9

Release and Popularisation of Cultivars in Gujarat

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Characteristics of Agriculture in Gujarat

Gujarat is situated on the west coast of India, flanked by Rajasthan, Madhya Pradesh, Maharashtra, the Gulf of Kutch, the Arabian sea, and Pakistan. Although best known for its industrial production, it is also a major agricultural state. Half the total area of nearly 20 million hectares is under cultivation. With 41 million inhabitants, it is quite densely populated.

Soils fall broadly into seven groups: black soils, alluvial soils, saline-alkaline soils, desert soils, lateritic soils, hilly soils, and forest soils. In general, the soils of Saurashtra (the area to the south-west of Ahmedabad) are medium in nitrogen and low in phosphorus content, while those of the rest of Gujarat are low in nitrogen and medium in phosphorous content.

Climatic conditions vary from arid, to semi-arid, to sub-humid. The extreme northern regions and the northern fringe and western parts of Saurashtra, are very dry, while the far south has a sub-humid climate. The rest of the state is semi-arid.

Gujarat receives rainfall from the south-west monsoon. As the state is at the edge of the main current of the south-west monsoon, rainfall distribution is extremely uneven and irregular. Low pressure depressions that develop over the Bay of Bengal during the monsoon season also bring rain to northern Gujarat.

Temperature varies considerably. The minimum average weekly temperature is about 12.5^{o}C in January and some areas occasionally experience frost. The maximum average weekly temperature is 39.9^{o}C, which is generally reached by about the second week of May. October also tends to have high temperatures. The wide variation in soil and climate has helped create conditions suitable for growing crops ranging from pearl millet to transplanted rice. There are eight agro-climatic zones. Part of South Gujarat (Zone 1) has heavy rainfall and is known for rice cultivation. Rice is followed by beans and pigeonpea in *rabi*. Finger millet, kodo millet, sugarcane, sapota, mango and banana are also important crops. Other parts grow rice, sorghum, cotton and vegetables during *kharif*, and wheat, sorghum, pigeonpea and black gram during *rabi*. Sugarcane is also popular.

In Central Gujarat (Zone III), which includes hilly terrain inhabited by tribal people, pearl millet, rice, sorghum, wheat, maize, kodo millet, finger millet, cotton, groundnut, rape-seed, mustard, sesame, pigeonpea, chickpea, wheat and vegetables are grown. Neighbouring North Gujarat also has a wide range of crops, including pearl millet, wheat, sorghum, castor, sesame, rape-seed, mustard, green gram, cumin, fennel, plantago and vegetables.

The Saurashtra region has widespread cultivation of groundnut and pearl millet, and some sorghum, wheat, castor, sesame, cotton, green gram, kidney bean and chickpea. The Bhal and coastal area grows durum wheat, cotton, sorghum and chickpea.

The area, production and average yield of major crops are presented in Table 9.1.

Table 9.1 Area, production and productivity of major crops in Gujarat, mean of 1990-93.

Crop	Area ('000 ha)	Production ('000 t)	Productivity (t ha^{-1})
Rice	568	770	1.36
Pearl millet	1192	1165	0.86
Sorghum	603	301	0.64
Wheat	579	1237	2.14
Maize	360	479	1.33
Finger millet	28	22	0.78
Kodo millet	8	6	0.71
Pigeonpea	402	311	0.77
Green gram	158	62	0.40
Chickpea	120	78	0.65
Black gram	126	66	0.53
Kidney bean	57	18	0.31
Groundnut	1842	1274	0.69
Rape-seed & mustard	408	442	1.08
Sesame	259	91	0.35
Cotton	1069	1497†	0.24
Sugarcane	122	1057‡	8.68
Tobacco	100	173	1.73
Potato	19	463	24.90
Cumin	106	43	4.04
Chilli	16	18	11.26
Onion	20	498	24.40
Garlic	17	87	4.99
Banana	17	959	55.99

† Production of cotton in '000 bales, each of 170 kg lint.
‡ Production of sugarcane in terms of Jagery (Gur).

Varietal Identification and Release System

Genetic improvement of crops in Gujarat dates back to 1936 when the first improved variety of cotton, 1027 ALF, was released. Historically cotton has had an important place in Gujarat, and the release of 1027 ALF followed the initiation of research at Surat in 1904 by the former Bombay State (which encompassed Gujarat and Maharashtra). Then in 1942 the state government enacted the Bombay Cotton Control Act to ensure the supply of quality cotton seed to farmers. The act bestowed powers of permission and prohibition over production and marked the beginning of the regulatory framework, and seed legislation, in the state.

