Vision 2030

Junagadh Agricultural University
Junagadh - 362 001 (Gujarat), India

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Dileep Sanghani

सत्यमेव जयते

Minister of Agriculture and Cooperation,
Animal Husbandry, Fisheries,
Cow-breeding, Prison, Law and Justice,
Legislative and Parliamentary Affairs
Government of Gujarat.
Date : Jan. 18, 2012

Message

Agriculture sector is witnessing radical changes and challenges at state and national level. The demand for agricultural commodities is steeply rising; food preferences of the next-generation consumers are changing; and agriculture sector is struggling with decelerating profitability which are dragging its performance. The emerging challenges and opportunities call for a paradigm shift in the innovation-driven agricultural research system to connect inventions with all the stakeholders in the entire food supply chain.

I am delighted that the Junagadh Agricultural University has shown the foresightedness and prepared innovation-driven strategy. The present document JAU Vision 2030 provides the strategic framework for innovation-led inclusive and sustainable agricultural growth. I complement the efforts made by the Junagadh Agricultural University to come up with a comprehensive road-map with potential to transform agriculture towards prosperity.

I am sure that the forward looking approach and proposed strategies of the university would bring a substantial change in the agricultural research system, and improve its efficiency and effectiveness to accelerate the growth of agriculture sector.

Dileep Sanghani

(***Dileep Sanghani***)

Dr. N. C. Patel

Vice Chancellor
Junagadh Agricultural University
Junagadh - 362 001 (Gujarat), India

Foreword

Agriculture is the mainstay of Indian economy. It continues to be a powerful engine for livelihood security, economic growth and social transformation. However, increase in the requirement of food, fibre and wood for the burgeoning population, diminishing natural resources and degradation in their quality is adversely impacting the agricultural production and productivity. Tasks ahead of us are plenty and the challenges colossal. However, we stand to play a vital role in achieving the objectives set before us.

The agricultural education and research at Junagadh has passed through metamorphosis during last five decades. Started as an affiliated college of agriculture, it has grown remarkably by addition of several colleges, polytechnics, research stations, KVKs and Centres of Excellence. It has also grown qualitatively adding, restructuring and rewriting the curriculum of almost all the under graduate and post graduate programmes. During last two and half decades, JAU (previously GAU) has played a pivotal role in steering the agriculture growth in the state.

This document highlights the achievements and proposes new research concepts to develop and promote innovative and need based scientific technologies to meet the demand of continuously changing social and economic needs together with an explicit analysis of our weaknesses and strengths. It is expected that approaches and advance concepts presented in the "Vision 2030" document will prove useful for educationist, scientist and extension educationist to address the future challenges for growth and development of agriculture and related sectors of Gujarat.

I commend the efforts put by all the Deans, Directors and Task Force Committees for preparation of the Vision 2030 document.

I hope the vision will provide us the sense of direction in realizing our goals and mission.

Junagadh
Date: 25.01.2012

Patel

(***N. C. Patel***)

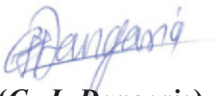
Preface

As visualised decades ago by Mahatma Gandhi, India's main economic pillar is embedded in the agriculture sector, which is the prime sector for achieving sustainable growth rate of any country. Amidst the contradiction of ever-increasing demand of food due to population explosion and degrading or depleting natural resources combined with the adversities generated by climate change, the role of agricultural research becomes vital. The situation warrants the urgency to raise farm income through improved agricultural innovations. This requires reforms in the research system by creating greater synergies between research, education, extension and commercialization. Junagadh Agricultural University (JAU) is one of the posterities of the erstwhile Gujarat Agricultural University, which came in to existence from May 1st 2004. Jurisdiction of JAU is Saurashtra region comprising seven districts of Gujarat State and representing four agro climatic zones, possessing arid and semi-arid climatic conditions, different soil types, very long coastal line with salinity ingression and diverse but unique socio-economic scenario. During the last decade, Gujarat has witnessed an average agricultural growth of about 10.67 per cent as against the national average of 3.57 per cent. Nevertheless this progress should not make us contented as the state agriculture is facing many challenges to achieve sustainable growth rate in future.

JAU Vision 2030 is an essence of the strategies and necessities to reap the existing potential and opportunities to strengthen the extension, education and research pertaining to field crops, fruit crops, livestock, fisheries and agricultural engineering components by redefining academic focus as per the changes and challenges confronting the region, establishing the linkages and partnership among stakeholders connecting higher agricultural education and research to the productive sector, developing innovative plans for training future agricultural leaders with a focus on practical applications, building up expertise in biotechnology, nanotechnology, value addition, agro-based industries and fish enterprises, training for the acquisition of entrepreneurial skills and other forms of experiential learning and reaching into the sphere of vocational training, researching the potent fields endangering the production potential such as biotic and abiotic stresses, and developing environment-friendly novel management

stratagems for natural and genetic resources and farmer-friendly farm mechanization.

I would like to express my gratitude to Hon'ble Minister for Agriculture, Gujarat State, Shri Dileepbhai Sanghani for his invaluable guidance in visualizing the Vision 2030. I am also thankful to Hon'ble Vice Chancellor, Junagadh Agricultural University, Dr. N. C. Patel who has been an incessant source of inspiration and a driving force behind preparation of this vision document. The contribution of the various inputs rendered by the different committee members and the assistance received by different stakeholders is thankfully acknowledged. I appreciate the perseverance and sincere efforts of Dr. I. U. Dhruj, Associate Director of Research, Dr. A. S. Joshi, Research Scientist (Mega seed), Dr. K. B. Parmar, Asstt. Research Scientist, Dr. S. T. Sanandia, Asstt. Research Scientist, and Dr. R. K. Mathukia, Asstt. Professor in giving fine shape to the Vision 2030. The Vision 2030 will certainly be proved a road map to address current and future challenges in agriculture at regional, state and ultimately the national level.



Junagadh
Date: 25.01.2012

(*C. J. Dangaria*)
Director of Research &
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Agricultural Scenario of Saurashtra

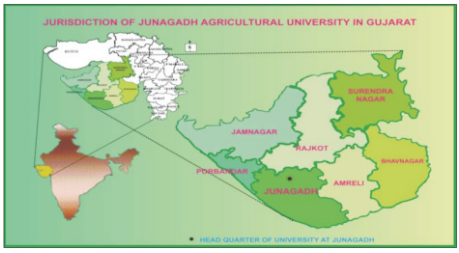
The agricultural education in Saurashtra region of Gujarat State started way back in 1960 with the establishment of College of Agriculture in a palatial building at Sardarbaug, Junagadh. The college was affiliated to Gujarat University, Ahmedabad from its outset till the year 1967.

Subsequently, on inception of Saurashtra University in 1968 at Rajkot, the affiliation was transferred to it. With the establishment of Gujarat Agricultural University (GAU) as an autonomous body in 1972, it was transferred to the Gujarat Agricultural University with all the activities so far carried out by the Department of Agriculture. It thus, became a constituent college of the Gujarat Agricultural University. Junagadh Agricultural University was carved out of GAU with its splitting into four universities on May 01, 2004.

The jurisdiction of this University is seven districts *viz.*, Junagadh, Rajkot, Jamnagar, Porbandar, Amreli, Bhavnagar and Surendranagar of Saurashtra region comprising nearly 32.82 per cent (6.43 million ha) area of the Gujarat State (19.60 million ha).

College of Agriculture, Sardarbaug (1960)

University Bhavan



Jurisdiction of JAU

Geographical distribution

Saurashtra is located on the West Coast of India in Gujarat State and lies between $20^{0}30'$ to 23^{0} N latitude and 69^{0} to 72^{0} E longitude. It is flanked by Arabian Sea on the western side, the Gulf of Kutch in the north and Gulf of Khambhat in south. The Saurashtra region has an irregular high land core. The low coastal strip covered with sand and alluvium silt with the high land fringe by a 75 m contour. The altitude gradually rises to 300 m and above to form different grades of surface.

Climate

In terms of the standard climatic type, Saurashtra region comprises of arid and semi arid types of climate. The region in the extreme north comprises the district of Jamnagar and to the southern part, the district of Bhavnagar. The entire region is surrounded by sea on three sides, while it is connected with main land of Gujarat to its east. The Gulf of Kutch lies to its north, while the Gulf of Khambhat is located to its south east. The rivers that drain the area are Bhadar, Shetrunji, Shigvada, Raval, Ardak, Machhundri, Hiran and Bhogavo. Hills of Girnar, Palitana and Barda are noteworthy in the region. The natural eco-system include thorn-scrub forests, grassland (*Vidis*), dry deciduous and riverine forests, mangroves, inter tidal region and coastal area including estuaries.

Rainfall

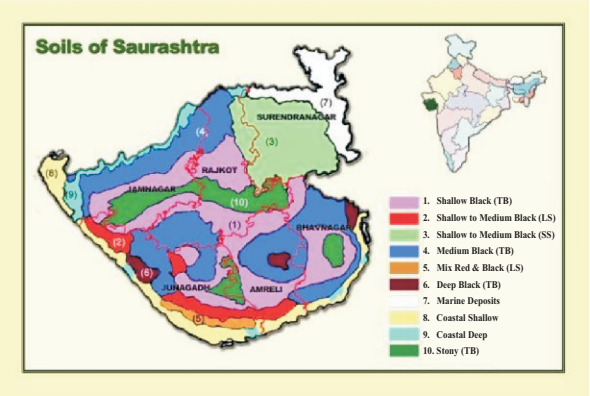
All parts of Saurashtra receive precipitation through the south west monsoon. The region being located at the peripheral boundary of the south west monsoon, the distribution of rainfall has been extremely uneven and irregular. The low pressure, depressions developing over the Bay of Bengal during monsoon months and moving north-to-north west also give rains to this part of the state. The average annual rainfall over different parts of the region varies widely from 400 mm in the northern part to 800 mm in the southern part of Junagadh district. The monsoon usually commences by the middle of June and withdraws by the middle of September. More than 95 per cent of the total annual rainfall is being received during June-September in most parts of the region. About 10-15 per cent of the annual rainfall is received in June, nearly 40 per cent in July, 30 per cent in August and 10-20 per cent in September. The maximum number of rainy days are in July and August. The rainy days range from 20 in Jamnagar to 37 in Junagadh district. The entire region falls under dryland and drought prone area. The co-efficient of variation of rainfall is more than 45 per cent.

Temperature

There is considerable variation in average temperature in different seasons in the region. During summer season, the maximum temperature goes beyond 42^{0}C and minimum temperature falls to 25^{0}C. In winter season,

minimum temperature occasionally goes below 8^0C and maximum temperature up to 34^0C. The lowest temperature is recorded in the month of January and the highest temperature in the month of May. Temperatures are relatively low at places located in coastal region. The diurnal range of temperature is least in the months of July and August, while it is more in the winter. The range is higher for places like Rajkot, Amreli and Surendranagar.

Soils



The soils of Saurashtra region are low in nitrogen, sulphur and zinc, medium in phosphorus and iron, and high in potash. The soil of Saurashtra region is diverse in nature which can be broadly classified into ten groups viz., 1) shallow black (Trap Basalt), (2) shallow medium black (Lime stone) (3) shallow to medium black (Sand stone), (4) medium black (Trap Basalt), (5) mix red & black (Lime stone), (6) deep black (Trap Basalt), (7) marine deposits, (8) coastal shallow, (9) coastal deep, (10) stony (Trap Basalt).

While considering the major soil types, the pattern of rainfall and the temperature, the Gujarat State is divided into eight agro climatic zones *viz.*, I-South Gujarat Heavy Rainfall, II-South Gujarat, III-Middle Gujarat, IV-North Gujarat, V-North West, VI-North Saurashtra, VII-South Saurashtra and VIII-Bhal & Coastal area. Out of which Junagadh Agricultural University is functioning in agro climatic zone No. VI, VII and part of zone V & VIII.

Issues

The major part of the Saurashtra region, falls under semi arid and arid types with varying climatic as well as soil conditions, has been divided into two Agro-climatic zones. The agro-ecological characteristic features and issues thereof have been:

- About 70 per cent of total area is rainfed and there is a wide variability in crop yields due to erratic and scanty rainfall.
- The economy is mainly based on the activities related to cotton and groundnut in crop sector and livestock and fisheries in the non-crop sector.
- The area and production of cereals and pulses is limited.
- In Saurashtra, irrigated area is quite low and most of the irrigation is through open wells and tube wells. It ranges between 14.6 per cent in

Jamnagar to 23 per cent in Junagadh with an average of 20 per cent. However, use of water conservation technologies *viz.*, check dam, bori-bandh, khet-talavdi (farm pond) etc. has recharged the ground water up to some extent.

- Saurashtra has groundnut as predominant monocrop system followed by cotton and bajra in kharif season.
- In the adjoining areas of 788 km long coastal belt, sea water ingress and inland salinity caused soil health/fertility problems.
- Due to industrial establishments in Saurashtra, the deposition of effluent water and heavy metal contaminants as well as mining near coastal region posed socio economic and ecological problems. The heavily affected areas have been the part of Jamnagar, Porbandar, Junagadh and Bhavnagar districts.
- As the water requirement of the crops is very high, scanty rainfall and the less number of rainy days are the hurdles for crop production in the region.
- The cost of cultivation is relatively higher in the region.
- Limited fruit processing industries in this region.

