % P of RDF (20 N:40 P₂O₅:00 K₂O kg/ha) as basal doze

and 75 % N of RDF through drip fertigation adopting the following drip system and irrigation schedules in 5 equal splits at 6 days interval after 12 days of sowing to get higher seed yield and net return.

Specifications of drip irrigation system and its operating time for green gram crop				
Drip irrigation system details	Nos. and depth of irrigation and drip irrigation system operating time for green gram crop during summer season			
	DAS	No. of irrigations	Irrigation depth (mm)	Operating time/ irrigation
Lateral type =Inline	0	1	20	1 h & 41 Minutes
Inline drip size =16 mm (OD)	0-10	1	15	1 h & 16 Minutes
Dripper rate 4 =lph	11-30	5	21	1 h & 46 Minutes
Dripper spacing =0.5 m	31-70	6	23	1 h & 56 Minutes
Lateral spacing =0.675 m	>70	1	22	1 h & 51 Minutes
Nos. of crop rows per drip line =2				

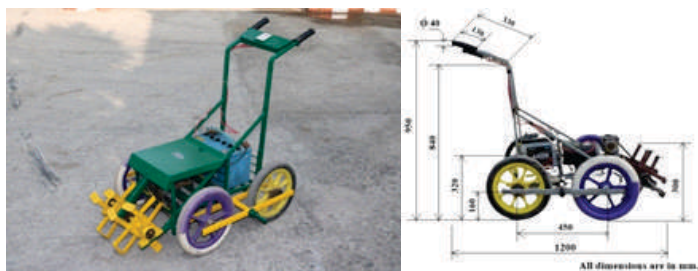
***In-situ* soil moisture conservation: utilization and management of rainwater for groundnut production**

The farmers of North Saurashtra Agro-climatic Zone are recommended to grow groundnut by sowing on tied ridge with plot bunding and apply agricultural waste (Groundnut shells @ 1.5 t/ha) as mulch to conserve moisture and obtaining maximum rain water use efficiency, higher productivity and net returns under dry farming conditions.



Design, development and performance evaluation of battery operated light weight interculture tool/weeder

Farmers and manufacturers are recommended to use the JAU developed battery operated (easily operated by one person) intercultural tool /weeder (having rotary type blades, operated by 0.5 hp DC motor and 12-V 74-Ah, rechargeable battery) for vegetable/horticultural crops for interculturing / weeding operation. The working width of weeder is 30 cm with field capacity 0.02-0.03 ha/h and 84 to 90 % weeding efficiency. There is a saving of up to 85 % in time, 35 % in energy and 78 % in cost of operation.



Development and performance evaluation of mini tractor operated multi crop weeder

Farmers are recommended to use “Mini Tractor Operated Multi Crop Sweep Blades Weeder” developed by Junagadh Agricultural University for better performance in weeding, time and cost saving in place of existing blade harrow.



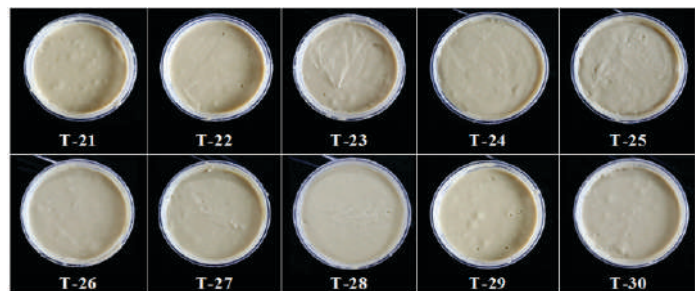
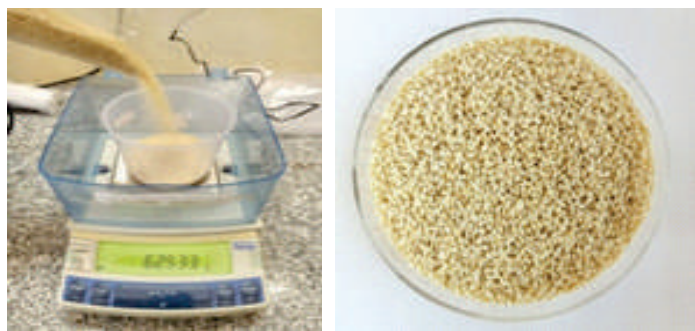
Development and performance evaluation of mini tractor operated weed inverting roller

Farmers are recommended to use “Mini Tractor Operated Weeder with weed inverting roller” developed by Junagadh Agricultural University for better performance in weeding, weed inverting and time saving in place of existing blade harrow.