Today, the Gujarat Agricultural University (GAU) is the body with principal responsibility for the genetic improvement of all crops grown in the state. The university submits proposals for the state release of varieties to the Gujarat State Seed Sub-Committee (SSSC), which has final authority for release within the state. AICCIP of the ICAR, international institutes, and one NGO have also contributed improved varieties *via* the central release system (Annex 4).

The Gujarat State Seed Sub-Committee

Varietal releases for the Gujarat state are made by the Gujarat State Seed Sub-Committee (GSSSC), and typically comprises:

- Secretary, Department of Agriculture, Government of Gujarat (GOG) - Chairman;
- Director of Agriculture, GOG;
- Director of Research, GAU;
- Managing Director, Gujarat state Seeds Corporation (GSSC);
- Director, Gujarat State Seed Certification Agency (GSSCA);

- Chief Executive, Gujarat State Co-operative Marketing Federation (GSCMF);
- Regional Manager, National Seeds Corporation (NSC), Ahmedabad;
- Assistant Director, Seed Testing Laboratory, Navsari;
- Representative of private seed sector;
- Two farmers' representatives;
- Joint Director (In charge Seed) or Deputy Director (Seed), GOG-Co-convenor, and
- A nominee of the Department of Agriculture & Co-operation, GOI-Co-convenor.

Proposals for release of varieties either bred by or recommended by GAU are submitted by the Director of Research in the prescribed form to the Co-convenor of the SSSC for presenting to the committee for consideration for release in Gujarat. The Committee has met on average once a year in the last ten years; there being two meetings in certain years (e.g., 1985, 1991) and none in others (e.g., 1993). Delays in constituting the GSSSC were the major factors causing long breaks between meetings.

The university, research stations and zonal testing

Gujarat Agricultural University has its main campus at Sardar Krushinagar in north Gujarat, and covers four administrative zones: Junagadh, Anand, Navsari and Dantiwada. Each zone has a Director of Campus who administers and co-ordinates all activities within the zone.

Overall planning, execution, co-ordination and supervision of research activities is done by the Director of Research, who is assisted by four Associate Directors of Research (one for each administrative zone), and research scientists with state-wide responsibility for a particular crop. GAU also has a Directorate of Extension Education.

The technical programme of each zone is laid down at the Zonal Research and Extension Advisory Committee (ZREAC) workshop, which is attended by representatives of the Department of Agriculture, GOG, the university, the public and co-operative sector, seed agencies, and farmers. The meeting is chaired by the Director of Campus. Programmes are crystallised at university level by the Plant Breeding and Genetics Research Sub-Committee and endorsed by the Joint Research Sub-Committee of all disciplines, chaired by the Vice-Chancellor. The Department of Agriculture is also represented on the Research Sub-Committees. The ZREAC and research sub-committees meet twice a year, enabling separate discussion of plans for the *kharif* and *rabi* seasons.

GAU has 61 research stations distributed across the eight agro-climatic zones (Table 9.2)**,** enabling it to identify promising genotypes suitable for the different conditions. This state-wide infrastructure is also used by the AICCIPs. Cropwise, research stations are assigned lead or verification and testing functions in accordance with the importance of the crop in the region.

Table 9.2 Zonal distribution of GAU research stations.

Agro-climatic zone	Regional/zonal research station	Main research station	Sub-research stations
South Gujarat (Heavy rainfall)	Navsari	Waghai	Gandevi, Paria, Danti-Ubharat, Vyara, Vanarasi
South Gujarat	Bharuch	Surat	Bardoli, Hansot, Acchalia, Tanchha
Middle Gujarat	Anand	Nawagam, Godhra, Khandha	Derol, Dabhoi, Dahod, Thasara, Vadodara (Baroda), Dharmaj, Devgadhbaria
North Gujarat	Sardar Krushinagar	Vijapur, Jagudan, Deesa	Talod, Sanand, Chharodi, Aseda, Khemdbrahma, Dehgam, Ladol
North-west area	Bhachau	Mundra	Viramgam, Kothara, Radhanpur, Khedoi, Halvad
North Saurashtra	Targhadia	Jamnagar, Dhari, Amreli	Nana Khandasar, Jamkhambhali, Okha, Halvad, Sikka
South Saurashtra	Junagadh	Mahuva	Mangrol, Ratia, Khapat, Kodinar, Manavadar
Bhal and Coastal area	Arnej	-	Vallabhipur, Dhandhuka
Total No. of stations	8	13	40

