CHAPTER III.

COTTON ECONOMY AND THE COTTON STAPLE OF SOUTH GUJARAT.

Gujarat forms the most renowned centre for cotton growing.\(^1\) Gujarati is traditionally divided into North and South. As the economy of Gujarat mostly rests on cotton, the divisions of Gujarat closely conform to the Zones Growing distinct varieties of cotton.

Cotton Tracts of Gujrati:

The North Gujarat covers an area to the north of the river Sabarmati and comprises the districts of Ahmedabad and Mehsana. This tract used to grow two cotton varieties i.e. 'Lalia' and "Wagad". Now, an improved variety, "Kalyan" is introduced here, since 1948 which covers about 5½ lakh acres. The Middle Gujarat lies between the river Sabarmati and the Narmada. This tract is the original home of 'Broach Deshi' Cotton, which was so much reputed for its quality and was recognised as the basis of the Broach Cotton Contract, at the beginning of this century. During and after the First World War, it began to be grown mixed with the very inferior, coarse and highly susceptible 'Goghar1' variety, and therefore lost the reputation in trade. The selective breeding was commenced in 1913, and to-day the most lucrative variety grown here, is "Vijay", which is now replaced by 'Dig Vijay' from 1955-56 crop season.

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1. It is known for its cotton cultivation, almost from the beginning of the Indian cotton trade. Since, times past, Gujarat has become the home of two of the best known commercial varieties of Indian Cotton viz. the 'Broach Deshi' and the 'Dhollera'.
SOUTH GUJARAT COTTON TRACT:

Area:

The South Gujarat is a coastal plain lying between the river Narmada and Damanganga, in the south; but cotton production does not extend beyond the river Par of the Surat District. The South Gujarat region is the entire Surat District and Seven talukas of Broach District comprising an area of 5785.7 square miles, and consisting of 2815 villages and 18 towns. The Surat District has 18 talukas, of which Dharampore and Pardi are non-cotton areas, whereas, Bulsar, Songadh, Vasda and Gandevi have very small acreage under cotton. The seven talukas of the Broach District included in the South Gujarat are Ankleswar, Dediapada, Hansot, Zagadia, Nandod, Sagbara and Valia. Of these, Dediapada and Sagbara have negligible acreage under cotton. South Gujarat, normally, has 6 lakh acres under cotton (now including Indian State Territories) and produces about 2.25 lakh bales of cotton. (of 400 lbs. each).

Physical Setting: Geology, Relief, and Drainage:

Geologically, the basal complex of the region consists of igneous rocks, upon which rests a metamorphic series. The Gujarat plains are of recent origin; alluvial but with the traces of the Deccan trap. The Narmada and Tapti rifts have a tilt towards the Arabian sea. The Tapti and Narmada Valleys flow through what are considered as rifts. The Tapti Valley, bears a much dissected appearance due to intense erosion in a alluvial region. The Narmada has a well-marked Valley with a broad floor and steep sides. These rivers have built up the alluvium of South Gujarat. From the viewpoint of minerals South Gujarat tract is not important.

Soil:

The South Gujarat soil is typically suited to the cultivation of a high grade cotton. Soil is formed of alluvium brought by the Tappti and Narmada, and is black in colour, varying in depth from 3 to 5 feet. Owing to this depth of the soil and also due to its clay and colloidal content, it expands on wetting and contracts and cracks deep and wide on drying. The cracking of the soil is considered to be a great advantage as it leads to the surface soil being mixed with the subsoil either during the process of cultivation or during the first rains. The flow of water into the cracks, carrying with it a large amount of surface soil, leads to the absorption by the soil of a very large amount of initial rains, even up to 7 or 8 inches, in one continuous fall without wash or erosion. But water enters and drains so slowly from this soil, that once the cracks are filled up by the enormous amount of water at the first monsoon, the soil is saturated and the water drains away very slowly. It can absorb further stock of water only with difficulty.