Agricultural Scenario

Gujarat is located on the west coast of India surrounded by the Arabian Sea in the West, Rajasthan in the North and North-East, Madhya Pradesh in the East and Maharashtra state in the South and South East. It is situated between 20º1' and 24º7' north latitudes and 68º4' and 74º4' east longitudes. The state has the longest coastline of about 1600 km that has attracted seafarers through the ages, lured by the rich prospects of trade. The state has three distinct geographical regions a corridor which is the industrial main land, a peninsula known as Saurashtra, and Kutch, which is partly desert and partly marshland. The state has an international border with Pakistan at the north western fringe.

Population

As per the 2001 census, the population of state is about 5 crore. The state has 26 districts divided into 226 talukas with about 18309 villages. In Saurashtra region of Gujarat state, there exists marked variation in agro-ecological situations and diversity in socio-economic and cultural habits. The total population of Saurashtra region is 13.44 million as per 2001 census with a density of 215 people per km^2 living in 4767 villages spread over in seven districts. The overall literacy percentage in the Saurashtra is 68.20.

Land utilization

The total geographical area is 6.43 million hectares representing 32.82

per cent area of the state. Of the total geographical area of Saurashtra, 3.70 million hectares (61%) is cropped area. The cultivable waste land, other fallow, permanent pasture land, forest area, non-agricultural use & barren and uncultivable land account for 0.11, 0.32, 0.43, 0.39, 0.35 and 0.54 million hectare, respectively (Table 1 & Fig. 1).

Table 1: Land use pattern

Type	Per cent Area	
	Gujarat	Saurashtra (JAU jurisdiction)
Net sown area	47.33	61.13
Double cropped	5.99	3.17
Total cropped area	53.32	64.30
Cultivable waste land	9.88	1.89
Area under forest	9.29	6.46
Non agricultural use	5.68	5.78
Current and cultivable fellow	4.61	5.37
Permanent pasture & grazing	4.23	7.25
Barren & Uncultivable Land	12.97	8.95
Miscellaneous	0.02	0.00
Total geographical area of Gujarat =195,98,000 ha		

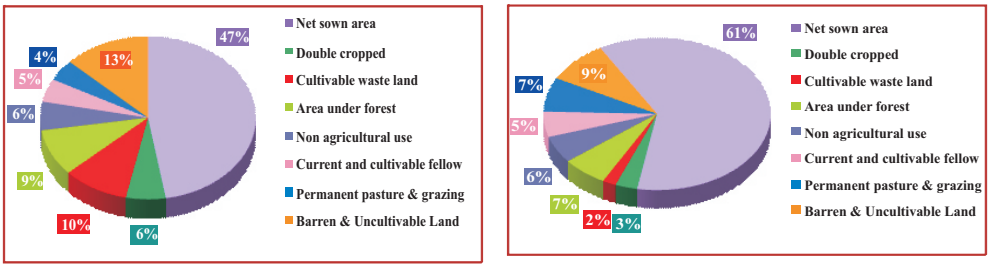


Fig.1: ***Land use pattern (area percentage) in Gujarat and Saurashtra***

Agriculture

Among the major crops, oilseeds (groundnut, sesame and castor) occupy 47.42 per cent of the gross cropped area followed by cotton (31.64 %) and total food grains (20.28 %). Other important crops grown in the region are spices (1.96 %), fruits (mango 0.66 % & sapota 0.17 %) and vegetables (brinjal 0.50 % & okra 0.24 %). In Saurashtra region, the major field crops are groundnut, cotton, wheat, bajra, sesame & cumin, while mango, coconut, citrus, sapota, guava & ber are the major fruit crops, and onion, brinjal, okra, tomato & cluster bean are the major vegetable crops (Table 2).

The cultivated area of cotton, gram, wheat, cumin, onion & garlic is increased, while area under groundnut, bajra, castor, sesame & pigeonpea is

decreased during 2004-10 as compared to 1994-03 in Saurashtra region (Table 3, Fig. 2). The area under vegetables, fruits and spices is increased during 2005-10 as compared to 2001-02. During the same period, the productivity of almost all the crops is increased to the tune of 5.75 % in onion to 111.74 % in cotton.

In Gujarat State, nearly 88 per cent of the cultivated area received inadequate, erratic and unevenly distributed rains which ultimately results into low and unstable crop yields and some times crop failure. Saurashtra region comprises of arid and semi arid types of climate. Most remunerative inter/relay cropping system are groundnut + pigeon pea, groundnut + castor, sesame + cotton, sesame + green gram, sesame + groundnut, pearl millet + moth bean and groundnut based cropping systems viz., groundnut-wheat, groundnut-wheat-green gram/black gram, groundnut-onion, cotton-sesame for the region.

Table 2: Major crops

District	Major crops (Rank)				
	I	II	III	IV	V
Field crops					
Amreli	Groundnut	Cotton	Sesame	Bajra	Wheat
Bhavnagar	Cotton	Groundnut	Bajra	Sesame	Wheat
Jamnagar	Groundnut	Cotton	Wheat	Bajra	Sesame
Junagadh	Groundnut	Wheat	Cotton	Bajra	Cumin
Porbandar	Groundnut	Cumin	Wheat	Gram	Cotton
Rajkot	Groundnut	Cotton	Wheat	Sesame	Bajra
Surendranagar	Cotton	Sesame	Bajra	Cumin	Wheat
Saurashtra	**Groundnut**	**Cotton**	**Wheat**	**Bajra**	**Sesame & Cumin**
Fruit crops					
Amreli	Mango	Sapota	Citrus	Guava	Ber
Bhavnagar	Mango	Citrus	Coconut	Guava	Sapota
Jamnagar	Papaya	Coconut	Mango	Ber	Sapota
Junagadh	Mango	Coconut	Sapota	Banana	Papaya
Porbandar	Coconut	Mango	Sapota	Papaya	Ber
Rajkot	Mango	Ber	Citrus	Sapota	Anola
Surendranagar	Ber	Citrus	Mango	Papaya	Sapota
Saurashtra	**Mango**	**Coconut**	**Citrus**	**Sapota**	**Guava & Ber**
Vegetables					
Amreli	Onion	Brinjal	Okra	Tomato	Cowpea
Bhavnagar	Onion	Brinjal	Tomato	Okra	Cucurbit
Jamnagar	Onion	Tomato	Okra	Brinjal	Cowpea
Junagadh	Brinjal	Onion	Okra	Cluster bean	Cucurbit
Porbandar	Onion	Brinjal	Cucurbit	Tomato	Okra
Rajkot	Onion	Brinjal	Cabbage	Tomato	Cucurbit
Surendranagar	Brinjal	Okra	Tomato	Cluster bean	Onion
Saurashtra	**Onion**	**Brinjal**	**Okra**	**Tomato**	**Cluster bean**

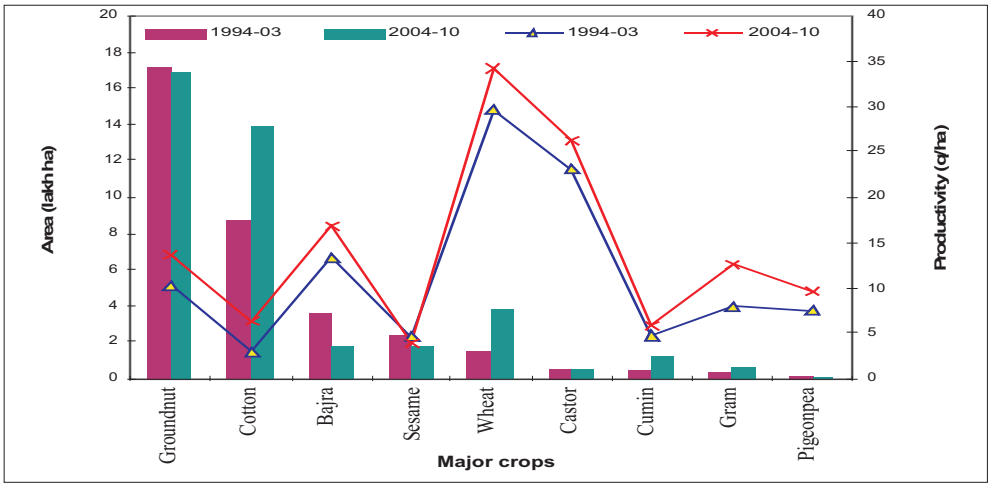


Fig.2: *Comparative area and productivity of major crops in Saurashtra*

Table 3: Comparative area, production and productivity of major crops in Saurashtra and Gujarat state

SN	Crop	Period	Saurashtra			Gujarat		
			Area (ha)	Production (t)	Yield (kg/ha)	Area (ha)	Production (t)	Yield (kg/ha)
1	Groundnut	1994-03	1714390	1761480	1023	1908560	2067510	1072
		2004-10	1688771	2312643	1372	1881657	2587600	1378
	Increase/Decrease (%)		-1.49	31.29	34.12	-1.41	25.16	28.54
2	*Bajra*	1994-03	359180	479250	1340	1036370	1185890	1140
		2004-10	181600	2999329	1670	815529	1031200	1273
	Increase/Decrease (%)		-49.44	-37.54	24.63	-21.31	-13.04	11.67
3	Castor	1994-03	47370	104180	2304	328050	596860	1707
		2004-10	46514	120729	2615	386257	740143	1907
	Increase/Decrease (%)		-1.81	15.89	13.50	17.74	24.01	11.72
4	Cotton	1994-03	871450	256709	298	1545690	422836	275
		2004-10	1393014	883491	631	2308886	1295337	559
	Increase/Decrease (%)		59.85	244.16	111.74	49.38	206.35	103.27
5	Gram	1994-03	34720	30350	804	99240	72990	651
		2004-10	65000	83200	1252	166529	159700	953
	Increase/Decrease (%)		87.21	174.14	55.72	67.80	118.80	46.39
6	Sesame	1994-03	237410	108610	456	317200	143250	446
		2004-10	177729	68143	389	310871	113000	368
	Increase/Decrease (%)		-25.14	-37.26	-14.69	-2.00	-21.12	-17.49
7	Pigeonpea	1994-03	13140	9910	742	352630	257760	723
		2004-10	4671	4500	966	264243	261529	988
	Increase/Decrease (%)		-64.45	-54.59	30.19	-25.07	1.46	36.65
8	Wheat	1994-03	145480	452850	2966	563680	1347790	2351
		2004-10	382029	1325429	3408	1027257	2794971	2693
	Increase/Decrease (%)		162.60	192.69	14.90	82.24	107.37	14.55
9	Cumin	1994-03	43350	20890	472	132270	55730	423
		2004-10	125243	73700	582	222529	118957	534
	Increase/Decrease (%)		188.91	252.80	23.31	68.24	113.45	26.24
10	Onion	1994-03	22860	623890	26259	25310	693870	26386
		2004-10	49057	1373843	27770	53400	1515443	28128
	Increase/Decrease (%)		114.60	120.21	5.75	110.98	118.40	6.60
11	Garlic	1994-03	14340	91440	6062	15370	97970	6074
		2004-10	28743	189886	6515	30543	203729	6596
	Increase/Decrease (%)		100.44	107.66	7.47	98.72	107.95	8.59

12	Vegetables	2001-02	66159	998598	15094	236696	3299132	13938
		2005-10	135979	2402508	17668	404308	7054476	17448
	Increase/Decrease (%)		105.53	140.5881	17.05	70.813	113.828	25.18
13	Fruits	2001-02	52232	449141	8599	188886	2376025	12579
		2005-10	76373	868784	11376	333041	6087378	18278
	Increase/Decrease (%)		46.22	93.432	32.29	76.319	156.2	45.31
14	Spices	2001-02	62895	76798	1221	256705	239586	933
		2005-10	239848	409878	1709	486858	834442	1714
	Increase/Decrease (%)		281.35	433.71	40	89.657	248.28	83.71

Animal Husbandry

Animal Husbandry and Dairying play a vital role in the rural economy by generating substantial income to rural population where employment is scarce. As per the 2007 census, there is 237.94 lakh total livestock population in Gujarat State in which cattle, buffalo, sheep, goat and other livestock with population of 79.76, 87.74, 20.02, 46.40 and 4.03 lakh, respectively. Whereas in Saurashtra region total livestock population 63.56 lakh State in which cattle, buffalo, sheep, goat and other livestock with population of 23.22, 19.26, 10.23, 10.23 and 0.62 lakh, respectively.. The sharing of cattle and sheep of Saurashtra region are higher in total livestock population of Gujarat. Saurashtra is the home of famous breed of cattle (Gir), buffalo (Jafrabadi), goat (Zalawadi) and horse (Kathi).

Fisheries

Gujarat has a long coastal-line of 1600 km, which is broken by several bays, inlets, estuaries and marshy lands. The area available for fishing activities extends from Lakhpat in Kachchh district in north to Umargaon in Valsad district in south. Important commercial varieties of fish namely pomfret, jew fish, bombay duck, shrimp, lobster, squid, cuttle fish, silver bar, shark, catfish, mullets, etc. are caught in large quantities in these areas. In addition, the Gulf of Kachchh has congenial conditions for growth and sustenance of different type of oysters, shell fish and sea-weeds. Some important ports like Veraval, Porbandar, Pipavav, Okha and Sikka are located in Saurashtra region.

The yearwise inland and marine fish production in Gujarat from 2003-04 to 2009-10 is given in Fig. 3.