Standardization of process parameters for sesame spread preparation

The manufacturers of sesame spread are recommended to adopt the process technology developed by Junagadh Agricultural University for the production of good quality sesame spread. The recommended procedure involves roasting of dehulled sesame seeds at 147 °C for 27 minutes 30 second. Subsequently, the cool roasted dehulled sesame seeds are blended and grinded with jaggery (9.50 %), hydrogenated vegetable oil (6.20 %), guar gum powder (1.3 %) and salt (1.0 %). Following this process protocol leads to sesame spread with optimal quality attributes.



The manufacturers of sesame spread are recommended to store sesame spread in PET (Polyethylene Terephthalate) containers under refrigerated conditions (8°C) to ensure safety storage up to three months. This storage protocol developed by

Junagadh Agricultural University maintains superior biochemical, rheological and sensory quality along with oxidative and microbial stability of the sesame spread throughout the three month storage period.

Development of solar tunnel dryer for local spices

The farmers and processors involved with drying of spices, viz., fresh red chilies, turmeric and ginger are recommended to use the solar tunnel dryer developed by Junagadh Agricultural University to reduce the drying time, drying space, minimize post-harvest losses during drying and handling, better quality, more recovery as well as higher economic returns of their dried spices as compared to traditional sun drying method.



- Quantity of spices in the dryer: 500 ± 5 kg (Red chilies), 540 ± 5 kg (Turmeric), 525 ± 5 kg (Ginger) per batch
- Drying time: 14 days (red chilies), 22 days (turmeric), 23 days (ginger) (during January-April).

Development of solar tunnel dryer for local spices

The farmers and processors involved with drying of spices are recommended to use the solar tunnel dryer developed by Junagadh Agricultural University for drying spices to a safe moisture level as per following details.



- Details of solar tunnel dryer:
- Capacity of dryer: 500 ± 5 kg to 540 ± 5 kg depends on spices to be dried.
- Drying trays: 64 trays arranged in two tiers.
- Maximum drying air temperature: 53 °C ± 2 °C.

- Maximum increment in drying temperature: 25.9 °C (winter) and 28.8 °C (summer).
- Solar collectors (Optional): 3 Nos. (1.22 m x 2.44 m).

Gasification of Castor and pigeon pea crop residues for combined gaseous and bio-char production

The farmers and entrepreneurs are recommended to use shredded castor and pigeon pea stalks as feed stalks in an open-core downdraft gasifier system developed by Junagadh Agricultural University. The maximum gasification efficiency of 71.44 % & 73.28 % and biochar production of 21.56 % & 21.78 % having the fixed carbon content of 59.61 % and 49.22 % could be achieved from castor and pigeon pea stalk respectively at 22 m³/h gas flow rate. The carbon footprint (CF) of biochar is a net reduction of 1.67 tons of CO₂ per ton of feedstock.

Performance of field crops and shade resistance vegetable crops under the Agrivoltaic System

Farmers of Gujarat state are recommended to use J.A.U model of Agrivoltaic system for electricity generation along with the cultivation of field crops like; Cotton, Groundnut and Cucumber to get additional income on the same land throughout the year.

4.7.2 Recommendation for Scientific Community

River flow simulations integrating satellite data in a forested catchment

In assessing the spatial soil wetness condition of a catchment, microwave remote sensing proves to be an invaluable tool. However, it is advised the scientific community to exercise caution when applying scatterometer data for estimating river water levels in forested catchments. The presence of a dense forest canopy can lead to reduced radar backscatter, potentially affecting the accuracy of the estimates.