The surface soil is 8 inches deep, and the subsoil represents the next 8 inches layer. The chemical Analysis of the soil at Surat is as under;

<table>
<thead>
<tr>
<th></th>
<th>Surface Soil</th>
<th>Sub Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>26.0 %</td>
<td>23.3 %</td>
</tr>
<tr>
<td>Fine Sand</td>
<td>33.0 %</td>
<td>31.0 %</td>
</tr>
<tr>
<td>Coarse Silt</td>
<td>17.3 %</td>
<td>20.0 %</td>
</tr>
<tr>
<td>Medium Silt</td>
<td>12.6 %</td>
<td>13.9 %</td>
</tr>
<tr>
<td>Fine Silt</td>
<td>6.6 %</td>
<td>6.3 %</td>
</tr>
<tr>
<td>Clay</td>
<td>3.6 %</td>
<td>4.6 %</td>
</tr>
</tbody>
</table>

1. Vide: Imperial Gazetteer Vol. III
This soil, being derived from the Deccan trap, has all the features of the Black Cotton soil with additional advantages due to its power of expansion and contraction on wetting and drying respectively. Even the limited amount of rain fall is enough to give the necessary moisture to the sub soil. This soil is highly retentive of moisture. From June to September, and even up to the middle of October the soil receives from time to time, large quantities of rain water, which is generally more than sufficient to wet the soil thoroughly and to replenish the loss that occurs at intervals between rains.

The Ideal Soil for Cotton:

Describing the ideal soil for cotton, paint Collings says... An ideal soil for Cotton is one which is well drained, and which contains about equal proportions of sand, silt, and clay together with a considerable amount of Organic Matter. While it should be well-drained it also should be a store house for moisture... Further, he states that, very few soils are ideal for cotton production, either they are too dry or too wet, too poor or too rich for maximum production. In this context, the soil of South Gujarat, owing to their great depth, fine texture, homogeneity, retentive capacity and other properties making it absorbent of large quantity of water during the rainy season, and retaining the same for several months without much loss, is most suitable for the deep-rooted crop like cotton which entirely depends upon the supply of rain water in this tract.

Suitable Climatology for Cotton: Rainfall:

Similar to the typical characteristic soil of South Gujarat, the climate is likewise, quite characteristic of suitability to the cultivation of cotton. The total rain, being greater than in most of the Indian Cotton growing areas, is entirely concentrated to the months from June to October. No rain usually appears onwards to the following June. The annual rainfall of the tract varies from 30" in the North to 50" in the South. July is the heaviest rainfall month, recording on an average about 40% of the season’s total rainfall. The South Gujarat has an average rainfall of 43.16" spread over 65 days in the year. The precipitation is mostly in July, August and September. It is difficult to establish a close correlation between the total rainfall and the average yield of the cotton crop, in the region. The relation if any, is very indirect. But the cotton crop of this tract, is entirely rainfed and from this point of view, the following Table may prove to be interesting.

TABLE No. 2

SURTI COTTON TRACT.

The total annual rainfall, acreage under cotton, total yield, and the yield per acre.

(Prepared from the Bombay Cotton Annuals No: 33, 34, 35,)

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Rainfall in inches, recorded at Surat.</th>
<th>Acreage under Cotton in 000s</th>
<th>Yield in 000s, of Bales of 392 lbs.</th>
<th>Yield per acre in lbs. of lint.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947-48</td>
<td>37.05</td>
<td>373</td>
<td>38</td>
<td>87</td>
</tr>
<tr>
<td>1948-49</td>
<td>18.68</td>
<td>384</td>
<td>54</td>
<td>55</td>
</tr>
<tr>
<td>1949-50</td>
<td>45.17</td>
<td>265</td>
<td>73</td>
<td>108</td>
</tr>
</tbody>
</table>

The above table shows very broadly that, whenever the rainfall has declined, the yield also has declined. Particularly in the 1949-50, the total acreage under cotton is less than the previous year, but the yields have shown an increase, in correspondence with plentiful rains.

In the season 1951-52, although the acreage rose by 20% over the previous year's figure, the yield declined by as much as 43.2% respectively. This can prove that, the rainfall as a climatic factor is not less important for cotton crop in this region. Much depends upon the nature and the distribution of rainfall throughout the season. Although, the average annual rainfall is 40 inches, it varies widely from year to year as seen from the table. Similarly, there is the extreme variability in the monthly rainfall. Yet the tract is practically free from a complete failure of the crop, as the rains necessary to wet the soil to the depth of 3 to 5 feet are usually precipitated in the month of July, and early August. This is ordinarily sufficient to ensure a normal crop.