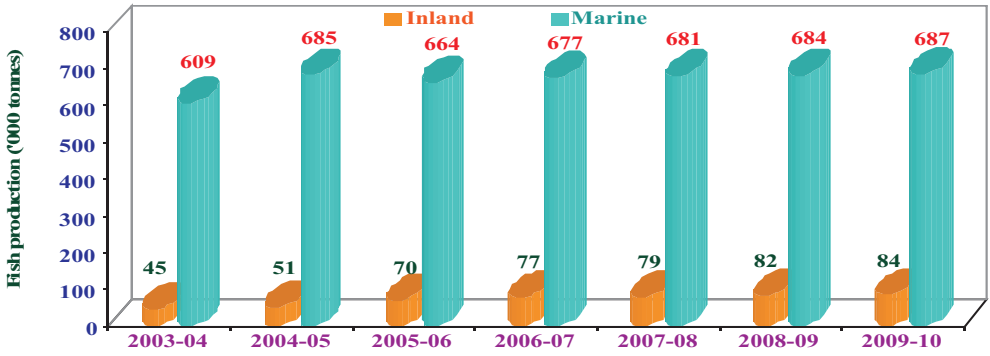


Fig.3: *Fish production in Gujarat*

JAU Profile

Gujarat Agricultural Universities Act 2004 vested powers with Junagadh Agricultural University (JAU) to institute degrees, diplomas and other academic distinctions. Accordingly, JAU has powers to provide instruction in Agriculture and allied sciences and in such other branches of learning as the University may deem fit. The University has been authorized to establish and maintain colleges relating to Agriculture, Agricultural Engineering & Technology, Fisheries Science, Veterinary Science & Animal Husbandry and Agri-Business Management and, institute courses of study and hold examination leading to the conferring degrees, diplomas and other academic distinctions on persons who pursue a course of study and/or carry out research in the University or in an institution recognized in this behalf by the University. The University is empowered to award fellowships, scholarships, medals, prizes, besides conferring honorary degrees or other distinctions. The University is also authorized to make provision for research and dissemination of the findings of research and technical information through extension education programmes. Keeping in view, the wider objective of taking agricultural education to farming community in the state, University has made provision to provide lectures and instructions for field workers, village leaders and other persons not enrolled as regular students of the University and to grant certificates to them. Board of Management, Academic Council and Board of Studies which are statutory authorities of the University, oversee the educational programmes of the University.

The organisational chart of the University is presented in Fig. 4.

Education

In 2004, the erstwhile GAU was bifurcated into four Agricultural Universities. The institutions and research stations located in seven districts (Saurashtra region) of the State came under the jurisdiction of JAU. The growth of the University over the years has been phenomenal. To begin with, the University had three UG degree programmes covering broadly Agriculture, Agril. Engineering & Technology and Fisheries Science. Over the years, attempts have been made to diversify agricultural education by starting

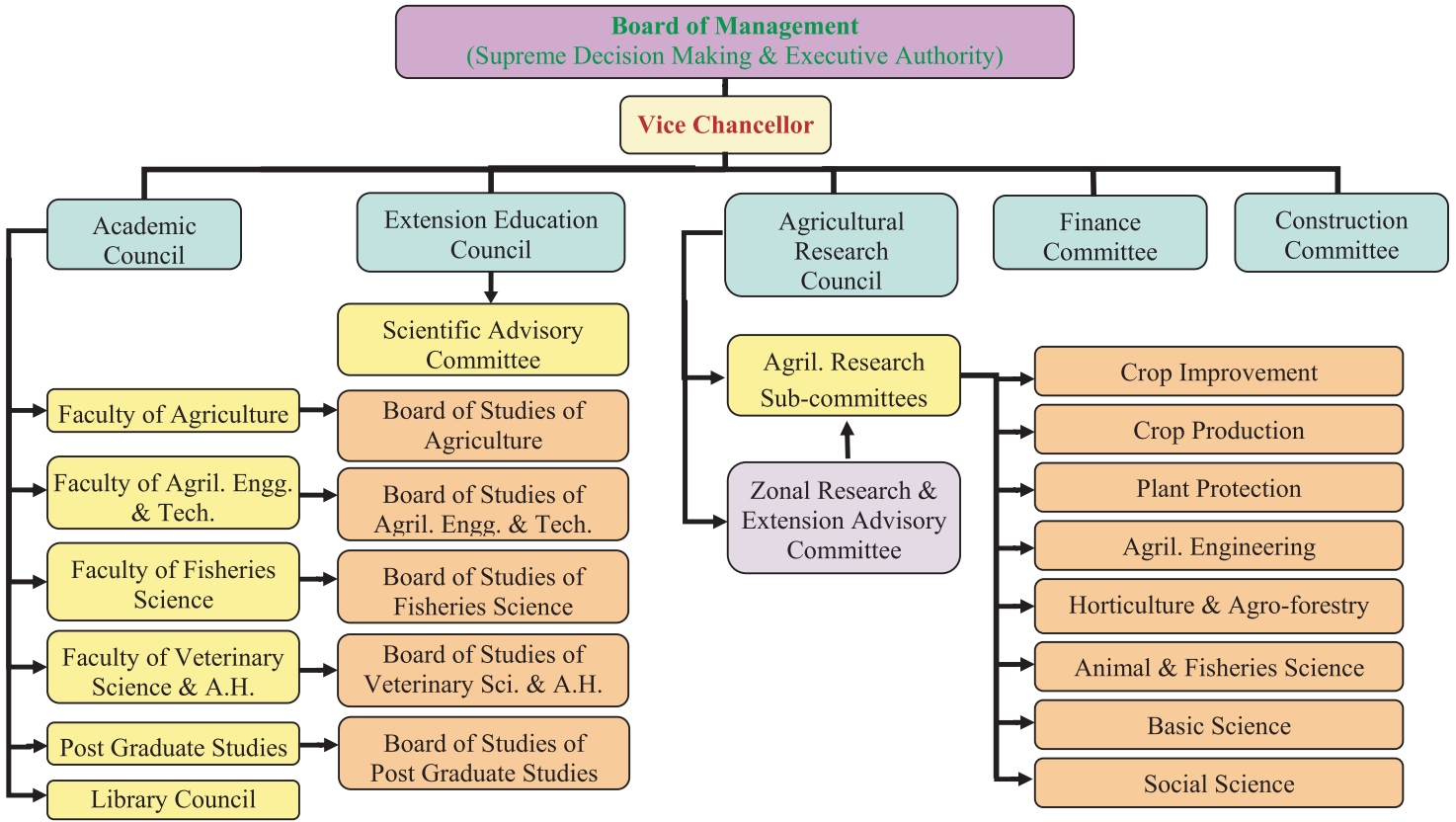


Fig.4: ***Organizational chart of JAU***

Sixth Convocation held on January15, 2011

specialized under graduate and post graduate degree programmes in various branches of agricultural sciences. The JAU has started PG programme in Fisheries Science, UG & PG programmes in Veterinary Science and MBA in Agri-business. Moreover, three PG Diploma programmes have been started. Presently the University offers four Bachelors' degree programmes covering Agriculture, Agril. Engineering & Technology, Fisheries Science and Veterinary Science & Animal Husbandry and five Masters' degree programmes in 28 disciplines of Agriculture(Agril. Economics, Agril. Extension, Agril. Entomology, Agril. Meteorology, Agronomy, Crop Physiology, Plant Breeding & Genetics, Horticulture, Plant Pathology, Seed Science & Technology, Soil Science & Agril. Chemistry, Plant Biotechnology, Floriculture & Land Scaping, Agril. Biochemistry, Agril. Statistics, Fruit Science), Agril. Engineering & Technology(Post Harvest process & Food Engg., Farm Machinery & Power, Soil & Water Engg., Renewable Energy), Fisheries Science (Mariculture, Fisheries Resources & Management, Post Harvest Technology, Inland Aquaculture), Veterinary Science & Animal Husbandry (Animal Genetics & Breeding, Animal Nutrition, Live Stock Production & Management) and Agri-business Management (M.B.A. in Agri-Business) and Doctoral degree programmes in various disciplines.

UG Classroom of Agriculture College

Modern lecture hall at PGI-ABM

Table 4: Under Graduate, Post Graduate and polytechnic Diploma Programmes Offered by the University

SN	College	Duration (years)	Started during year
1. College of Agriculture, Junagadh			
	B.Sc. (Agri.)	4	1960
	M.Sc. (Agri.)	2	1965
	M.Sc. (Hort.)	2	2010
	Ph.D.(Agri.)	3	1965
	Ph.D.(Hort.)	3	2010
	PG Diploma in • Plant Protection • Floriculture & Landscaping • Seed Science & Technology	 1 1 1	 2007 2007 2007
2. College of Agril. Engg. & Tech., Junagadh			
	B.Tech. (Agril. Engg.)	4	1984
	M.Tech. (Agril. Engg.)	2	1994
	Ph.D.	3	2001
3. College of Fisheries Science, Veraval			
	B.F.Sc.	4	1991
	M.F.Sc.	2	2006
	Ph.D.	3	2011
4. College of Veterinary Science & A.H., Junagadh			
	B.V.Sc. & A.H.	5	2008
	M.V.Sc.	2	2007
	Ph.D.	3	2007
5. PG Institute of Agri-business Management, Junagadh			
	MBA in Agri-business	2	2008
6. Polytechnic in Agriculture, Dhari			
	Diploma in Agriculture	3	2009
7. Polytechnic in Horticulture, Junagadh			
	Diploma in Horticulture	3	2009
8. Polytechnic in Agro-processing, Junagadh			
	Diploma in Agro-processing	3	2009
9. Polytechnic in Home Science, Amreli			
	Diploma in Home Science	3	2009

The University has a well established library, eleven hostel blocks for boys and four for girls having capacity of about 1146 students and adequately developed sports complex which is one of the best sports complexes in Saurashtra.

A large number of graduates and post graduates from College of Agriculture, College Agricultural Engineering & Technology and College of Fisheries Science have occupied senior positions in different departments such as Agriculture, Horticulture, Fisheries, Forest, Police, Custom, Institutions, Corporate, Civil Services, Banking Services, Pesticides, Fertilizers and Seed Industries, etc. Some of the alumni of this University also reached to the rank of Vice Chancellor and Director of Campus of Gujarat Agricultural University, Director of Agriculture, Minister of Agriculture in the State of Gujarat. They

made significant contributions in upliftment of agriculture.The education programme in Junagadh Agricultural University is based on two tier system. The first one covers higher education in Agriculture, Agricultural Engineering & Technology, Fisheries Science and Veterinary Science & Animal Husbandry, in which polytechnic diploma, UG and PG resident instruction programmes are covered. While the second consists of lower education, i.e., diploma and certificate programmes like Horticulture Diploma, Agriculture Diploma, Bakery Training, Livestock Inspector Training, Mali Training as well as Extension Education Training.

During the period of year 2004-05 to 2011-12, 358 students at polytechnic diploma level, 1489 students at UG level and 947 students at PG level were given admission in various colleges of the University i.e. College of Agriculture, College of Agricultural Engineering & Technology, College of Veterinary Science & Animal Husbandry and PG Institute of Agri-Business Management at Junagadh and College of Fisheries Science at Veraval. During the period, 756 students at UG level and 582 at PG level (including Ph.D.) have successfully completed their courses (Table 5 to 8).

Table 5: Details of Under Graduate students

Degree	Particular	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total
B.Sc. (Agri.)	Intake	85	85	85	95	101	101	108	116	776
	Admitted	55	76	85	75	91	89	100	109	680
	Passed out	44	60	36	51	64	74	72		401
B.Tech. (Ag. Engg.)	Intake	56	56	56	66	76	76	81	83	550
	Admitted	35	46	46	56	70	72	81	80	486
	Passed out	35	32	26	27	40	45	42		247
B.F.Sc.	Intake	33	33	33	33	33	56	60	65	346
	Admitted	13	17	16	29	23	36	35	35	204
	Passed out	17	22	19	06	15	07	22		108
B.V.Sc. & A.H	Intake	-	-	-	-	30	30	30	38	128
	Admitted	-	-	-	-	30	29	29	31	119
	Passed out	-	-	-	-	-	-	-		-
UG total	Intake	174	174	174	194	240	263	279	302	1800
	Admitted	103	139	147	160	214	226	245	255	1489
	Passed out	96	114	81	84	119	126	136		756

Table 6: Details of Post Graduate (Master Degree) student

Degree	Particular	04 -05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total
M.Sc. (Agri.)	Intake	113	102	165	168	169	287	124	115	1243
	Admitted	56	51	61	75	47	97	93	70	550
	Passed out	59	45	49	48	41	78	58		378
M.Sc. (Horti.)	Intake	-	-	-	-	-	-	21	17	38
	Admitted	-	-	-	-	-	-	19	10	29
	Passed out	-	-	-	-	-	-	-		-

M.Tech. (Ag. Engg.)	Intake	15	13	20	31	31	43	29	16	198
	Admitted	04	06	03	05	09	11	18	16	72
	Passed out	05	18	12	09	06	04	09		63
M.F.Sc.	Intake	-	-	16	12	18	13	10	18	87
	Admitted	-	-	16	04	04	07	08	12	51
	Passed out	-	-	-	-	09	09	04		22
M.V.Sc.	Intake	-	-	-	09	12	20	14	15	70
	Admitted	-	-	-	-	-	01	08	04	13
	Passed out	-	-	-	-	-	-	-		-
MBA in Agri-business	Intake	-	-	-	-	30	40	43	43	156
	Admitted	-	-	-	-	06	27	39	27	99
	Passed out	-	-	-	-	-	-	07		07
Total Master Degree	Intake	128	115	201	220	260	403	241	224	1792
	Admitted	60	57	80	84	66	143	185	139	814
	Passed out	64	63	61	57	56	91	78		470

