1. INTRODUCTION

Geography and climate

In Gujarat, rice is cultivated in the following ecology with a total area of about 7.18 lakh hectares.

i) Irrigated transplanted

ii) Rainfed Transplanted

iii) Rainfed upland drilled

iv) Coastal/Salt-affected transplanted rice

The distribution pattern of the area under rice and production potentiality of the crop in different agro-ecological situations apparently governed by the onset and withdrawal of monsoon, the distribution of rainfall and the extent of irrigation facility available. The area under rainfed conditions is about 40 per cent and the rice productivity of Gujarat is about 1.8 tonnes per hectare.

GEOGRAPHICAL INDICATOR

(a) Climate:

In terms of the standard climatic types, tropical climates, *viz.,* sub-humid, arid and semi-arid are spread over different regions of the state. The regions in the extreme north, comprising the district of Kutch and the western parts of Banaskantha and Mehsana, the Northern fringe of Saurashtra and its western part have an arid climate. The districts of Valsad and the Dangs in the extreme south of the state have a sub-humid climate; the rest of the state has semi-arid climates.

The principal weather parameters that build the climate of the state are rainfall and temperature, although others like humidity, cloudiness, dew and fog are also important from the agricultural point of view.

(b) Soil type:

The soils of Gujarat can be broadly classified into seven groups. There are (i) black soils, (ii) mixed red and black soils, (iii) residual sandy soils, (iv) alluvial soils, (v) saline-alkali soils, (vi) desert soils, (vii) lateritic soils, (viii) hilly soils and (ix) forest soils.

(c) Rainfall :

All parts of Gujarat receive precipitation through the south-west monsoon. The state, being located at the peripheral boundary of the main current of the south-west monsoon, the distribution of rainfall has been extremely uneven and irregular. The low-pressure depression

developing over the Bay of Bengal during monsoon months and moving north to north-west also gives rains to part of the state in the Northern region.

The average annual rainfall over different parts of the state varies widely from 300 mm in the western half of Kutch to 1500 mm in the southern part of Valsad district and the Dangs. The monsoon usually commences by the middle of June and withdraws by the end of September, about 95 per cent of the total annual rainfall being received during these months in most parts of the state. About 10 % to 15 % of the annual rainfall is received in June, nearly 40 % in July, 25 % in August and 15% to 25% in September. The maximum number of rainy days is in July and August.

The number of rainy days in the season varies from one part of the state to another. The range is from a minimum of 16 in Kutch to a maximum of 48 in Surat and the Dangs. Generally, the number increases as one moves towards the eastern and southern parts of the state. The number of spells of rainy days is more in July and August compared with those in June and September. The number of spells of rainy days of long duration ranges from 2 to 4 for July and August, with intervening spells of rainless days.

(d) Agro-climatic zones-state-wise:

Taking into consideration the rainfall pattern, the topography, soil characteristics, the climate in general and the cropping pattern, eight agro-climatic zones have been identified for Gujarat. It may be mentioned that one of the zones is on account of variations in topography and cropping patterns. The following eight zones have been identified by the ICAR Research Review Committee in its report of December 1979.

I. South Gujarat-Heavy Rainfall Area
II. South Gujarat
III. Middle Gujarat
IV. North Gujarat
V. North West zone
VI. North Saurashtra
VII. South Saurashtra
VIII. Bhal and the Coastal area.

State Agriculture status and role of rice

Among the rice growing districts, the productivity of six districts is higher than the national average productivity and eleven districts have productivity below the national average. There are six districts under the medium productivity group, six districts under the medium low productivity group and two districts under the very low productivity group. About 52 per cent of the area is concentrated in the medium-low productivity group, which accounts for 41 per cent of total rice production.