The successful Production of Cotton is largely controlled by the group of factors, which go to make up climate much as, the amount and distribution of rainfall, sunshine, air temperature, humidity and wind velocity. Their effect on the cotton plant is
so great that, even the quality of the figure of the same variety of cotton is changing when grown in different areas with varying combinations of the above factors. 2 Cotton and Sunshine go together for cotton is a sunliving plant. When the plant is young short periods of sunshine alternating with short periods of rainfall bring about an ideal conditions of growth. When the plant is in full bloom, plenty of sunshine is essential. That has an effect upon the lustre of lint. 3 Surti Cotton has a silky feel which is largely due to the climatology obtaining in South Gujarat tract. With the concentrated rains in the month of July and mid-August - (a period of slow growth for the cotton plant in the region) the period covering September, October, and November, provide a mixed climate, with blast of rains, and sunshine. This is the period of active growth; and flowering commences with mid November when the spells of cloudy weather alternating with sunshine appear. 4

Air Temperature:

In addition to rainfall air temperature is no less an important factor because it governs the variations in humidity, the wind velocity and other atmospheric phenomenon affecting the cotton Plant. Cotton is a torpical plant, accustomed to warmth, particularly during the most rapid stages of growth. 1 For two months, after sowing in June both the maximum and minimum

2. Collings: Production of Cotton: Page. 3.

3. and not on the growth of the plant as recent researchers have shown. Brown: Cotton: Page. 113.

4. See Table Next. **

i. Collings: op. cit. Page. 3.

ii. Normal sowing period for South Gujarat Cotton, is June to July; the normal picking period is December to March, Normal Marketing period is March to July - Bombay Cotton Annual 1953-54, No. 35 Page. 30.
temperatures do not vary to a marked extent, maximum being 87°F to 88°F and minimum being 76°F to 78°F. During this time, which is a period of concentrated rains, the growth of the cotton crop is very slow. After the September, the maximum temperature steadily rises and reaches the highest mean maximum at 93°F. Whereas, during the whole of the crop season, the minimum temperature gradually declines. The Cotton Plant, now shows a rapid growth, particularly during October. Then follows the period in which both the maximum and minimum temperatures descend together, until they reach in January, a level, not exceeding the mean of 86.5°F and 57°F respectively. This is the period of flowering and the boll development. After March, when the harvesting begins, both the maximum and minimum temperatures rise until the highest is recorded in April and June. Below are shown the stages of growth of the South Gujarat Cotton Plant.

iii. Personal enquiry at the Agricultural Research Centre, Athwa, Surat.

iv. Slow growth in the early growing season is a factor determining the quality.

(Statement No. 3 is on the Next Page.)
TABLE NO. 3.

The stages of growth of South Gujarat Cotton Plant; (difference between the maximum and minimum temperatures and the monthly rainfall as the average of 54 years from 1878 to 1931)\(^1\)

<table>
<thead>
<tr>
<th>Crop Phase</th>
<th>Sowing</th>
<th>Slow Growth</th>
<th>Active growth</th>
<th>Flowering</th>
<th>Boll Development</th>
<th>Harvesting</th>
<th>Preliminary tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>8.5</td>
<td>16.2</td>
<td>7.1</td>
<td>5.5</td>
<td>1.9</td>
<td>0.3</td>
<td>0.07</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Humidity:

The quantity and frequency of rainfall determine to some extent the degree of humidity, which is also an important factor affecting the quality of cotton. Humidity in South Gujarat tract, is very high during the rainy season i.e. from July to September, a period of slow growth and falls at a rapid rate during October and November - i.e. a period of rapid growth. It remains constantly low, till April, when the flowering and the boll development takes place. It again rises in May. However the vapour tension in the early part of crop season, helps the vegetative growth of the plant, while its decline in October and November and further onward promotes the blooming of the cotton plant. Humidity is higher in South Gujarat, than in the Middle and North Gujarat. Humidity is greater at Navsari than at Surat. This is believed to be one of the factors, contributing to the better quality of cotton from Navsari centre, although the same variety is sown all over the South Gujarat tract.1

Apart from its effect on the quality of the cotton fibre, a high degree of humidity, often encourages fungous diseases.2 Particularly in the region to the North of the river Tapti, there was a problem of wilt disease,3 which used to take a heavy toll of the cotton crop. As a result of the coordinated research work, done at Shera, near Ankleswar, and at Surat, a new variety of Surti Cotton, known as '2087' was developed and is now covering the total cotton acreage in this tract. This variety is a highly wilt resistant, and now, the damage to the crop by disease, has become a thing of the past.

3. caused by the 'fungus': Fusarium Vas, infactum.
Wind Velocity:

This is an important factor in climatology for cotton, in so far as it affects the flowering and boll development. Owing to the powerful winds, the shedding of the cotton bolls may occur, and to that extent crop output suffers.¹

In South Gujarat, winds blow heavily prior to sowing and continue to do so in June and July. The velocity is low in August and September and remains more or less constant from October to March, when it again begins to rise at a sharp rate. Thus, the fast blowing of wind during the early period of growth, is said to affect adversely the seedlings, but is considered an advantage in a way because it dries up the surface soil pretty fast during the intervals of rains and make the fields accessible for weeding and interculturing operations.²

From the above, description of the Climate of South Gujarat, it will become evident, that this tract, is well situated and favoured to grow a quality cotton. Merely, genetic factors of a cotton variety do not ensure the expected results about the quality of the cotton fibre. The climatology does play an important part in making this tract reputed for its cotton, so coveted by the Indian Textile Mills.