Table 7: Details of Ph. D. students

Degree	Particular	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total
Ph.D. (Agri.)	Intake	23	30	50	45	50	70	35	25	328
	Admitted	07	28	17	17	04	07	13	13	106
	Passed out	10	31	25	10	06	17	11		110
Ph.D. (Horti)	Intake	-	-	-	-	-	-	03	03	06
	Admitted	-	-	-	-	-	-	03	03	06
	Passed out	-	-	-	-	-	-	-		-
Ph.D. (Ag. Engg.)	Intake	05	12	10	14	14	16	09	05	85
	Admitted	03	11	04	00	00	00	00	00	18
	Passed out	00	01	00	00	00	00	01		02
Ph.D. (Vet. Sci.)	Intake	-	-	-	-	06	04	08	06	24
	Admitted	-	-	-	-	03	00	00	00	03
	Passed out	-	-	-	-	-	-	-		-
Total Ph.D. Degree	Intake	28	42	60	59	70	90	55	39	443
	Admitted	10	39	21	17	07	07	16	16	133
	Passed out	10	32	25	10	06	17	12		112

Table 8: Details of Polytechnic course

Degree	Particular	09-10	10-11	11-12	Total
Polytechnic Diploma	Intake	100	140	140	380
	Admitted	100	125	133	358
	Passed out	-	-		-

Research

The University has taken up the task to intensify and reorganize the research, education and extension education. Junagadh Agricultural University has 30 research stations including multidisciplinary main research stations, sub centres on various crops and testing centres spread over in whole North Saurashtra & South Saurashtra Agro-climatic Zones and part of North-west &

Bhal-Coastal Area Agro-climatic Zones of Gujarat (Table 9). These research stations are working in the field of Agriculture, Agricultural Engineering, Animal Sciences and Fisheries for catering the needs of farmers, artisans, livestock holders, fishermen and rural masses for their upliftment. The research activities have been carried out in Crop Improvement, Crop Production, Horticulture and Agro forestry, Plant Protection, Basic Science, Social Sciences, Agricultural Engineering, Animal Science and Fisheries Science.

Table 9: Research Stations under JAU

SN	Location	Category	Land (ha)			Mandate
			Total	Cultivated	Irrigated	
1	Junagadh: 1. Oilseeds 2. Wheat 3. Cotton 4. Pulse 5. Castor 6. Vegetable 7. CERS, Sagdividi 8. RTTC 9. CBF 10. Inland fisheries	Zonal & Main Centre	864.10	608.14	250.00	**Crops**: Groundnut, Castor, Cotton, Wheat, Pulses **Fruit Crops**: Mango, Sapota, Banana, Papaya etc. **Vegetables**: Onion, Garlic, Brinjal, Tomato, Okra, Cumin etc. **Area**: Soil science, Soil & water management, MIS system, Organic farming, Bio control, Bio technology, Bio pesticides, Food testing, Post harvest technology, Agro processing, Renewable energy, High tech horticulture, Weed science, Fisheries, Livestock research, Meteorology and Protected cultivation.
2	Targhadia	Zonal & Main Centre	24.39	21.34	02.00	Groundnut, Cotton, Pearl millet, Sorghum, Sesame, Pulses, Dry farming.
3	Jamnagar	Main Centre	35.57	25.00	02.00	Pearl millet, Oilseed, Seed technology.
4	Kodinar	Main Centre	57.42	45.76	30.00	Sugarcane, Groundnut, Wheat.
5	Amreli	Regional Centre	22.53	16.63	03.00	Sesame, Cotton, Soybean, Groundnut.
6	Dhari	Regional Centre	652.83	270.67	13.75	Forage crops, Wheat, Groundnut, Seed production of wheat, gram, castor, cumin and groundnut.
7	Mahuva: 1. ARS (Fruit) 2. Fisheries	Main Centre Sub Centre	420.66 50.00	265.00 50.00	150.00 -	Fruit crops: Coconut, Sapota, Pearl millet, Onion, Garlic, Salinity, Seed production of wheat and pulses. Aquaculture

8	Mangrol	Sub Centre	16.19	15.55	15.00	Coconut, Ber, Sapota, Gunda, Salinity.
9	Manavadar	Sub Centre	45.73	35.25	08.00	Groundnut, Wheat.
10	Khapat	Sub Centre	03.73	02.23	02.00	Cotton, Groundnut, Pearl millet.
11	Ratiya	Sub Centre	36.42	34.71	01.20	*Deshi* cotton, Sorghum, Gram.
12	Jam Khambhalia	Sub Centre	23.47	18.50	04.00	Groundnut, Pearl millet, Sorghum, Garlic.
13	Vallabhipur	Sub Centre	24.94	20.10	-	*Deshi* Cotton, Gram, Sorghum, Wheat.
14	Halavad	Sub Centre	18.14	12.96	-	Cotton, Cumin, Groundnut.
15	Okha	Sub Centre	-	-	-	Fisheries.
16	Sikka	Sub Centre	11.20	-	-	Fisheries.
17	Kukada	Sub Centre	42.05	40.00	40.00	Cotton (*Deshi* and Hybrid), Groundnut, Sorghum, Sesame, Pearl millet, Pulses.
18	Talaja	Sub Centre	59.25	50.00	32.00	Onion, Sugarcane, Pearl millet
19	Amreli	Sub Centre	30.00	-	-	Bull mother of *Gir* Cow & *Jaffrabadi* buffalo.
20	Jonpur	Sub Centre	130.11	-	-	Grassland
21	KVKs: Khapat Jamnagar Targhadia Nanakandhasar Amreli	District level	 20.59 20.44 20.00 26.71 19.31	 19.50 19.00 18.50 25.00 18.00	 19.50 14.50 08.50 20.00 18.00	Dissemination of research technology through extension programmes.
		Total	**2675.78**	**1631.84**	**635.00**	

The various research projects, their monitoring and supervision, planning and implementation of research activities at different research stations as well as the PG teaching programmes and their evaluation in different disciplines were carried out under the guidance of Director of Research & Dean PG Studies during the year under report. The efforts made by scientists of the University were emerged in 271 technologies including varieties for farmers and 49 scientific recommendations during year 2004-05 to 2010-11. The University has also developed 31 new crop varieties for farmers, out of which 13 varieties were released at state and national level (Table 10 to 12). Besides this, seed production programme was also taken up in different crops

GJG - 22


GHB - 538

JAU Groundnut Digger-cum-Shaker

Post Hole Digger

Visit of Dr. S. Ayyappan, Secretary, DARE & DG, ICAR to Fisheries Research Centre, Okha

Table 10: Crop Varieties Released

SN	Year	Crop	Variety	Level of release
1	2004-05	Sponge gourd	GSG-1	State & National
		Groundnut	GG-8	National
			GG-16	National
2	2005-06	Brinjal	JBGR-1	State
		Sesame	G.Til-3	State
		Coconut	Hybrid T x D (Mahuva)	State
3	2006-07	Pearl Millet	GHB-538	State & National
			GHB-757	National
		Wheat	GW-366	State & National
		Garlic	GG-4	State
		Castor	GC-3	State
		Okra	GO-3	National
4	2007-08	Groundnut	GJG-HPS-1	State
		Pearl Millet	GHB-719	State & National
			GHB-744	State & National
			GHB-732	State & National
		Chickpea	GG-3	State
		Tomato	Junagadh Tomato-3	State
5	2008-09	Okra	GJ Okra Hybrid-2	State & National
		Custard Apple	GJCA-1	State
6	2009-10	Groundnut	GJG-9	State
			GJG-31	State
		Brinjal	GJB-2	State
		Okra	GJ-Okra-3	State & National
		Sesame	G. Til-4	State
7	2010-11	Groundnut	GJG-17	State
			GJG-22	State
		Soybean	GJSoy-3	State
		Indian bean	GJIB-11	State
		Okra	GJOH-3	State & National
		Pearl Millet	GHB-732 (Endorse)	State

Table 11: Recommendations / Technologies Developed

SN	Sub-Committee	Number of Recommendations made for farmers							Total
		04-05	05-06	06-07	07-08	08-09	09-10	10-11	
I	Crop Improvement	03*	03*	06*	06*	02*	05*	06*	31*
II	Crop Production	17	13	11	21	15	13	16	106
III	Plant Protection	14	03	08	12	08	16	05	66
IV	Horticulture & Agro Forestry	01	02	05	03	02	05	04	22
V	Agril. Engineering	01	02	05	04	07	05	05	29
VI	Fisheries Science	03	-	02	01	-	02	02	10
VII	Animal Science	02	-	01	-	-	02	-	05
VIII	Basic Science	-	-	01	01	-	-	-	02
Total		**3*+38**	**3*+20**	**6*+33**	**6*+42**	**2*+32**	**5*+43**	**6*+32**	**31*+240**

*Varieties released

Table 12: Recommendations made for scientists

SN	Sub-Committee	Number Recommendations made for scientists							Total
		04-05	05-06	06-07	07-08	08-09	09-10	10-11	
I	Crop Improvement	01	-	-	-	-	-	-	01
II	Crop Production	-	-	02	02	02	03	05	14
III	Plant Protection	02	05	02	03	-	-	-	12
IV	Agril. Engineering	01	02	-	-	-	02	01	06
V	Basic Science	-	01	-	02	01	-	-	04
VI	Social Science	-	06	-	-	-	-	-	06
VII	Fisheries Science	-	01	-	01	-	01	01	04
VIII	Horticulture & Agro-forestry	-	-	-	-	01	-	01	02
Total		**04**	**15**	**04**	**08**	**04**	**06**	**08**	**49**

Table 13: Production of quality seed/planting materials of different crops at JAU for farmers of Gujarat under Mega Seed Project

Particular	Unit	06-07	07-08	08-09	09-10	10-11	Total
Seed							
Breeder seed	q	1663	1787	1652	2061	1909	9072
Truthful seed	q	881	2820	1684	8106	11295	24785
Total	q	2544	4607	3336	10166	13204	33857
Planting material							
Fruit crops graft	Nos.	12160	18178	22735	29672	16934	99679
Fruit crops saplings	Nos.	30597	51999	70711	64666	56811	274784
Total	**Nos.**	**42757**	**70177**	**93446**	**94338**	**73745**	**374463**

and varieties. About 9,072 q breeder and 24,785 q truthful seeds were produced during 2007-08 to 2010-11 under Mega Seed Project. During this span, total 99,679 graft of fruit crops and 2,74,784 plant sapling were availed to the farmers (Table 13). After inception of the University, total 225 new research projects were sanctioned by ICAR, Government of India, Government of Gujarat and other agencies(Table 15).

Under HRD component of the University, total 2454 scientists participated in different programmes like seminar, conference, workshop, group meet, etc. (Table 14). The university has also organised 52 programmes. The University has signed 19 MoUs with national and international organization for education and research activities in last seven years. A major contribution for publications of the university is from scientist in the form of research articles in International & National Journals. Total 1851 research papers and books were published by the University (Table 16). In addition, the pearl millet variety *viz.*, GHB-526, GHB-558, GHB-538 & GHB-719 registered in PPV & FR and Gir Kesar mango is registered as Geographical Indication No.185 by GI Registration, Government of India, Chennai for Gir region of Junagadh & Amreli districts.

GC - 3

G. Til - 3

GG - 3

GJCA - 1

GG - 4

GW - 366

JBGR - 1

Table 14: Human Resource Development (HRD)

SN	Particulars	04-05	05-06	06-07	07-08	08-09	09-10	10-11	Total
1	International Conference / Symposium (held in India)	05	02	15	-	-	04	05	31
2	Summer school / Winter school	28	20	10	71	42	111	67	349
3	Short term training	12	40	30	16	31	51	156	336
4	Group meeting / Workshop	80	148	97	115	126	120	163	849
5	Seminars / Symposium / Conference	137	168	155	82	103	115	129	889
	Total	**262**	**378**	**307**	**284**	**302**	**401**	**520**	**2454**
1	Seminar/conference/workshop/group meet organized by JAU	04	05	03	02	05	19	14	52
2	Summer school/Winter school organized by JAU	-	-	-	-	-	-	02	02

Table 15: New Projects Sanctioned

SN	Agency	05-06	06-07	07-08	08-09	09-10	10-11	11-12	Total
1	ICAR/GOI	08	04	04	03	03	04	01	27
2	Govt. of Gujarat	23	02	01	11	01	02	05	45
3	NAIP	-	-	01	--	01	-	-	02
4	RKVY	-	-	--	07	05	05	-	17
5	Other Agencies	10	15	16	23	19	17	31	131
6	ICRISAT	-	-	--	--	02	-	01	03
	Total	**41**	**21**	**22**	**44**	**31**	**28**	**38**	**225**

Table 16: Publication

SN	Details of publication	2004-08	2008-09	2009-10	2010-11	Total
1	International Journals	138	112	140	126	516
2	National Journal	349	100	92	94	635
3	Presented in Seminar/ Symposium	370	83	86	128	667
4	Books	23	05	03	02	33
	Total	**880**	**300**	**321**	**350**	**1851**

Extension Education

At present, Agriculture Diploma School, three centres offering certificate courses, Training & Visit Scheme, *Sardar Smruti Kendra,* Farm Advisory Service Centre, five *Krishi Vigyan Kendras,* Extension Programme for Fisheries, Agricultural Technology Information Centre (ATIC), Centre of Communication (COC), four Transfer of Technology (TOT) centres and

Information & Reception Centre (IRC) are functioning in the University. Of which, all the five KVKs, Extension Programme for Fisheries, ATIC, COC, TOT and IRC are recent addition after establishment of the University. The Diploma Schools are converted into Polytechnics and new Home Science Polytechnic started in 2009-10.