Table - 6 Area, Production and Productivity of Rice with Five Productivity Groups of Districts in the Gujarat State (mean of three Years 2021-22 to 2023-24)

Category of District	District	Area (Lakh ha)	Production (Lakh T)	Productivity (Kg/ha)
High Productivity Districts (>2500kg/ha)	Sabar kantha, Arvalli, Ahmedabad, Botad, Anand, Kheda, Navsari, Valsad, Tapi	5.69	15.49	2723.34
Medium Productivity Districts (2000-2500 kg/ha)	Mahesana, Gandhinagar, Surendranagar, Mahisagar, Surat, Vadodara, Dangs	1.62	3.61	2223.72
Medium Low Productivity Districts (1500-2000 kg/ha)	Rajkot, Gir Somnath, Panch Mahal, Bharuch	0.56	0.86	1530.05
Low Productivity Districts (1000-1500kg/ha)	Dahod, Chota Udepur, Narmada	0.67	0.88	1317.83
State Total	**23**	**8.54**	**20.84**	**1948.74**

Source: Report of Directorate of Agriculture, Gujarat State, 2023-24

CROPPING SYSTEM-ZONE-WISE

Sr.No.	Agro-climatic zone	Crops in the zone
I	South Gujarat (Heavy Rainfall)	Rice- Hill millets, Sugarcane, Fruits, Tuber vegetables, flowers
II	South Gujarat	Cotton, Sorghum
III	Middle Gujarat	Tobacco, Rice, Maize, Cotton
IV	North Gujarat	Wheat, Pearl-millet, Pulses, Castor, Mustard, Cumin, Cotton, Isabgul, Maize, Potato, Tobacco
V	North West zone	Cotton, Vegetables, Sorghum, Pearl-millet, Date palm, kidney bean
VI	North Saurashtra	Groundnut, Pearl-millet, Cotton, Sorghum, Pasture
VII	South Saurashtra	Groundnut, Cotton, Pearl-millet, Wheat, Coconut, Sorghum, Sugarcane, Fruits, Vegetables
VIII	Bhal and the Coastal area.	Rainfed Wheat, Rice, Cotton, gram, Sorghum

Source: Status report, GAU, Navsari, Gujarat

RICE GROWING SEASONS AND REGIONS

Rice is growing mainly in the *kharif* season in Gujarat and in summer, it is being grown on about 30,000 hectares.

(a) Season-wise varieties / hybrids

Varieties: NAUR-1, GNR-3, GNR-4, GNR-7, GR-15, GR-17, GR-18, GR-20, GR-24, GR-25, GR- 27, Jaya, Gurjari, etc., (Irrigated transplanted)

GNR-6, IR-28, (Rainfed transplanted)

GR-16, Purna, (Drilled Rice)

Dandi, GNR-2, NAUR-1, GNR-3, GNR-5,GR-19, GR-26 (Salt affected soils)

Hybrids : GNRH-1, GRH-2

BYPRODUCTS OF RICE SPECIFIC TO THE STATE

(a) Usage	:	➢ For the fodder and paper industries ➢ Coarse-grain type rice is used for the preparation of pauva and mamara on a very large scale. ➢ Rice bran is used as fish and cattle feed.
(b) Market value	:	➢ Straw: 5 Rs per kg ➢ Rice bran: Rs 20-25 /kg
(c) Milling industries	:	➢ *Pauva-mamara* industries ➢ Paper Industries ➢ Bricks Industries

Status of Rice area and Production in the state

The scenario of rice in Gujarat comprises nearly 60-65 % of lowland (transplanted) and 35-40 % of upland (drilled) rice. The average productivity of lowland (transplanted) rice is 2400 to 2500 kg/ha, while that of the upland (drilled) rice is merely 700 to 900 kg/ha. The overall low productivity is mainly due to the fact that about 40 per cent of the area under rice is upland with a productivity of 0.7 to 0.9 tonnes/ha. The area under irrigated rice increased with the enhancement of irrigation facilities after 1992-93.