Development of improved varieties is largely restricted to the research station with the lead function for the crop. The new entry is tested in Preliminary Evaluation Trials (PET) for one year at the lead station. The promising entries are promoted to Large Scale Trials (LSTs) which are conducted for three years in all the agro-climatic zones where the crop is grown. These trials are conducted by the breeder in collaboration with the scientists from other departments of the university. Information is collected on the agro-morphological, chemical and technological traits of the genotype and its reaction to major pests.

Successful entries that survive three years in the LSTs can be proposed for release. The release proposal is discussed in the Plant Breeding and Genetics sub-committee followed by a Joint Meeting of all sub-committees of the Research Council of GAU which is chaired by the Vice-Chancellor and has representatives from the state department of agriculture. If approved, the proposal for release is submitted to the GSSSC. The release recommendation is sent to the Central Sub-Committee for notification of the variety. Pre-release testing on university and State Department of Agriculture farms is sometimes carried out for one year before submitting the release proposal to the university level Meeting of the Joint Research Sub-Committee.

Before release, cultivars are assessed for acceptability by getting the views of farmers and consumers on visits to research stations, and in the course of the trials conducted on farmers' fields.

The stamp of release

A cultivar is recommended for release if it is superior to existing varieties or hybrids for one or more traits which could either benefit the farming community or industry. However, higher yield is the primary consideration. Most varieties that eventually get released are developed by breeders but this is not necessarily the case. For example, a local cotton variety called Khapatio became very popular in the Ghed region of South Saurashtra and was released as G. Cot 12 in 1981.

Varieties released by other states, or centrally, have to pass through the same requirements as unreleased material. The justification for this is that their performance has not been assessed in the agro-climatic zone(s) for which recommendation is sought. The JL 24 groundnut variety of Maharashtra was released for cultivation in Gujarat after testing. Similarly, the rice varieties Jaya and IR66 developed by IRRI were released after testing. However, some varieties—such as the pearl millet cultivars MH 179, MH 169 and ICTP 8203, and the maize hybrid Ganga Safed 2—have been released by the CSC and grown in Gujarat without having been formally released. These varieties are grown by farmers without the benefit of Gujarat state intervention.

A bushy chickpea variety from Madhya Pradesh which has become very popular among farmers in the Ghed area of South Saurashtra, and is known as Kantala, is still awaiting release. Whenever there is a scarcity of seeds of this variety, the Department of Agriculture (GOG) arranges for seed procurement from Madhya Pradesh.

NGOs are free to undertake crop improvement activities, but cultivars evolved by them must go through the GAU trial procedure. The only example of NGO success is the wheat variety Lok 1, which was evolved by the NGO *Lok Bharati*. Multilocational testing was done in collaboration with GAU, and Lok 1 was released in 1982 and went on to become a popular national variety.

Popularisation of New Varieties

Gujarat farmers tend to be enterprising and receptive, which makes popularisation of new varieties relatively easy. Nevertheless there are several less developed parts of the state where there is a lower adoption of the latest technology. The state popularises varieties through various channels:

- The Department of Agriculture arranges minikit trials on farmers' fields. Large numbers of farmers were exposed to new varieties and in 1993-94 the pearl millet and maize targets were reached (Table 9.3).
- GAU, with the co-operation of the Department of Agriculture, GOG, conduct trials at farmers' fields. From 1990 to 1994 such trials for rice, wheat, maize, groundnut, mustard, sunflower and chickpea were run in six districts. Fewer trials took place than under the minikit programme, but the information gathered was more substantial, except on farmers' opinion about the quality of the produce.
- Pre-seasonal and monthly training and visit programmes.
- KVKs and the voluntary organisations-Sardar Smruti Kendra (SSK) and the Tribal Upliftment Project (TUP), run demonstrations and training programmes for technology dissemination. Information gathered from demonstrations shows that they help expose farmers to the potential of new varieties (Tables 9.4 and 9.5). But feedback regarding the quality of produce remains to be gathered. Only a fairly restricted choice of cultivars is offered, and many of them are very old.
- Open-days for farmers arranged on research stations.
- Farmers' *shibirs* (camps) organised by NGOs in collaboration with the Department of Agriculture and GAU.
- Popular agricultural journals, radio and television.