(1) Centres for Certificate Courses
   1. Livestock Inspector Training Centre, Junagadh
   2. School of Baking, Junagadh
   3. *Mali* (Gardener) Training Centre, Junagadh

(2) Training & Visit Scheme, Junagadh

(3) *Sardar Smruti Kendra,* Junagadh

(4) Farm Advisory Service Centre, Junagadh

(5) *Krishi Vigyan Kendras*
   1. *Krishi Vigyan Kendra,* Targhadia (Rajkot)
   2. *Krishi Vigyan Kendra,* Jamnagar
   3. *Krishi Vigyan Kendra,* Amreli
   4. *Krishi Vigyan Kendra,* Khapat (Porbandar)
   5. *Krishi Vigyan Kendra,* Nana Kandhasar (Surendranagar)

(6) Extension Programme for Fisheries, Okha

(7) Agricultural Technology Information Centre (ATIC), Junagadh

(8) Centre of Communication (COC), Junagadh

(9) Transfer of Technology (TOT) Centres
   1. Transfer of Technology (TOT) Centre, Junagadh
   2. Transfer of Technology (TOT) Centre, Targhadia
   3. Transfer of Technology (TOT) Centre, Amreli

(10) Information and Reception Centre, Junagadh

Through the extension education activities, total 1,756 students completed different certificate/diploma courses, *viz.*, Horticulture Diploma, Agriculture Diploma, Livestock Inspector Training, Bakery Training, *Mali* Training etc. during 2004-05 to 2010-11. Under T & V programmes total 66 training programme were organized and about 1,551 extension workers were trained. Under *Krishi Vigyan Kendra* and TOT scheme total 2,503 training programmes were organized and 74,711 farmers/ farm women/ rural youth were trained as given in Table 17. In addition to this total 618 training

Hon. Chief Minister of Gujarat state shri Narendra Modi inaugurated Krushi Mahotsav and Krushimela-2011 at Una

Khedut Shibir under COC and demonstration of Bakery product

programmes of extension functionaries were organized through which 19100 extension workers were benefited. All five KVKs also organized 4,104 different extension activities like *Khedut Sibir,* exhibition, *Krishi Mela,* etc. through which total 11,25,268 beneficiaries were benefited. In all 3,545 FLDs were conducted on various crops in 1652.8 ha through KVKs. The farmers' problems were solved through personal visit and proper guidance by KVKs. The feedbacks on farmers' problems were collected and sent to concerned scientist to reform research.

Various extension activities like *Krishi Mela,* exhibition, training programmes, farm advisory, distribution of agricultural literature, etc. were also organized by *Sardar Smruti Kendra.* The Govt. of Gujarat is celebrating *Krishi Mahotsav* since 2005. Large number of farmers took the benefit of scientists while the visit of *Krishi Rath.* Moreover, many *Khedut Shibir* were also organized by APMC and other NGOs where in thousands of farmers participated. Considering the various extension activities including *Krishi Mahotsav* total 747 activities were organized and 58,86,731 farmers were

benefited. *Sardar Smruti Kendra* is publishing various extension literature for the farming community. During report period 650900 copies of 396 publications were printed. University is regularly publishing JAU News Bulletin. Under Centre of Communication scheme total 210 *Gram Kisan Samitis* were formulated and 7,460 members were involved in different extension activities. Various extension programmes for Fisheries were organized by Okha centre and large number of farmers / fishermen visited the museum and got the desired details from the scientists of Okha centre.

Table 17: Extension activities

Name of Centre	04-05	05-06	06-07	07-08	08-09	09-10	10-11	Total
Sardar Smruti Kendra	78 (41164)	68 (53509)	181 (519127)	75 (43237)	93 (989502)	159 (3158154)	93 (1082038)	**747 (5886731)**
Krushi Vigyan Kendra								
Training for farmers	39 (1025)	239 (6754)	316 (10885)	508 (12957)	459 (11401)	447 (17397)	495 (14292)	**2503 (74711)**
Training for Extension Functionaries	--	239 (6757)	322 (10613)	21 (521)	14 (435)	7 (314)	15 (460)	**618 (19100)**
Other activities	228 (111100)	461 (160644)	807 (524285)	522 (70773)	256 (86875)	825 (33230)	1005 (138361)	**4104 (1125268)**
T & V	13 (221)	16 (317)	14 (361)	04 (66)	06 (143)	07 (193)	06 (250)	**66 (1551)**
COC	--	10	21	08	04 (34)	109 (6227)	58 (1199)	**210 (7460)**
Diploma / Certificate Courses	316	300	262	224	209	238	207	**1756**

Note : Figures in parenthesis indicate no. of beneficiaries

Students' Welfare

The University authority is always looking forward to the welfare of the students through different activities like sports, cultural, spiritual programmes, NSS, health, adventure, educational tour with a view to develop personality, character and high human values in UG & PG students of the University.

The campus interviews were arranged for placement of students of different colleges. Total 19 inter-collegiate sports and cultural / literary activities organised by the University every year. The University students participated in All India Inter Agricultural University Sports and Games Meet from 2004-05 to 2010-11. Students also participated in SAU's (Gujarat) Inter

Agril. University sports tournaments and so also in Cultural-Literacy Competition at State and National level. Students were also participated in Inter University National Debate Competition, All India Agricultural Universities Youth Festival and Basic Rock Climbing Course. Under NSS, several programmes were organised. Educational tour was arranged for the students of College of Agriculture, College of Agricultural Engineering & Technology and College of Fisheries Science. Various scholarships were availed to the students. About 52 spiritual and health awareness programmes were organised (Table 18).

Table 18: Student activities

Activity	04-05	05-06	06-07	07-08	08-09	09-10	10-11	Total
Sports (IC + IU)	10 (310)	14 (324)	13 (318)	15 (351)	14 (436)	14 (602)	14 (608)	**94 (2949)**
Cultural / Literary	-	03 (30)	03 (35)	10 (115)	13 (105)	14 (143)	15 (148)	**58 (576)**
Placement	13	51	44	59	55	85	119	**426**
NSS	11 (468)	11 (327)	11 (584)	07 (586)	32 (468)	44 (722)	103 (993)	**219 (4148)**
Gold Medal	10	37	28	30	31	32	44	**212**
Cash Prize	-	-	-	-	02	02	02	**06**
Scholarship	06 (08)	06 (09)	06 (57)	06 (57)	07 (124)	06 (150)	08 (180)	**45 (585)**
Students' training	-	-	-	02 (89)	02 (79)	01 (50)	02 (80)	**07 (298)**
Special Lecture / Programme	02	09	05	15	05	08	08	**52**
Adventure	10	14	12	17	11	51	51	**166**

* Figure in the parenthesis indicates the no. of participants, enrolled NSS volunteers, and scholarship recipients.

Finance and Accounts

Major sources of finance are Government of Gujarat, Government of India, ICAR and other agencies which sanctioned grant through different schemes. The yearwise expenditure is given in Table 19 and shown as bar diagram in Fig. 5.

Table 19: Yearwise Expenditure (₹ in lakh)

Particulars	04-05	05-06	06-07	07-08	08-09	09-10	10-11
Education	904.85	1207.90	1631.51	2051.20	2632.79	3825.69	4969.40
Research	1606.14	2265.91	2744.78	2060.91	3040.73	2854.97	4835.67
Extension Education	178.14	447.16	571.54	1098.97	2900.63	1517.54	2310.52
Administration	258.31	335.42	343.47	365.26	385.89	385.89	686.86
Construction works	38.17	101.18	280.58	120.31	15.68	15.68	1121.50
Total	**2985.61**	**4357.57**	**5571.88**	**5696.65**	**8975.72**	**8599.77**	**13923.95**

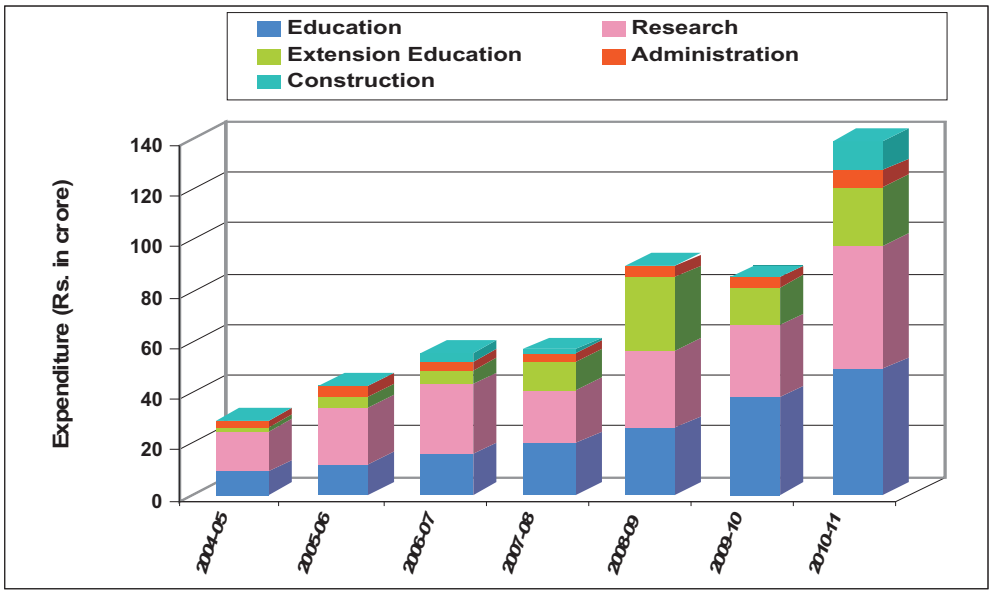


Fig.5: *Bar diagram of expenditure*

Information Technology

Junagadh Agricultural University (JAU) has 4 Mbps BSNL leased line and 20 Mbps Broadband connectivity for providing IT services. JAU is also connected to Gujarat State Wide Area Network (GSWAN) through radio connectivity. The various IT services like Internet, e-mail, online programmes and access to research references data base have been provided and maintained through Local Area Network (LAN). These services have greatly boosted the administration as well as educational, research and extension education activities of the University. As a part of the e-governance, various online programmes are developed at the University level by utilizing meagre facilities of staff. These programmes include online bill entry and accounts, online tour programme, online provident fund and online university circulars, etc. All the sub centres of university are connected to university LAN by virtual private networking (VPN) for availing the benefit of these online programmes as well as library database services for research references.

Junagadh Agricultural University has its website having the URL of www.jau.in. This website includes various aspects and activities of Junagadh Agricultural University like Administration, Education, Research, Extension Education, Farmers' Corner, Library facility, important announcements/events, tenders, advertisements, RTI, JAU publications, etc. Further, a mail server having more than 650 e-mail accounts is also maintained by IT Centre and the same has been incorporated in the website enabling the user to read and reply e-mail from any locations.

The University Library possesses 44000 books, 9 international and 50 Indian journals and 15000 back volumes, 11 e-books and 1525 theses. Cyberary with 100 Mbps LAN connectivity enables users with online database like CAB, AGRICOLA, AGRIS & J-Gate. Full time internet, scanning and CD writing facilities are available for the students in the Cyberary. CeRA (Consortium for e-resources in Agriculture) and KRISHIPRABHA facility available in the cyberary section in the library is of good help to the users. The book bank facility also exists for students. The library is marching towards automation through Libsys software for the circulation of library materials to users.

Manpower

Sanctioned Strengths of the faculty, technical and administrative staff of the University in Teaching, Research and Extension Education are given in Table 20.

Table 20: Manpower details (As on 01.12.2011)

Particulars	Faculty	Technical	Administrative	Total
Education	241	183	667	1091
Research	210	377	369	956
Extension Education	55	85	56	196
Total	**506**	**645**	**1092**	**2243**

Estate Management

The construction & its related works, repairs & maintenance of buildings & roads, water supply, maintenance of drainage system, street light, electrification, repairing of electrical faults, all these works are looked after by the Executive Engineer of the University.

Infrastructure

The University has developed unique infrastructural facilities and specialized facilities for training. This has been instrumental in taking up advanced research in several areas and training to graduate students in new and emerging areas of modern biology. The biotechnology, food quality testing lab, tissue culture lab, farm machinery, inland aquaculture facilities developed for research and training are unique in the State. Likewise, adequate infrastructure has been developed in the form of seed processing unit, green-houses and poly-houses. The University has established museums including live museums and botanical gardens for the benefit of both the visiting farmers and students. Air conditioned Auditorium, Seminar Halls and Conference Halls as well as spacious Community Hall are the useful infrastructural facilities available in the university.

SWOT Analysis

Junagadh Agricultural University (JAU) came into existence in May 2004 with the regional mandate for executing and strengthening the triple functions of agricultural education, research and extension education. The University represents seven districts *viz.*, Amreli, Bhavnagar, Junagadh, Rajkot, Jamnagar, Porbandar and Surendranagar, historically known as Saurashtra, covering about one-third area of the Gujarat State. The University is functioning in a typical arid and semi-arid type of climate in the state. Hence, drought, erratic rainfall, low fertility and salinity ingress are the major constraints limiting productivity and agricultural production of this region. Despite all these constraints, the University has responded most dynamically to the needs, challenges and opportunities of agriculture in Gujarat and fine-tuned its mandate, plans and programme accordingly.