River flow simulations integrating satellite data in a forested catchment

It is recommended to use the following power function relationship as a tool for estimating downstream discharge (outlet discharge) based on water level measurements. $Y = a \cdot X^b$ Where, $a = 0.7501$, $b = 2.4511$, X = river water level, meter and Y = discharge in cumec)

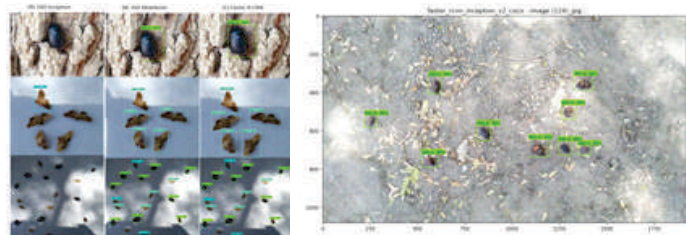




This equation offers invaluable assistance to forest planners in effectively managing available water resources. By employing this relationship, planners can make informed decisions, ensuring sustainable and efficient water allocation within forested regions, thereby contributing to sound environmental stewardship and resource conservation.

Detection and Classification of the major Nocturnal flying Insects using Deep Learning

It is recommended to use Convolutional Neural Network (CNN)'s meta-architecture Faster Region-Convolutional Neural Network (Faster R-CNN) for the detection and classification through digital view of major nocturnal flying insects for better performance. In the case of addressing class imbalance issues, an augmentation technique with Faster R-CNN is recommended.



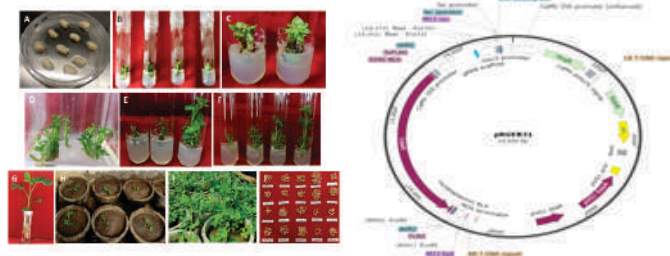
4.8 Basic Science

Basic Science group works on the areas of plant Biochemistry & Biotechnology, Plant Physiology and Plant molecular Biology. It includes research on Genetic manipulation of crops for stress resistance, molecular biology and genetic engineering work in plant sciences.

4.8.1 Recommendation for Scientific Community

Improvement of Groundnut oil quality for high oleic acid through CRISPR/Cas gene editing technology

The scientific community involved in groundnut improvement through genome editing technology is recommended to use the optimized tissue culture protocol using de-embryonated cotyledone as explants (multiple shoot formation: MS + 25.0 mg/l 6-benzylaminopurine, shoot elongation: MS + 3.0 mg/l 6-benzylaminopurine, + 1.0 mg/l gibberellic acid, root induction: MS + 1.0 mg/l naphthalene acetic acid), CRISPR/Cas9 technology and binary vector for successfully editing the gene of interest (*AhFAD2B*) in groundnut for achieving high O/L ratio (8.52). A single guide RNA sequence (5'TGTGGTCTATGATCTGT-TAATGG3'), designed by using CHOPCHOP, was utilized to guide the Cas nuclease for precise editing.



4.9 Social Science

Social Science group works on the areas of Agricultural Economics, Agricultural Extension Education, Agricultural Statistics, Agribusiness Management and Home Science.

Agricultural economists worked on different research projects viz. i) Farm cost studies of important crops in Gujarat state; ii) Changing Cost Structure and Total Factor Productivity Growth of Onion in Gujarat; iii) Credit flow and its utilization behavior among farmers in Saurashtra region, Gujarat; iv) Price forecasting for selected crops; v) Performance and Determinants of Plant Varietal Protection (PVP) Legislation in Indian Agriculture with Special Reference to Gujarat; vi) India's balance of trade in agriculture with SAARC nations: An econometric analysis and vii) The scheme for creating a permanent





machinery for studying the cost of cultivation/production of principal crops grown in Gujarat. The price forecast reports of groundnut and cotton were prepared and disseminated in October-November, 2023 at harvesting season, which published in 7 clippings of leading Gujarati News Papers on different dates. This benefits the farmers to take decisions regarding, storage or to sale at current prices.

Various research projects are running by Post Graduate Institute of Agribusiness Management Institute, JAU, Junagadh, which includes: i) Effect of micro irrigation system on livelihood in Saurashtra region; ii) Value chain analysis of Kesar mango in Saurashtra region; iii) Social media usage and academic performance of students of Junagadh Agricultural University; and iv) Export cost estimation and mileage of major commodities of Saurashtra.