Table 9.3 Minikit trials conducted on farmers' fields by the Department of Agriculture, GOG†

Year	Crop	Target no of trials	No. of trials conducted
1991-92	Rice	12,000	9,980
	Pearl millet (*kharif*)	25,000	21,337
	Pearl millet (summer)	40,000	39,861
	Maize	15,000	13,851
1993-94	Rice	7,250	4,000
	Pearl millet (*kharif*)	58,000	55,128
	Pearl millet (summer)	11,000	11,000
	Maize	5,000	5,000

† Source: Department of Agriculture, GOG.

Table 9.4 Demonstrations organised by various GAU centres†

						Average yield (t ha^{-1})	
Centre‡	Crop	Variety	Year of release	No. of farmers	Area (ha)	Demo.	Local check
Kharif 1991-92							
KVK Deesa	Castor	GCH 4	1987	39	15	3.0	2.5
Rabi 1991-92							
KVK Deesa	Mustard§	Guj 1	1989	50	20	1.8	1.4
NDP SKNagar				50	20	1.8	1.7
KVK Devataj				165	40	1.6	1.2
SSK Junagadh				20	20	1.6	1.4
TUP Khedbrahma				120	30	1.3	1.0
KVK Devataj	Safflower§	Bhima	1983	26	15	1.6	1.2
				20	5	0.9	0.8
SSK Anand				14	10	2.3	1.5
KVK Deesa	Chickpea§	ICCC 4	1983	25	10	1.3	0.9
NDP SKNagar¶		Chaffa	1940	25	10	1.2	1.0
KVK Devataj		ICCC 4	1985	40	10	1.1	0.9
KVK Devgadhbaria		Pusa 256	1985	29	9	2.0	0.6
		Dahod Yellow	1960	34	7	1.5	0.6
SSK Junagadh		Dahod Yellow	1960	10	10	1.2	1.0
Summer 1992							
KVK Devataj¶	Groundnut	GG 2	1984	50	10	1.8	1.2
SSK Anand		GG 2 & J 11	1964	25	05	1.1	0.8
NDP SKNagar		GG 2	1984	13	05	1.3	1.2
KVK Deesa	Green gram	K 851	1982	38	10	0.8	0.7
TUP Khedbrahma		K 851	1982	50	10	0.9	0.8

† Source: Directorate of Extension Education, GAU.
‡ See list of abbreviations for centres.
§ Irrigated
¶ Rainfed

Table 9.5 Demonstrations organised by GAU under Lab to Land programme†.

Centre	Crop	Variety	No.of participating families	Area (ha)	Average yield (t ha^{-1}) Inside demos	Average yield (t ha^{-1}) Outside demos
Summer 1991						
KVK Deesa	Pearl millet	GHB 32	34	13.60	2.3	2.0
	Green gram	K 851	1	0.40	0.6	0.4
***Rabi* 1991-92**						
KVK Deesa	Mustard	Guj 1	17	4.72	1.6	1.2.
	Wheat	GW 496	14	2.80	3.7	3.0
		Kalyan Sona	6	1.20	3.4	3.0

† Source: Directorate of Extension Education, GAU.

Varieties released by private companies are popularised through field demonstrations, advertisements and media features, and by dealers and sub-dealers through their personal contacts.

Despite the well-organised infrastructure for popularisation it takes a minimum of four to six years for a new variety to reach farmers for commercial production. For example, certified seed of wheat varieties GW 496 and GW 503 released in 1989 was produced in large quantity during 1992-93, making it available, eventually, for large-scale commercial cultivation in 1993.

Seed Production, Certification and Dissemination

Agro-climatic conditions and the enterprising nature of farmers have played a pivotal role in making Gujarat one of India's leading seed producing states. Farmers are well experienced in production techniques, and the state has a surplus of seeds of pearl millet, castor, cotton hybrids, rape-seed, mustard and sesame, and is self-sufficient for rice and wheat seed. However, sorghum, maize, chickpea and groundnut production is far below that required, and seed has to be brought in from other states.