Strength

- JAU has four colleges, one PG institute of ABM, four polytechnic and 30 research stations covering entire Saurashtra region.
- The University has collaboration with 5 international institutes, 13 ICAR institutes, 13 national institutes, 8 state universities, 25 state level agencies and 16 other organizations.
- Very good infrastructural facilities are available to cater the needs of the stake holders. These include tissue culture laboratory, food testing laboratory, biotechnology laboratories, green houses, seed processing units, machine testing centre, pump testing lab, bio-control lab, bio-fertilizer lab, agricultural quality labs, aquaculture farms, WTO Cell, electronic mail connectivity, engineering workshop and fabrication units, internet connectivity, etc.
- Diverse soil types which facilitate cultivation of large number of crops round the year.
- Enterprising, receptive and hardworking farmers.
- Close linkages with State Departments, Manufacturers, and other Research & Development organizations. The University has established a good

rapport with the local, district level, and state level, national and international level institutes dealing with education, research and extension activities.

- Course structure and syllabus are contemporary and there are mechanisms to make them effective as per IV Deans' Committee of ICAR.
- Classrooms, laboratories and conference/seminar halls are spacious with good ambience and facilities.
- Good support from ICAR through providing development grant for education and research.
- Enthusiastic and devout supporting staff.
- ICAR accredited the university in 2009 for 5 years.
- College of Agricultural Engineering and Technology accredited by ICAR, New Delhi, the Institution of Engineers (India), Kolkata, All India Council for Technical Education (AICTE– NBA), New Delhi and M.Tech. in Farm Machinery and Power accredited by All India Council for Technical Education (AICTE–NBA), New Delhi.
- Well established/organized research co-ordination of the different faculties.
- A good number of research projects funded by external agencies including several international agencies, is a mark of quality research being done in the University.
- Availability of multi-disciplinary, highly qualified scientists to take up inter-disciplinary research projects.
- The research for improvement of crop varieties in groundnut, cotton, bajra, sesame, wheat, gram etc. and production technology has helped the state to achieve self-sufficiency in food production. The contribution in the research of bajra crop has received many national level awards.
- Huge basic germplasm of groundnut, bajra, sesame, wheat, cotton, pulses, fruit crops, vegetables and onion & garlic is maintained, which can be utilized for future improvement.
- Strategic research has been conducted on groundwater potential, groundwater recharge and its efficient utilization using remote sensing and GIS tools.
- Research has been conducted on water management for improving water use efficiency in major crops of the region.
- The grafts/saplings of various fruit crops are produced commercially. Hybrid coconut is the exclusive item of the University which has a huge demand among farmers.

- Saurashtra is the home of famous breed of cattle-Gir cow, Jafarabadi buffalo, Zalawadi goat and Kathiavadi horse.
- University is also a leader in the research of animal breeds *viz.*, Gir cow and Jafrabadi buffalo.
- The Mega Seed Project provides quality seeds of new varieties of different crops directly to the farmers.
- The university has the capacity of commercial production of bio-fertilizers and bio-agents like *Trichoderma harzianum,* Egg parasitoid *Trichogramma chilonis, Beauveria bassiana, Verticillium lecanii, Metarizium anisopliae, Nomuraea rileyi, Helicoverpa* NPV, *Spodoptera* NPV, Methyl eugenol trap, etc.
- Good extension network system, 5 KVKs in different regions of Saurashtra.
- Training and demonstration facilities on improved farm implements and machineries

Weaknesses

- About 60% of gross cropped area is under rainfed farming.
- Fragmented and small farm/land holdings.
- Lack of infrastructural facilities for clinical and animal farm practices for newly established Veterinary College.
- Lack of sufficient manpower.
- Inadequate facilities for nano-biotechnological research.
- Lack of international exposure to the scientists.
- Basic and strategic research which is essential for the advancement of science needs strengthening.
- Lack of Technical persons for STL and Farm Assistants in KVKs.

Opportunities

- With the globalization of the markets there is a growing demand of highly trained manpower in the specialized subjects.
- Scope for e-communications and e-extension of research findings.
- Opportunities exist for export of value added agro-products.
- Scope for entrepreneurship development for custom hiring of high capacity and costly post-harvest machinery.
- Potential of employment generation through agro processing centres at village level itself.
- High potential for using renewable energy sources.

- Assessment, evaluation and development of technologies for safe use of farm machines in rural sector
- There is a vast scope of establishing the nano-biotechnology college, horticulture college and college of food processing technology.
- Opportunities for the establishment of the Academic Staff Training College for advanced technical education in all faculties of the University.
- Development of veterinary college as referral institute for cattle as well as wild life health and management services, as Junagadh is in the lap of forest and wildlife sanctuary.
- Geographical information system, remote sensing, and crop modelling can be emphasized to generate new concepts, tools and methodologies based on system approach.
- Identification and characterization of gene pods and gene mapping.
- International Forensic Research Institute for Agriculture may be established to be unique in the world.
- Revolutionary research can be made in the areas of energy and saline water.
- DNA Bar-coding of biodiversity.
- Providing a cost effective and simple technology for the production of biodiesel from the single cell algae.
- Frontline areas like precision farming, remote sensing and geographical information system, system modelling, etc. needs to be developed.
- The disciplines of Floriculture & Landscaping, Architecture, Fruit science, Vegetable Science, Plant Physiology, Seed Science & Technology, Agril. Microbiology etc can be strengthened.
- Induction of variability in important medicinal plants and their genetic improvement.
- Establish linkages with other disciplines to provide molecular level solutions to the field problems, value addition and food processing, integrated nutrient management, integrated pests and disease management.
- Good scope for recycling of crop residues, organic farming, precision farming, integrated farming system research, protected cultivation, and wasteland development.
- Monitoring and mitigation of climate change and adaptation strategies on water management.
- Development of transgenic varieties of major crops.
- Scope of partnership and linkages with public, private, national and

international organization for energy and water management research and outreach.

- Crop modelling can be emphasized to generate new concepts, tools, and methodologies based on system approach
- Great potential of mechanization in vegetables and horticulture crops.
- Saurashtra has a vast coastal area for marine fisheries. A large number of fisheries industries in Junagadh and Porbandar districts help boosting the export of marine products. Scope of related research and extension exists.
- Coastal area management, brackish water aquaculture and wasteland ecology management can be undertaken.

Threats

- Salinity ingress in the coastal areas of Saurashtra is also one of the major threats.
- Decreasing per capita land holding.
- Global warming may divert resources and attention.
- Climate change has brought the changes in precipitation pattern, more unpredictable and unseasonal rainfall, the frequency of extreme weather events like storm, cyclone, flood, heat waves, cold waves, etc. This has severely affected the crop production and biology of insect-pests as well as the atmosphere.
- Stagnation in the yield, unabated growing pollution, continuous use of chemicals and pesticides with harmful residues, depleting resources and many other adversities are growing.
- Deteriorating groundwater quality.
- Erratic distribution of rainfall, droughts, floods and cyclones of high frequency & intensity, irrigation water scarcity, limited availability of land for agriculture are the major threats.
- Admission of academically poor students of 12^{th} science deteriorates the standard of undergraduate education in college.
- Lack of specific infrastructure facilities at various research units such as in fisheries especially aquaculture ponds, laboratories & research facilities, fishing vessels are big hindrances in research.
- Poor exposure of scientist and teachers to national and international stream may adversely affect the output.
- Due to poor monitoring and regulations, over exploitations in capture fisheries and heavy stocking in aquaculture, it leads to depletion of stocks and mortalities respectively which results in fluctuations in fish harvest and local economy.

JAU 2030

The Junagadh Agricultural University is determined with renewed vigour to overcome the major limiting problems and is gaining the capacity to convert the weaknesses and threats to opportunities for the comprehensive agricultural growth. The efforts would be to become a leading Agricultural University in the country which will be responsive, vibrant and sensitive to the needs of all stakeholders. Our vision, mission and focus are given below.

Vision

Junagadh Agricultural University intends to be one of the nation's leading universities in terms of its academic quality, advancement in technological research and enhancement of farmers' knowledge for sustainable agriculture as well as ensuring food and nutritional security to the people.

Mission

Play pivotal role in teaching, research and extension education related to agriculture and allied sciences.

Focus

Junagadh Agricultural University will focus on the following key areas in teaching, research and extension education activities to realize the vision and the mission.

- Endowing the quality education to produce globally competitive graduates and post-graduates in different areas of agriculture and allied sectors.
- Imparting skills/training to rural youth through agricultural education that develops entrepreneurs, managers, agro-industrial workers and above all progressive farmers with a global perspective and a strong commitment to sustainable growth of agriculture.
- Strengthening individual faculty and student for leadership, good governance and innovation by organizing need based capacity building programmes.

- Strengthening existing centres and establishing new research stations and specialized research laboratories for taking up research and its application in agriculture, horticulture, agricultural engineering, animal husbandry, dairy and fisheries sciences.
- Increasing crop productivity through genetic improvement and making available ample quantity of quality seed of newly developed varieties to the farmers for important crops like groundnut, cotton, pearl millet, castor, wheat, chickpea, pigeon pea, sesame, vegetables, seed spices etc.
- Production of good quality planting material of fruit crops, flowers and medicinal crops for distribution to farmers.
- Research on high density planting, efficient canopy management, eco-friendly and integrated nutrient/pest management, production, processing, storage and varietal improvement in mango, sapota and plantation crops.
- Protected cultivation using net and poly house for cash crops, vegetables, medicinal plants and floriculture.
- Research on integrated management of plant protection for control of major diseases/pests through use of cultural practices, bio agents/herbal pesticides and optimum use of chemical pesticide in the major crops of the region.
- Research on integrated nutrient management using organic, inorganic and bio-fertilizers, appropriate irrigation/water conservation systems and production technology to minimize the input use and maximize its efficiency for sustainable agriculture under rainfed as well as irrigated conditions in the region.
- Soil and water conservation through suitable water harvesting techniques and utilization of micro irrigation practices through computerized remote sensing technique.
- Application of frontier science technologies such as biotechnology and nano-biotechnology for improving production in Agriculture and allied sectors.
- Development of mitigation strategies and climate resilient varieties/ technologies to reduce adverse impact of climatic change on agriculture, livestock production and allied sectors.
- Developing cutting edge technology for enhancement of shelf life of and value addition to the commodities of agriculture and allied sectors.
- Reducing cost of cultivation and human drudgery through farm mechanization along with human safety and comfort.

- Exploring the possibilities of harnessing renewable sources of energy for utilizing in agricultural production and processing including the recycling of biomass and agricultural waste.
- Utilization of agro-industrial byproducts and crop residues in the production of value-added products.
- Addressing the food quality and safety issues through scientific interventions.
- Improving animal health care and delivery systems for efficient milk production.
- Improvement and maintenance of pure Gir Cow and Jafarabadi Buffalo through pedigree selection and artificial insemination using proven bulls.
- Development and diversification of freshwater/brackish water aquaculture with potential species such as mud crab, oysters and mussels.
- Ornamental fish culture research with particular reference to breeding and feed formulation as well as application of remote sensing technique to augment marine fish production.
- Acting as a catalyst in reclaiming degraded saline soils of coastal area through advanced smart farming approach.
- Improving the knowledge management system for efficient technology dissemination through innovative use of Information and Communication Technologies.
- Intensifying existing transfer of technology programmes for effective farming and capacity building.
- Demonstration of proven production and processing technologies on quality aspects through on-farm demonstrations.
- Acting as a knowledge dissemination centre for information related to agriculture, animal husbandry, fisheries and allied sciences through publications, information broad casting system and other advanced means of mass media communication.
- Fostering linkages and collaborations with public-private organizations at national and international level.

Strategy and Framework

The following strategies would be adopted to accomplish the vision and the goals of the Junagadh Agricultural University and to enhance efficiency and effectiveness of education, research and extension education activities.

SN	Goal	Approach	Performance measure
EDUCATION			
	Agriculture		
1.	Up-gradation of knowledge and skill of the faculty. Creation of adequate facilities and quality human resources to address emerging challenges	• Modernize education systems (infrastructure, faculty, generation of new aids and modules in teaching). • Internalize problem solving approach in curricula (increase analytical skills, increase experiential learning, greater focus on science and processes). • Capacity building through training on recent development. • Effective co-ordination of multi-disciplinary education & research. • Strengthening of polytechnics. • Establishment of departments (microbiology, virology, toxicology & nematology).	Qualified and trained manpower in agriculture and allied sector. Up-gradation of faculty resulting in better quality technology. Improved education & research.
2.	Transforming examination system	• Implementation of quiz system in PG programme. • Design and development of suitable answer sheets including OMR sheet in UG programme. • Use of information technology in evaluating students. • Online examination.	Speed and accuracy in examination results. Competence of students produced.