4.9.1 Recommendation for Scientific Community

Changing Cost Structure and Total Factor Productivity Growth of Onion in Gujarat

It is suggested to the policymakers that since the onion yield growth rate during the last three decades in Gujarat could not outpace the growth in labour, seed and plant protection costs, the negative growth in total factor productivity (TFP) and higher growth of real cost of production (RCP) over farm harvest prices (FHP) need to be countered with the promotion of large-scale mechanisation in farm operations, proper management of agronomical practices and optimal seed rate.

Performance and determinants of Plant Varietal Protection (PVP) behaviour in Indian agriculture with special reference to Gujarat

It is recommended that targeted sensitization drives through training and workshops be scaled up to increase the grassroots awareness of PPVFRA and enhance the registration of farmers' varieties. In addition, it is also recommended for promoting location-specific hand-holding sessions for filing the applications of farmers to address the imbalances in crop-wise and region-wise registrations. Both public and private agencies should also be encouraged to share their infrastructure and technical knowledge, leading to the enhanced prospects of registration and commercialization of improved varieties/hybrid cultivars.

Hectareage Prediction Models for Major Oilseed crops of Gujarat: An Empirical Investigation

It is recommended to the scientific community that area under selected crops can be precisely predicted using the single equation models rather than simultaneous equation models as single equation model gives maximum R^2 and \bar{R}^2 with low values of MAPE, RMSE and MAE.

Development of Statistical Analysis Programme using Python Machine Learning and Data Visualization

The scientists/researchers of SAUs are recommended to use new computer programs developed by the Junagadh Agricultural University which are requirement specific, unique, user friendly with the important features of descriptive auto conclusion and auto data visualization for Individual, pooled, control vs rest CRD, RBD, FCRD and FRBD analysis respectively, simple linear, multiple linear and polynomial regression as well as one, two and pair sample T tests. It is also recommended to JAU to develop & design open source user interface, so SAUs of the Gujarat can be used these computer programs without any charges.

Farmers' adoption of cotton production technologies recommended by JAU, Junagadh

The extension functionaries are advised to conduct training programmes, field demonstrations and exhibitions of pest and disease samples for cotton growing farmers in line with the recommended cotton production technologies of Junagadh Agricultural University to ensure their maximum adoption by farmers.

Value chain analysis of Kesar mango in Saurashtra region

Stakeholders and policymakers involved in the Kesar mango value chain in the Saurashtra region are advised to strengthen crop management system, develop post-harvest infrastructure and improve post-harvest operations to maintain better quality of Kesar mango for the remunerative farming and consumer satisfaction.



Effect of micro irrigation system on livelihood in Saurashtra region

Extension functionaries are recommended to advise farmers of the Saurashtra region to adopt and use micro irrigation system in their farm to reduce their poverty level and increase the financial and overall livelihood.

4.10 Transfer of Technology

4.10.1 Front Line Demonstration (FLD) conducted on farmers' field

Crop scientists of JAU have successfully conducted Front Line Demonstrations (FLDs) of newly developed varieties and production technologies on farmers' fields for speedy propagation among the farmers.

Table 4.10.1: Summary of FLDs of Improved Varieties

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	Sesame (Summer)	GJT 5	20	8	8.07	7.46	8.12
2	Sesame (Kharif)	G.Til 6	13	5.2	7.64	6.67	14.45
3	Cotton	GADC-3	10	4.0	4.891	4.389	11.44
4	Castor	GCH 9	32	12.8	40.71	36.39	17.10
5	Pearl millet (Summer)	GHB 1129	50	20	39.59	37.12	6.67
6	Pearl Millet (Kharif)	GHB 1129	12	4.8	27.91	25.28	10.40
7	Pigeon pea	GJP-1	15	13.0	17.68	14.72	20
8	Chickpea	GG 7	4	2.0	22.60	18.70	21
		GG 8	5	2.5	25.44	21.20	20
		GKG 1	1	0.5	24.00	19.00	26
		GJG 6	15	6.0	16.46	14.76	11.55
9	Coriander	G. Cr.-4	18	0.4	17.56	12.39	41.68
		G. Cr.-3	21	0.4	12.86	11.59	10.95
10	Cumin	Gujarat Cumin-4	17	0.4	6.06	5.12	18.41
11	Fenugreek	G. Fenugreek-2	04	0.4	17.39	14.40	20.75
12	Fennel	G. Fennel-12	02	0.4	18.05	14.17	27.34
13	Ajwain	Gujarat Ajwain-2	01	0.4	7.10	5.95	19.33
14	Onion (Kharif)	Bhima Supar	05	0.4	328.30	294.70	11.40
15	Onion (Rabi)	GJRO-11	20	0.4	356.55	292.93	21.72
16	Garlic	GJG-5	07	0.4	69.38	59.67	16.27