For sorghum hybrid seed production, non-synchronisation of flowering of male and female parents is the main problem under Gujarat conditions. Also, released sorghum hybrids do not meet the grain quality requirement of consumers and farmers. Consequently, farmers grow non-released varieties from non-certified seed.

The major factor limiting maize seed production is the non-availability of white grain varieties/hybrids maturing within 90 days under zero-management. These are the varieties best suited to the needs of tribal people in hilly areas of north Gujarat and Middle Gujarat. In 1987 Gujarat Makai 1, an early type white grain, was released but it has yet to become popular.

For groundnut, a high seed rate together with a low seed to seed ratio stand in the way of achieving the necessary seed replacement rates.

Patel (1988) attempted to estimate the requirement of breeder, foundation and certified seed for the major crops of Gujarat for 1994-5 and 2000-01. These are based on projected crop area, seed rate, multiplication ratio and seed renewal period. Attributes like market survey and climatic fluctuations have not been taken into consideration. A slight increase in total seed requirement is forecast for 2000-01 due to an increase in irrigation facilities resulting from the Narmada Dam Project.

Seed producers

The main seed producers in the public and co-operative sectors are the GSSC, GAU, GSCMF, NSC, the Gujarat State Co-operative Grain Growers Federation and the Gujarat State Co-operative Oilseeds Growers Federation (GROFED). Data on the private sector complied by the GSSCA show that there were 378 seed producers and 45,537 growers registered for seed certification in 1992-93.

GSSCA was established as a separate wing of the Department of Agriculture for seed certification in 1969, and was given autonomous status in 1980. Its governing board, constituted by the state government, comprises:

- Secretary, Department of Agriculture, GOG - Chairman;
- A representative of the Department of Agriculture (GOG);
- Managing Director, GSSC;
- A representative of the Finance Department, GOG;
- Director of Research, GAU;
- Two senior research scientists (crop), GAU;
- Three representatives of seed growers;
- A representative of the farming community;
- A representative of the Central Seed Certification Board, and
- Director, GSSCA.

The Agency has its headquarters in Ahmedabad and has 16 sub-offices. In 1992-93 it had 406 positions, of which 261 were filled. There are three Seed Testing Laboratories—at Gandhinagar, Navsari and Junagadh—designated under the Seed Act 1966 and under the administrative control of the Department of Agriculture, GOG. The number of samples tested by these laboratories varies greatly. In 1990-91 it was 77,338, in 1991-92 it was only 13,008 and in 1992-93 it was 44,787.

Seed certification

Data for the area under certified seed production and the quantity of seed grown for the 13 years 1980-92 show gradual progress up to 1984 (Fig. 9.1). There was a sharp decline in 1985 due to drought, and there was increase in area or production until when 1988 the area under seed production again increased. Over the period, the quantity of certified seed produced in Gujarat increased by 78%, whereas the area under certified seed production increased by 99%.

Details of the percentage contribution of each group of crops to the total certified area and to the quantity of seed certified in 1992-93 indicates that cereals made the greatest contribution, followed by oilseeds, pulses and fibre crops (Fig. 9.2).