SN	Goal	Approach	Performance measure
3.	Expansion of horticulture education	• Establishment of Horticulture College at Junagadh. • Starting of PG degree in vegetable science, plantation, aromatic and medicinal crops.	Qualified human resource in horticulture.
4.	Establishment of College of Agricultural Information Technology	• UG and PG programmes in Agricultural Information Technology. • Training programmes and short-term courses on agro-informatics, internet services, agriculture software, data communication & networks, agriculture knowledge management system, etc. in various fields of agriculture & allied sectors and rural development.	Qualified of IT professionals in Agriculture. Improved functioning in academic, research, accounting and administrative work.
5.	Establishment of College of Nano-biotechnology	• UG & PG programme in nano-biotechnology	Qualified persons in agricultural nano-biotechnology.
6.	Establishment of PG institute of Agricultural Biotechnology	• PG programme in Agricultural biotechnology. • PG studies in biotechnology and bioinformatics. • Imparting training in the field of biotechnology and bioinformatics. • To impart knowledge and to conduct research in the advanced area of biotechnology.	Qualified persons in agricultural biotechnology.
	Agricultural Engineering & Technology		
1.	Strengthening of UG, PG and Diploma Education in the Engineering	• Establishment of new laboratories and modernization of present laboratories. • Diploma programme in Agricultural Engineering. • Strengthening of polytechnic in agro processing. • Establishment of Basic Engineering Department. • Department of irrigation & drainage engineering. • Degree programme in Energy & Environmental Engineering at UG level.	Generation of qualified manpower. Availability of skilled and specialised manpower.

SN	Goal	Approach	Performance measure
		• Master and Ph.D. research program in Solar Energy, Wind Energy and Bio Energy. • Degree programme in Food Processing Technology. • Development of CAD/CAM computerized laboratory. • Upgradation of Ag. Engg. College with inclusion of Multi Engineering Disciplines. • International collaboration in PG research.	
	Fisheries		
1.	Enhancing the skill development and output of degree holders and diversification of fisheries education	• Raising the intake capacity. • Recruitment of well qualified faculty and supporting staff. • Improving and updating laboratory and classroom facilities. • Establishment of a full-fledged college campus. • Establishing new departments (information technology, food processing, biotechnology, fishery economics & statistics, fishery management). • Introducing new disciplines (fish nutrition & biotech., fishery pathology and microbiology, fishery genetics & biotechnology, aquatic environment, fisheries management). • Faculty exchange and training programmes. • Collaboration with international universities. • Starting of PG diploma courses (feed technology, marine biotechnology).	More number of graduates and post graduates. More number of students clearing JRF, NET, SRF examinations. More number of entrepreneurs in fisheries sector.
	Veterinary Science & Animal Husbandry		
1.	Strengthening institutional capacities in veterinary science	• Increase the intake capacity. • Upgradation of students' amenities. • Modernization of laboratories, instructional farm and teaching veterinary clinical complex. • Establishment of polytechnic courses in animal science.	Well qualified manpower in veterinary and animal husbandry. Updated teaching techniques. Better quality of student activities.

SN	Goal	Approach	Performance measure
	Agribusiness Management		
1.	Development of UG and Ph.D. programme in agribusiness. Distance learning programme in agribusiness, and management development programme (MDPs)	• Creation of infrastructure. • Aggressive niche strategy for the development of course curriculum. • Linkages with agro-based industries. • Identification and prioritization of areas of training. • Creation of modern management tools and techniques. • Starting the UG and Ph.D. programmes. • Development of need based learning modules. • Expansion of MDPs and training programme.	Qualified manpower for industry and universities. Solution for the managerial problems of stakeholders.
RESEARCH			
	Crop Improvement		
1.	Genetic up-gradation through hybridization	• Genetic enhancement and population improvement in diploid and tetraploid cotton. • Development of CMS based hybrids and diversification of cyto-source in cotton. • Development of long linted *G. hirsutum* with high yield potential. • Development of genotypes for early and late heat tolerance in wheat for climate change. • Development of short duration varieties suitable for Saurashtra conditions in wheat and chickpea. • Development of early and inputs responsive hybrids for good quality summer bajra cultivation. • Identification and utilization of open pollinated varieties/hybrids for average input conditions in pearl millet. • Development of bold seeded & confectionary type of groundnut varieties. • Development of early or medium late maturing MS lines in pearl millet.	Generation/development of high yielding varieties/hybrids and breeding materials/lines with improved characters. Development of new lines resistant to biotic and abiotic stresses. Evolvement of basic potential genetic material for further research work. Generation of new male and female lines for the development of hybrid varieties.

SN	Goal	Approach	Performance measure
		• Development of high yielding medium late maturing pigeonpea varieties. • Generation of genetic variability for resistance to biotic and abiotic stresses through use of wild relatives in cotton, wheat, bajra, groundnut, vegetables etc. • Development of CGMS system and hybrid development in sesame, onion, chillies, pigeonpea and onion. • Development of multi-adversity resistant (MAR) genotypes in cotton. • Use of synthetic germplasm for the development of new plant type in wheat. • Gene pyramiding for the development of disease resistant varieties in mandate crops. • Marker assisted selection for biotic, abiotic and quality traits in mandate crops. • Diversification of male sterile lines through development of downy mildew resistant CMS lines in A5 and A4 sources in pearl millet. • Establishment of long term population improvement programmes of pearl millet to extract downy mildew resistant CMS & 'R' lines. • Development of physiologically efficient plant types in mandate crops.	
2.	Germplasm maintenance and utilization	• Collection, conservation, characterization and evaluation of available genetic resources. • Identification and utilization of resistance sources against major biotic and abiotic stresses in mandate crops. • Cataloguing of accessions based on morphological, phenotypic and genetic characteristics in crop plants.	Maintenance and enrichment of biodiversity in mandate crop plants. Documentation of available germplasm in crop plants for further utilization in breeding programmes. Identification of potential donor parents for different

SN	Goal	Approach	Performance measure
		• Exploration of germplasm of minor vegetables, pulses and seed spices. • Collection, conservation and evaluation of germplasm of crop plants. • Identification, characterization and conversion of photo-period sensitive germplasm accessions to make them suitable for the region. • Pre-breeding/conversion of unabated germplasm of cultivated species of cotton into usable and value added varieties.	economic traits for their utilization in crop improvement programmes.
3.	Breeding for yield and quality improvement	• Development of high yielding cultivars amenable to machine harvesting in the mandate crops of Saurashtra region. • Development of highly nutritive pearl millet hybrids containing high Fe & Zn content. • Exploitation of genetic variability for milling characteristics and resistance to stored grain pests. • Development of high yielding onion varieties with high TSS for processing & export and big cloved garlic varieties. • Development of high oil and high O/L ratio containing groundnut varieties. • Breeding for resistance to specific diseases in the crops of the region. • Development of efficient criteria for selection, breeding methodologies for simultaneous improvement of yield and quality parameters. • Development of crop varieties/hybrids suitable for processing, export and confectionery purposes in important crops. • Use of biochemical tools to improve resistance / tolerance to biotic and abiotic stresses in mandate crops.	Improved varieties/hybrids of crop plants with better yield and quality attributes. Enhancement of total production and productivity in mandate crop plants. Development of crop varieties/hybrids suitable for changed climatic conditions. Development of efficient criteria for selection, breeding methodologies for simultaneous improvement of yield and quality parameters.

SN	Goal	Approach	Performance measure
		• Development of varieties with early and synchronized maturity suitable for machine picking in *arboreum* cotton. • QTL mapping for economically important traits inclusive quality traits in mandate crops. • Development of transgenic varieties for various purposes. • Application of biotechnology and tissue culture for development of inbreds and *in vitro* selection for disease and drought registance. • Pyramiding resistant genes for various races of important diseases of mandate crops. • Development of vegetable varieties/hybrids suitable for off season and greenhouse cultivation in important vegetables for processing, export and dehydration purposes.	
	Biotechnology		
1.	Upgrading and strengthening of biotech research centre.	• Understanding the physiological, genetic and molecular mechanisms underlying abiotic & biotic stress tolerance. • Molecular basis of male sterility and fertility restoration. • Cloning and characterization of novel genes of agronomic importance. • DNA fingerprinting of varieties released by JAU • Molecular analysis of important plant pathogens, pathotyping and host pathogen interaction. • Molecular breeding for stress tolerance. • Map based gene cloning and markers for MAS. • Genetic engineering for resistance to pathogens. • Genome sequencing of crop plants and microorganisms	Stress tolerant crop cultivars & transgenic. Novel genes for crop improvements. Marker aided selection for agronomic traits in breeding programme. Germplasm/varietal identification and their protection. Cataloguing of important plant pathogens prevalent in Gujarat. Pathogen-resistant transgenic crop plants. Gene constructs and gene sequences to develop gene based markers.

SN	Goal	Approach	Performance measure
2.	Establishment of agricultural forensic research institute	• Creation of infrastructure. • Linkages with forensic laboratories. • Identification and prioritization of areas of research. • Creation of modern tools and techniques for agricultural forensic research.	Analysis of samples and queries of agriculture oriented crimes.
3.	Pilot project for the establishment of saffron research center.	• Research experiments pertaining saffron cultivation in Saurashtra	Initiation of research on saffron in Gujarat.
	Basic Science		
1.	Production of elite planting materials	• Development of tissue culture protocols for important field crops, vegetables, fruits, medicinal & aromatic crops. • Endow the farmers with quality planting materials. • Development of protocol for anther culture and multiplication of highly recalcitrant crops. • Standardization of protocol for embryo rescue technique.	Multiplication of improved crop varieties of field crops, vegetables, fruits, medicinal & aromatic plants.
2.	Development of biodiversity park and encouraging production of quality planting material of medicinal and aromatic plants	• Improvement of infrastructure facilities in the existing botanical garden. • Introduction of germplasm of medicinal & aromatic plants. • Establishment of short term storage seed bank. • Development of biodiversity parks with automated domes. • Development of facilities for long term storage of seed through cryopreservation. • Fingerprinting of medicinal and aromatic plants germplasm.	Enrichment of plant biodiversity and multiplication of important species.
3.	Understanding the basic physiological mechanisms contributing to differential yield response of mandatory crops of the region	• Establishment of modern laboratory. • Identification of morphological, physiological and biochemical parameters for rapid screening of drought and salinity resistant crop genotypes.	Identification of plants ideotypes with desirable traits.

SN	Goal	Approach	Performance measure
		• Use of different salts/ PGR'S and biomolecules for seed treatment/ foliar spray. • Research on basic and applied aspects of plant growth and development, plant metabolism, micronutrients, growth regulators and abiotic stresses. • Study on molecular aspects of plant physiological processes particularly under changing environmental conditions.	
4.	Improvement of seed germination and storage capacity of seeds	• Establishment of functional seed testing laboratory and model of small scale seed processing plant. • Studies on seed dormancy. • Establishment of cultivar purity testing laboratory. • Development of protocol for seed coating and pelleting for small seeded crops.	Improvement in seed germination and storage capacity involving scientific and commercial technologies.
	Plant Protection		
1.	Bio-control of insects, pests and diseases	• Research on beneficial microbes and insects for control of pests and diseases. • Screening of promising micro-organisms and insects *in vitro.* • Testing of field performance of bio-control agents. • Acclimatization and sustainability of bio-control agents in ecosystem • Standardization and quality production of bio-control agents.	Production of effective bio agents for control of pests/diseases. Improvement in quality of agricultural produce, i.e., free from pesticides residue. Reduction in environment pollution and soil and water contamination.
2.	Integrated pest management	• Development of guideline for incorporation of non-chemical methods and integrated pest and disease management. • Evaluation of new micro-molecules and optimization of dose of pesticides with reference to pest ecology. • Quantification of pesticides residue in agricultural produces. • Development of IPM modules.	Efficient Integrated Pest Management (IPM) & Integrated Disease Management (IDM) practices. Reduced input cost and pesticides residue in agricultural produces. Soil and water, production of bio control agents and biofertilizers.

SN	Goal	Approach	Performance measure
	Natural Resource Management		
1.	Technology for organic farming including bio-fertilizer & integrated plant nutrient management	• Research on farm residue recycling. • Development of enriched organic manure. • Testing of efficient strains of N-fixing and P-solubilizing microbes. • Quality standards of organically raised farm produce. • Carbon sequestration.	Improved soil health and productivity.
2.	Development of dry farming and water management technologies	• Water management in cropping systems based on water availability. • Fine tuning of the recommendations on irrigation for different farming situations. • Increasing water use efficiency through adoption of micro-irrigation system. • Use of sewage water, recycling of waste waters in agriculture. • Developing low cost technologies for *in situ* moisture conservation. • Utilization of saline water for farming. • Contingent crop planning. • Evaluation of microbial techniques for justification of sewage water/saline water. • Introduction and evaluation of high value specialty crops for increasing system productivity and sustainability. • Integrated farming systems for small and marginal farmers.	Improved water use efficiency and production of crops.
3.	Integrated weed management	• Development of guidelines for incorporating the non-chemical methods (cultural/ mechanical and agronomic manipulation) with chemical methods. • Evaluation of new herbicides and optimizing their time and dose of application and elucidating factors affecting their efficiency.	Efficient integrated weed management practices. Herbicide residues in plant and soil.

SN	Goal	Approach	Performance measure
		• Dynamics of weed seedbank in soil. • Quantification of herbicide residues in soil, water and plant parts and their consequent entry in the food chain. • Development of management techniques to mitigate the negative impact of herbicide residues.	
4.	Technologies for improvement/ restoration of soil health	• Development of low cost technologies for the reclamation of salt affected soils. • Developing sustainable and stable cropping systems. • Diversification and intensification of agriculture. • Evolving alternate land use planning based on land capability classification. • Working out techniques of conservation agriculture, carbon sequestration and watershed management for rejuvenation of waste lands. • Developing technologies for arresting sea water ingress in coastal areas. • Real-time N application.	Improved soil health and productivity.
5.	Stability in production system under the changing climate	• Weather characterization. • Medium range weather forecasting models. • Development of crop contingency plans for mitigating climate change. • Risk management in agriculture and crop assessment.	Developed contingency plan for mitigating risk in agriculture under climate change.
	Horticulture		
1.	Establishment of centre of excellence in mango	• Production of quality planting material. • Training and demonstration to farmers about Good Agricultural Practices (GAP) right from field preparation to the marketing. • Research on cultivation of organic mango.	Supply of quality planting material. Improvement in the mango varieties. Organic mango protocol.