DISTRICT-WISE RICE ECOSYSTEMS OF THE STATE (2023-24):

(Area in '00 ha, production in '00 M. T., Yield in Kg/ha)

DISTRICT	Irrigated (*Kharif*)			Rainfed (*Kharif*)			TOTAL		
	AREA	PROD	YIELD	AREA	PROD	YIELD	AREA	PROD	YIELD
Kachchh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Banaskantha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Patan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mehsana	65.04	148.63	2285.20	0.00	0.00	0.00	65.04	148.63	2285.20
Sabarkantha	65.67	211.90	3226.80	6.54	9.03	1381.33	72.21	220.94	3059.66
Arvalli	8.82	23.54	2668.97	0.00	0.00	0.00	8.82	23.54	2668.97
Gandhinagar	120.11	291.41	2426.16	0.00	0.00	0.00	120.11	291.41	2426.16
Ahmedabad	1449.06	4009.00	2766.62	0.00	0.00	0.00	1449.06	4009.00	2766.62
Surendranagar	16.80	44.84	2668.97	3.04	6.02	1979.85	19.84	50.86	2563.38
Morbi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rajkot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jamnagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Devbhoomi Dwarka	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porbandar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Junagadh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gir Somnath	0.00	0.00	0.00	0.05	0.10	1979.85	0.05	0.10	1979.85
Amreli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bhavnagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Botad	0.32	0.85	2668.97	0.00	0.00	0.00	0.32	0.85	2668.97
Anand	1230.07	3559.10	2893.41	0.00	0.00	0.00	1230.07	3559.10	2893.41
Kheda	1147.28	3258.68	2840.35	0.00	0.00	0.00	1147.28	3258.68	2840.35
Panchmahal	293.21	569.29	1941.56	181.66	322.47	1775.11	474.87	891.75	1877.89
Mahisagar	363.73	859.72	2363.62	50.51	102.17	2022.85	414.24	961.90	2322.07
Dahod	263.78	525.50	1992.17	133.68	132.63	992.12	397.46	658.12	1655.82
Vadodara	338.26	699.41	2067.66	0.00	0.00	0.00	338.26	699.41	2067.66
Chhota Udepur	66.36	129.87	1957.09	78.91	60.06	761.18	145.27	189.94	1307.47
Narmada	0.00	0.00	0.00	112.93	116.44	1031.12	112.93	116.44	1031.12
Bharuch	88.80	169.74	1911.49	10.80	5.10	472.47	99.60	174.84	1755.45
Surat	349.66	932.94	2668.12	81.51	108.03	1325.37	431.17	1040.97	2414.28
Dangs	0.00	0.00	0.00	307.57	626.17	2035.86	307.57	626.17	2035.86
Navsari	236.42	666.13	2817.56	216.95	666.07	3070.14	453.37	1332.19	2938.43
Valsad	755.10	2102.53	2784.44	0.00	0.00	0.00	755.10	2102.53	2784.44
Tapi	307.36	922.41	3001.07	381.13	944.72	2478.74	688.49	1867.13	2711.92
Total	**7165.85**	**19125.47**	**2668.97**	**1565.28**	**3099.02**	**1979.85**	**7521.00**	**16278.00**	**1863.00**

*Source of Data: Director of Agriculture, Gujarat State, Gandhinagar

Because of a highly diversified climate, soil and irrigation facility, paddy is grown under different situations, *viz*., irrigated transplanted (55-60%), rainfed transplanted (10-12%) and rainfed drilled (25-30%). The productivity of paddy is low (1863 kg/ha), basically due to a sizable area under drilled paddy. Apart from this, paddy crop production related constraints also vary with the growing situations, which further complicate the technology development work. For resolving these problems and enhancing the productivity of paddy, NARP (Paddy), Navsari, was working as a sub-centre of the Main Rice Research Station, Nawagam, up to 2004. Subsequently, due to the bifurcation of GAU, NAU came into existence in 2004. Since then, NARP (paddy) has been given the status of the **Main Rice Research Centre,** which is looking after all aspects of rice research for the South Gujarat region. The AICRIP centre started in 2009-10 as a funded centre to carry out rice research, particularly with respect to the South Gujarat condition.