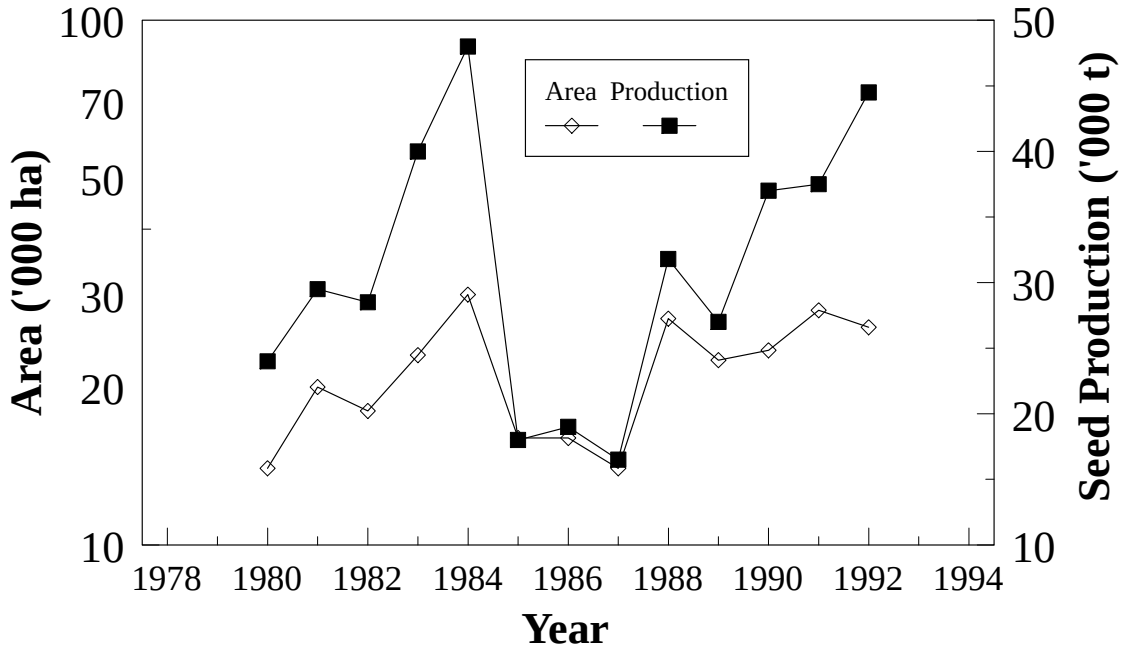

Fig. 9.1 **The area certified and the certified seed produced in Gujarat from 1980 - 1992 (source: Gujarat State Seed Certification Agency, Ahmedabad).**

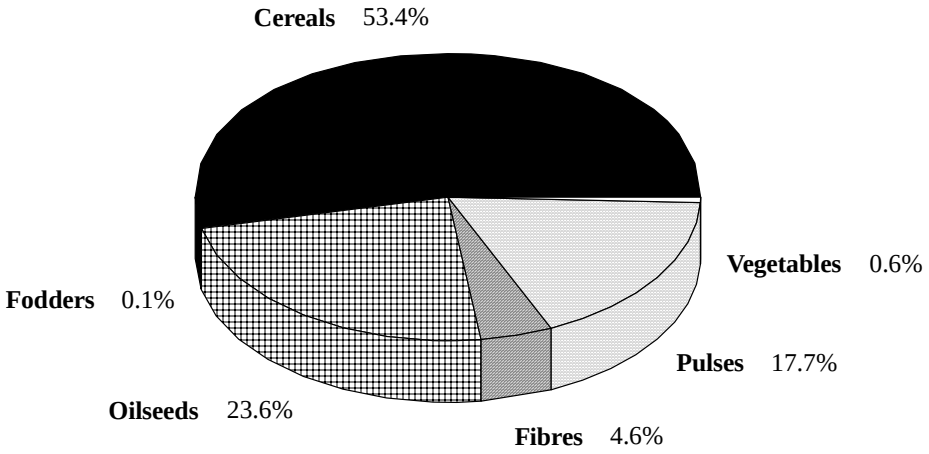

Fig. 9.2 **Percentage contribution of various groups of crops to the total area grown for certified seed production in Gujarat state during 1992-93 (source: Gujarat State Seed Certification Agency, Ahmedabad).**

Breeder seed

Production and distribution of breeder seed lies with the GAU. Whenever there is scarcity of breeder seed of groundnut the GSCCA certifies seed produced by GROFED, State Seed Farms, GSSC and GSCMF from Certified Stage 1 to Certified Stage 2, if recommended to do so by the Department of Agriculture (GOG). An examination of statistics on breeder seed production shows that seed production; for example:

- During 1992-93, 24 t of breeder seed of 16 rice varieties was produced. GR 11, Mahsuri, Jaya, GR 3 and GR 4 were the most popular varieties. However, they are old varieties, and were released 8 to 23 years ago, the youngest being GR 4 (released in 1984) and the oldest being Jaya (released in 1969).
- About 60 t of breeder seed of wheat was produced: Lok 1, GW 496 and Sonalika were the varieties most in demand. Of these, only GW 496 was a recent release of two years. Lok 1 was released in 1981 and Sonalika in 1969.
- Despite the large area devoted to sorghum growing, only 1.4 t breeder seed of the various varieties/parents of hybrids was produced.
- Among groundnut varieties JL 24, GG 2 and GG 11 appear to be the most popular. All these varieties were 7 to 8 years old. The new varieties ICGS 44, Girnar 1 and Somnath released in 1987 and 1988 have yet to make a mark.