SN	Goal	Approach	Performance measure
		• Research on effect of climatic changes in mango. • Standardization of rootstock and grafting technique. • Research in different varieties for higher production and introduction in new area. • Standardization of different post harvest techniques and value addition. • Standardization of geometric architecture and canopy management.	Value addition and increase in export.
2.	High-technology research in banana, papaya, guava, sapota and custard apple	• Production of quality planting materials for commercial planting. • Standardization of efficient de-suckering in banana for commercial planting. • Studies on sex expression in papaya. • Standardization of root stock and grafting technique in sapota. • Studies on blackening of fruits in custard apple. • Integrated nutrient management of different cultivars. • Use of PGRs for higher yield and export quality. • Research in different varieties for higher production and introduction in new area. • Standardization of different post harvest techniques and value addition in sapota.	Improvement in livelihood of farmers due to higher productivity of fruit crops and value added products.
3.	Efficient technologies for protected cultivation	• Development of production technologies for flowers and vegetables under protected condition.	Increase in the productivity and quality for round the year cultivation of flowers and vegetables.
4.	Strengthening of post harvest technology and value addition	• Post harvest handling, processing and storage studies for different horticultural produces. • Market studies with respect to fruits, vegetables and flower crops.	Reduction in post-harvest losses, increased in shelf life and preparation of value addition.

SN	Goal	Approach	Performance measure
	Agricultural Engineering		
1.	Development of Renewable Energy technologies and efficient utilization	• Research on solar drying, solar distillations, greenhouse technology, solar water heating, cooking, advance solar collector, PV pumping, LED based PV lighting etc. • Establishment of bio-energy research centre. • Development of Advanced solar systems for cooling, test set-ups for Solar, thermal and PV system. • Designing of solar thermal and PV power projects. • Development of new technologies on biomass gasification and biogas production. • Solar-wind hybrid system, wind turbine and high performance wind pumping systems.	Technology for harnessing solar, wind and bio energy. Sustainable development of villages through self sufficiency in energy.
2.	Reduction in cost of cultivation and drudgery through farm mechanization	• Development and modification of improved farm equipments with better timeliness of operation, higher input use efficiency comfort to operators. • Performance evaluation of developed technology. • Establishment of centre of farm Mechanization, precision farming and ergonomics • Establishment of custom hiring services for improved machines.	Development / adoption of commodity specific farm machinery. Mechanization of different farm operations. Precision farming approach for better production and productivity.
3.	Centre for Remote Sensing and Geo-informatics in Agriculture	• Development of the laboratory for the Remote Sensing and GIS with advanced software to conduct research. • Practical training to UG and PG students in the field of Remote Sensing and GIS application. • Assessment of the land, water and vegetation resources of the region.	The thematic maps of land, water and vegetation resources of the region.
4.	Water management	• Watershed development and management: rainwater harvesting in different agro-climatic zones.	Increase in water use efficiency.

SN	Goal	Approach	Performance measure
		• Assessment of groundwater development and energy use patterns for optimization of groundwater use. • Crop diversification and improvement of water use efficiency. • Strategies for mitigation of natural calamities, Global warming and its effect on crop production system; modelling weather variability for crop planning. • Conjunctive use of harvested rain water with groundwater through Micro Irrigation Systems. Participatory irrigation management. • Development of strategies for groundwater recharging in the coastal and semi arid watersheds, Standardization of methodology of extraction of groundwater. • Evaluation of performance features of canal irrigation system, and developing strategies for performance improvement to synchronize canal water supplies with crop water demand.	Improvement in water quality and its availability for irrigation.
5.	Management of coastal sodic and saline area programme	• Reclamation of waterlogged and coastal saline lands with physical as well as biological drainage measures. • Multiple use of village ponds/talavadi etc. through integration of pisciculture, duckery and cultivation of aquatic crops viz., makhana (*Euryale ferox*), water chestnut (*Trapa bispinosa*) and swamp taro (*Colocasia esculenta*).	Reclamation of soils. Increase in cultivable area and its productivity.
6.	Development of post harvest technology for cereals, oilseeds and pulses	• Development of post harvest practices / equipment for cereals, pulses and oilseeds. • Development of technology for groundnut – cereal-millets based extruded food products.	Development of value added products from cereals, oilseeds and pulses.

SN	Goal	Approach	Performance measure
		• Isolation of protein from defatted groundnut cake. • Application of bio-technology in food processing. • Technology and equipment suitable at rural level for processing. • Technology for utilization of by-products.	
	Fisheries		
1.	Enhancement of fish production and productivity Maintaining the sustainability of aquatic system and developing new value added products	• Development of indigenous feeds/ rations and feed additives for cultured fishes. • Developing technology for brackish water fish. • Developing new products from trash fish. • Research on prevention and control of disease and parasites of fishes. • *In vitro* technology for the production of prawn seed. • Genetic improvement of cultivable fish with respect to growth and disease resistance. • Novel seafood and marine product development. • Improvement in processing and packing of traditional cured fish products. • Research on marine proteins and marine oils. • Designing fish gears and their impact assessment. • Fish population genetics.	Increased availability of fish. Improved quality of fish and fishery products and marine products. Increased livelihood opportunities for fishermen.
	Veterinary & Animal Husbandry		
1.	Livestock improvement	• Development of low-cost methods for storage and value addition in crop residues. • Identification and nutrition enhancement of unconventional feed resources. • Clean milk production under Indian conditions. • Conservation and improvement of animal genetic resources *viz*., Gir cattle, Jaffrabadi buffalos,	Increase in production. Improvement in health of livestock in the field.

SN	Goal	Approach	Performance measure
		Kathiawadi horse and Zalawadi and Gohilwadi breeds of goats and wild ass. • Experiments on nutritional manipulations for increasing bio-active peptides and omega-3 fatty acids of milk. • Generation of animal behavioural information for sustaining with environment/climate change and its effects on various performance traits. • Identification and characterization of animals for registration /patents.	
2.	Establishment of advanced research institute on animal biotechnology	• Research for increasing yield and minimizing production risks through application of available biotechnologies *viz*., cryo-preservation of sperm and ova, embryo-transfer technology. • Facilities for gene-mapping and genetic manipulation for improving the quality and quantitative traits. • Research for improving efficiency of rumen microbes. • Initiation of research in immunogenetics. • Establishment of bio-safety lab. level III & IV.	Enhance total productivity, reduce mortality and enhanced productive life. Application of MOET (Multiple Ovulation and Embryo Transfer) in the field. Increase use of pre-biotic and pro-biotic in the animal feed.
3.	Establishment of Regional Animal Disease Diagnostic Laboratory	• Creation and strengthening of regional laboratory facilities for full-fledged clinical diagnosis of diseases of livestock and wild animals. • Use of ITK in prevention and control of diseases and parasites.	Effective diagnosis for prevention and control of diseases in livestock and wild animals.
	Social Science		
1.	Research on sustainable indigenous technological knowledge (ITK) of agriculture & allied fields	• Documentation and testing of ITK in Agriculture. • Selection of reliable ITKs. • Standardization of ITKs for forecasting of monsoon.	Identification of useful ITKs. Successful models for rain forecasting.

SN	Goal	Approach	Performance measure
2.	Export potential for major horticultural commodities from Gujarat	• Examine the growth and stability in area, production and yield of fruit crops in Gujarat state. • Workout the export competitiveness of fruits.	Guidelines for export potential for major horticultural commodities from Gujarat.
3.	Cost of cultivation/ production of major horticultural crops	• Work-out the cost of cultivation, production, returns, input-output ratios and pay back period for important horticultural crops.	Streamline data base for advance research in horticultural crops.
4.	Economic evaluation of irrigation project	• Cropping pattern of command area, estimation of profitability of different crops and economic feasibility of the project.	Information on efficiency of irrigation project.
5.	Improvement in the efficiency of field experiments	• Study the distribution of variability in field experiments on groundnut, sesame, cotton, bajra, etc. • Develop statistical methods/ approaches to minimize error.	Information on variability in experimental fields. Increase precision in research.
EXTENSION EDUCATION			
1.	Imparting trainings to farmers, rural youth	• Organization of on-campus and off-campus training programmes. • Training programme for upgrading scientific knowledge and communication skills of extension functionaries. • Vocational training programme for self employment of rural youth. • Establishment of pilot plants for groundnut based food products, for training, demonstration and entrepreneurship development.	Adoption of the improved agricultural technologies. Capacity building of extension functionaries. Self employment of rural youth.
2.	On Farm Trials (OFTs) and Front Line Demonstrations (FLDs)	• Assessment, refinement & dissemination of technologies. • Demonstrate the recommended technologies as compared to local practices. • Effective feedback mechanism. • Convincing farmers for adoption.	Refinement of developed technologies. Increase in adoption of recommended technologies.
3.	Certificate course in organic farming	• Formulation of course curricula. • Strengthening of facilities.	Increase in area under organic farming.

SN	Goal	Approach	Performance measure
4.	Certificate course in agricultural journalism and mass media communication	• Development of infrastructure. • Formulation of course curriculum. • Development of learning modules.	Trained personnel in Agriculture journalism and mass media communication.
5.	Establishment of distance education centre	• Creation of infrastructure. • Formation of course curriculum based on need of area. • Development and implementation of distance learning modules. • Establishment of Kiosk for transfer of technology.	Rapid dissemination of improved technologies in remote areas.
6.	Development of skilled manpower in the area of renewable energy	• Establishing Biogas Development & Training Centre (BDTC), and Solar and Biomass Energy Training & Testing Centre. • Training on Biogas Development, Repair & Maintenance, Biofuel Technology, Biomass Utilization and Solar Energy Technology Testing and Maintenance.	Availability of skilled manpower. Awareness and use of renewable energy sources in rural areas.
7.	Establishment of veterinary clinical complex	• Strengthening treatment facility for outdoor and indoor sick animals. • Need-based institutional training in A.H. field for farmers, farm women and rural youth.	Improvement in health care management. Reduction in morbidity and mortality.
8.	Transfer of fishery technologies	• Establishment of TOT centre for fisheries. • Establishment of demonstration-cum-training centre in freshwater aquaculture. • Vocational programmes in museology, feed formulation, ornamental fish culture, net fabrication, fishery product development, quality assessment of fishery products, etc. • Imparting trainings to personnel from different departments and organizations. • Establishing linkages with state fisheries department, fishermen, NGOs and entrepreneurs and also strengthening/creating alliances and partnerships. • Online fishery information.	Skill development in fishermen, women and youth. Increase in the income of fishermen and entrepreneurs. Availability of information and technologies to the stake holders.

Strengthening linkages

The existing formal and informal linkages with State Agricultural Universities, line departments, national institutes under Indian Council of Agricultural Research, Department of Biotechnology, Council of Scientific and Industrial Research, international institutes like International Crops Research Institute for the Semi-Arid Tropics, International Maize and Wheat Improvement Center, Government organizations like Gujarat State Seed Corporation, Gujarat State Seed Certification Agency, Gujarat State Agro-Industrial Corporation, Gujarat State Sardar Sarovar Narmada Nigam, Gujarat State Biotechnology Mission, etc. would be further strengthened for better cooperation in various activities. Parternership with private seed companies/ manufacturers, NGOs, Farmers' organizations, Marketing institutions, etc. would be stepped up for target based research and dissemination of new agricultural technology.

Epilogue

Junagadh Agricultural University is committed to bring a need-based and technology-led revolution in the state to meet challenges of the rising demand of ever increasing population for food, improving livelihood of farmers and for ensuring sustainable agriculture. We envision that innovations in agriculture would transform existing slowdown in agriculture into a vibrant and competitive environment by harnessing untapped opportunities in domestic and global markets. The university firmly believes that agricultural research and development would augment farmers' income, generate employment opportunities, conserve natural resources, promote exports and increase value addition for higher and comprehensive agricultural growth.

Concerted efforts would be made to transform the JAU to be more sensitive to the needs of the farming community, especially of the smallholders and of the poor living in the backward, fragile, rural and marginal areas. Intensive endeavours will be made to emphasize agro-eco region specific research and finding solutions to local problems through the existing network. In years to come, climate change and climate variability will certainly drive the research programme of the university in form and substance. JAU is marching ahead with renewed zeal and is committed to play pivotal role in teaching, research and extension education for sustained development of agriculture and allied sectors. In this context, JAU is absolutely devoted in realizing the new paradigms and using them to develop excellent human resource, innovative technologies and their dissemination so as to proficiently serve the farming community of the state and the country. The university will develop mechanism to regularly monitor the changes in agriculture scenario at state level, and the strategies to respond to the changes for the benefit of the farmers. Efforts will be made to maintain a culture of responsibility, accountability and integrity in agriculture science at the university. The JAU will keep the needs of contemporary and future agrarian sector in view to envisage the strategies and programmes, and is determined to boost the quality of education, research and extension in the modern, fast galloping era of radical transformation in science and industry.

Vision 2030

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