Table 4.10.2: Summery of FLDs of Improved Technology

Sr. No.	Crop / other	Production technology	No. of FLDs	Total area under FLD (ha)	Yield in IP (q/ha)	Yield in FP (q/ha)	Increase in yield (%)
1	Sesame (Summer)	Plant protection	5	2.0	7.51	7.16	4.83
		Fertilizer management	5	2.0	8.15	7.61	7.15
2	Sesame (<i>Kharif</i>)	Whole package	4	1.6	8.18	6.67	22.68
		Intercropping	1	0.4	8.38	6.42	30.53
		Fertilizer management	4	1.6	7.87	7.24	8.78
		Plant protection	3	1.2	6.67	6.26	6.61
3	Cotton	IPM/ INM and Canopy mgmt.	62	30	22.72	21.22	6.60
		High Density Planting	10	4.0	5.81	5.18	12.22
		Pest and disease management	10	4.0	5.55	4.98	11.51
4	Wheat	Nutrient management	10	4.0	33.40	29.80	12.07
5	Cumin	Pest and disease management	10	4.0	4.81	4.27	12.70
6	Groundnut (Summer)	Whole package	19	7.60	22.42	21.02	6.63
7	Castor	Intercropping - Castor + Groundnut	10	4.0	59.33	26.92	135.9

Note: 1. Improved technology includes crop production, plant protection and basic science.

2. Yield of inter cropping is the main crop (as shown in column-2) equivalent yield.

4.11 Others

4.11.1 Intellectual Property Rights (IPR)

University has developed different technologies in various fields of agriculture, agricultural engineering. To protect these technologies, University has filed these inventions under various categories of IPR, *i.e.* Patent, Design *etc.* The details of patented technologies under IPR Act are given below.

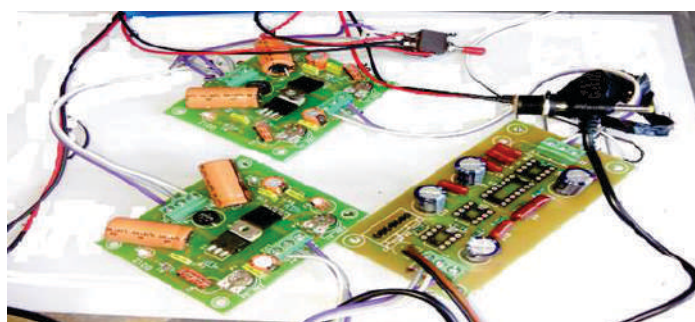


Table 4.11.1: Details of Patent/Design approved

Sr. No.	Title of Patent/ Design	Field of Invention	Patent/Design No.	Date of Grant
Patents				
1	Nano-biosensor and methods for Detecting Potassium Ion Concentration	Physics	438688	13/07/2023
2	A Grain Treater for Pre-Milling Enzymatic Treatment to Pigeon pea	Mechanical Engineering	470670	20/11/2023
3	Device for Insects Trapping for Managing Insects	Agricultural Engineering	478250	07/12/2023
4	A Process of Enzymatic Pre-treatment on varieties of Pigeon pea	Mechanical Engineering	486988	21/12/2023
5	Pomegranate Juice Extractor	Mechanical Engineering	506284	01/02/2024
6	Preparation of the Fishing Net Mending Table and its Application for Fabrication and Mending of the Fishing Net	Mechanical Engineering	528441	15/03/2024
Design				
7	Open Core Throat Less Downdraft Biomass Gasifier	Class 23, Subclass 03	394622-001	22/03/2024

4.11.2 New research programs sanctioned

Various research programmes of Plan, ICAR, RKVY and other agencies were sanctioned during the year 2023-24.

Table 4.12.2 New research programs sanctioned during the year

SN	Agency	No. of Research Programs	Amount (Rs. in Lakh)
1	Plan	2	248.10
2	ICAR	1	75.19
3	RKVY	1	100.00
4	Other Agencies	18	136.36
	Total	22	559.65