Foundation seed

Data for 1990, 1991, and 1992 show that more than 50% of foundation seed was produced by organisations other than the public and co-operative sector—mainly by private companies. GSSC's

share ranged between 26-32% and the co-operative sector's (GSCMF and GROFED) share ranged between 7-10%. The contribution of NSC by 1992-93 was insignificant.

Certified seed

Certified seed production is dominated by the private Sector. Between 1990-93 their total has ranged from 72% in 1990-91 to 59% in 1992-93. The GSSC was the next largest producer (a low of 17% in 1990-91 and a high of 20% in 1992-93) followed by the co-operative sector (8% to 14%).

Seed distribution

In the early years of regulation the only reliable sources for farmers to buy improved, genuine seed were the *taluka* seed multiplication farms (State Farms) and the farms of the Institute of Agriculture, Anand (now the Anand Campus of GAU). On the introduction of the high yielding variety programme and the commercial development of hybrid pearl millet, the production, marketing and distribution of hybrid pearl millet seed was entrusted to the Gujarat State Co-operative Marketing Federation. This arrangement continued until 1975 when GSSC came into existence. Since then, private and co-operative activity has grown and there are now about 380 organisations involved in seed production and marketing in Gujarat.

GSCMF and the Gujarat State Co-operative Oilseeds Grower's Federation have well-organised networks of sale points through district, *taluka* and village level co-operatives, and their own sale points. Private sector concerns sell through their dealers and sub-dealers. The state government has made adequate provisions for quality control in the seed trade by providing Agricultural Inspectors and Quality Control Inspectors, and by establishing a "Quality Control Cell" at headquarters. The quality control personnel collect samples, deal with complaints, and take legal action against those they suspect of malpractice.

Sales figures are not available, but from seed production data for 1992-93 sales for that year were estimated at 41,900 t. This estimate does not take into account:

- the sale of uncertified seed produced by State Farms, GAU and the private sector;
- the quantity of seed sold under Truthful Labels by seed producing agencies;
- the inter-state movement of seed, and
- the seed which has changed hands among farmers.

There is a need to evolve a system to monitor seed movement and utilisation to help plan seed production programmes.

Demand for seed is an indicator of the popularity of a variety/hybrid, and demand is ultimately reflected in the seed production programme. But demand itself is to a large extent dependent on farmers getting information about new varieties. As there are weaknesses in the popularisation system, demand figures must be used with caution in planning seed production.

Seed production figures indicate that for pigeonpea, sorghum, maize and chickpea old varieties still predominate and there is a need to replace them with improved cultivars (Table 9.6), e.g., GR 11 rice, which contributed 45% of the certified seed production in 1992-93, was released in 1977 and Dahod Yellow chickpea, released in 1960 accounted for 32% of the seed production (Table 9.6).

Table 9.6 Certified seed production (as per cent of total seed produced for all varieties of a crop) of varieties of eleven crops, 1992-93.

Crop	Variety	Year of release	%	Variety	Year of release	%	Variety	Year of release	%
Rice	GR 11	1977	45	Jaya	1968	22	GR 4	1981	15
Wheat	Lok 1	1981	50	HD 2189	1979	23	Kalyan Sona	1967	11

Pearl Millet	MH 179	1986	30	MH 169	1987	20	ICTP 8203	1988	36
Maize	Guj Makai 1	1987	35	Ganga Safed 2	1963	53			
Groundnut	GG 2	1984	44	GG 11	1985	31			
Castor	Hybrid GCH 4	1987	76						
Mustard	Varuna	1973	69	G.M-1	1989	19			
Sesamum	Gujarat Til 1	1979	100						
Chickpea	ICCC 4	1983	63	Dahod Yellow	1960	32			
Pigeonpea	BDN 2	1978	33						
Cotton	G.Cot. Hy.6	1980	76						

Seed certification data for 1992 show that several improved varieties that had been released for Gujarat in eighties had not entered into the seed production system. Examples of such varieties are given in Table 9.7.

Table 9.7 Examples of varieties released in eighties that had not entered into the seed production by 1992.

	Varieties and their year of release					
Crop	**Variety**	**Year**	**Variety**	**Year**	**Variety**	**Release**
Rice	Govind	1982	CR-138-928	1982	CSR 10	1989
Wheat	Raj 2184	1985	GW 405	1985	Sujata	1983
Maize	Sartaj	1988	Surya	1988	Pusa 2	1988
Pearl Millet	MBH 130	1987	ICMH 423	1987	GHB 187	1989
Groundnut	Girnar 1	1988	Somnath	1981		
Mustard	Kranti	1982				
Pigeonpea	Maruti	1986	Pusa-33	1987		
Chickpea	Pusa 244	1985	Pusa 417	1985		

Most of these varieties were released by Central Sub-Committee. These examples raise some basic questions as to why many released varieties/hybrids have not been adopted by farmers:

- Do the varieties fail to meet farmers'/consumers' requirements?
- Are farmers unaware of these varieties?
- Are these varieties unsuitable for some parts of Gujarat?
- Do the identification and release procedures need revising?

It is perhaps not surprising that many of them are Central Sub-Committee releases, as they will only gain official support in Gujarat if they are further tested for at least three years in Large Scale Trials and released by the SSSC.

Conclusions

Identification and release system

- The views of farmers and consumers are not sought until the final stage of testing or the pre-release stage trials on farmers' fields. Thus, the system puts the people for whom the cultivars are developed at the end of the process. If a participatory approach were to be followed, the genotype would be exposed to farmers early on, which would not only ensure acceptability of the product but would also help minimise research wastage. The quantitative information so gathered should be included in the release proposal.
- Currently breeders do not conduct pre-release trials on farmers' fields, which, if carried out in collaboration with extension agencies and NGOs, will help evaluation of cultivar preference and minimise the period of its popularisation from release. It can also help in collecting post-harvest

quality traits such as taste, cooking quality, *chapati* making quality which are difficult to assess in the laboratory. Data from on-farm trials should have the same creditability as that of research station trials in a release proposal.

- There have been long gaps between meetings of the Gujarat SSSC, probably due to the reconstitution of the committee. This holds up the release of new varieties.
- The Central Sub-Committee releases a variety nationally, or for more than one state, on the basis of coordinated trials conducted under the aegis of the All India Coordinated Crop Improvement Projects (AICCIPs). Such trials are usually restricted to one or two centres in a state, but recommendation is made for the entire state, ignoring the state agro-climatic zones. This needs rethinking. It would be desirable to develop a mechanism for linking AICCIP trials with state trials to assess promising national entries in all agro-climatic zones. This would help reduce the list of "unused" released varieties.
- Testing and release for national varieties is required but farmers enthusiastically adopt varieties that have not been released. It would be a simpler and easier strategy to always test:
  - national cultivars with farmers, and
  - other varieties released only at state level.

Popularisation with farmers

Despite the state's well-organised structure for popularising new varieties, it takes four to six years for a new variety to reach farmers' fields. To minimise this time, the authorities should consider encouraging the active involvement of NGOs in popularisation and involvement of farmers at various stages of varietal testing.

A system of about 380 organisations in seed production and marketing is the greatest strength of seed distribution in Gujarat. Several public, co-operative and private agencies are active in seed related activities. Availability of seed of a variety determines its adoption as shown by unreleased cultivars that become popular.

Seed production, certification and dissemination

- The delay between the release of a variety/hybrid to the commercial availability of its seed needs to be reduced. This could be helped by advance planning for replacement of varieties, enabling a simultaneous strategy for multiplication and demonstration programmes, inclusive of sales promotion.
- There is a need to establish a system for scientific demand forecast to help plan seed production strategy.
- There is considerable scope for increasing breeder seed production of sorghum, maize, groundnut, pigeonpea and chickpea. GAU needs to do more, and attempt to meet the entire breeder seed requirement. GSSC should utilise its resources for foundation and certified seed production.
- Seed testing and inspection has peak seasons. There is an acute shortage of technical staff at busy times of year, and employment of casual labour does not help because experience and reliability are essential. It is very difficult for an inspector to supervise the post-harvest operation, given the number of producers in different locations that have to be visited at around the same time. This gives scope for malpractices during threshing and transport, such as the mixing of grain from a rejected seed plot with grain from a certified seed plot.
- The registration of varieties evolved by all organisations engaged in research and development should be made compulsory to make available the supply of genuine and genetically pure seed.
- At present there is no requirement to deposit a specific quantity of seed with the National Gene Bank when a variety is released. There is a strong case for all varieties to be held by the national repository as insurance against an emergency or a dispute.