COTTON CULTURE:

The cultural practices, employed in the production of cotton, also exert a good deal of influence upon the size and grade of the fibre.¹ However, shedding has greater correlation with the excesses of rainfall and droughts. The excess of water in the soil, if not well drained, leads to shedding. Similarly, scanty water supply and dry weather may cause shedding, Brown: Cotton, P. 125.

² Personal enquiries.
of crop. The standard of Cotton Culture for the cotton grower is decided by his knowledge about the soil, the time for ploughing, sowing, the selection of seed and proper rotation, and the necessary intercultural practices. Although there are no definite studies undertaken in this direction, the average cotton grower in South Gujarat is more advanced in respect of his standard of the cotton culture, than his counterpart elsewhere in India. He knows how to preserve the quality of the crop. During this investigation, it was found that the cultivators were confident for their cultural operations. Might be due to the progressive outlook of Cotton Traders in this tract, or to the remarkable growth of the Cotton Cooperative societies or to the location of Bombay State Cotton Research Farms in this tract, the cotton growers appeared to be well informed of the recent cultural practices, advocated by the Agricultural Department.

Rotation of Crop:

The Cotton Crop, in this tract, is grown in rotation with Jowar, Wheat, Tur, and Rice. To the north of Surat, the rotation is with Jowar and Wheat, grown either singly or with a sprinkling of Tur or other pulses. Wheat is favoured in Olpad taluka particularly in cold season. It is a belief of the cotton growers, that sowing cotton, after wheat, gives a good outturn. However, the selection of crop for rotation depends upon the prospects of the price for crop in the next season.

Preparatory Tillage - Harrowing - Manuring:

Harrowing\(^1\) is done once or twice in April and May as a precondition, i.e. loosening the surface of the soil and destroying weeds, by a blade harrow.
preparatory tillage before rains. In the area, around Navsari three to four harrowings are done with a blade harrow. Farm yard manure is applied according to its availability in the cotton year. The local practice is to apply about 2½ tons to 5 tons or 5 to 10 cartloads of cattle manure per acre once every five years. But it depends upon the financial capacity of the farmer. These days, some cotton growers have begun using chemical fertilizers. The manure is carted to the field and dumped in heaps at convenient distances, and is then broadcast as evenly as possible.

**Sowing and Spacing:**

Sowing of seed is generally done in the last week of June or early in July, when sufficient rain to form a good seed bed, has fallen. Sowing is done either by dibbling or drilling. Dibbling i.e. Sowing by hand is particularly used when the soils are too wet for using bullock power. The seed rate is about 6 to 10 lbs. per acre; Usually 7 lbs. is the average. It depends upon the spacing. The spacing varies from 3' X 2' to 5' X 3'. The spacing has the effect on the yield of crop. Too close a spacing leads to shortage of soil food for the plants, whereas too wide a spacing may mean waste of soil food. In both the cases the yield is likely to be less than optimum. The ideal spacing depends upon the soil conditions. From the experimental observations made by Shri R. H. Dastur in 1942-43 Cotton Season, and by Shri D. D. Gopani, in later years, it was proved that close spacing of 4 sq. feet per plant checked the reproductive growth: 12 sq. feet i.e. 6' X 2' spacing was found to be optimum for the South Gujarat

1. The old practice of South Gujarat was to space 2' X 1'
Cotton Soil. At present, this optimum is employed on the government farms only. There is a temptation of an early and more crop in closer spacing by the Farmer. 

**Inter-Culture:**

Interculturing operations are undertaken during the August, when rains become lighter, and one or two hoeings with the bullock-drawn blade are given. The fields are also hand-weeded several times. The intermittent winds, drying the soil make this inter culture possible. In September inter-culturing is repeated 2 to 4 times, first by hand, then by a heavy type of a blade harrow, penetrating the soil to the depth of about 3 or 4 inches. In the years of late rains the September operations are delayed, and are finished in October. Then the crop needs no further culture and attention till the time of harvest.

**Time of Growth and Harvesting:**

The crop is sown, normally in June-july. The growth is slow, during July, August, and September. The wet soil, cloudy weather, high winds and absence of sunshine arrest the speed of growth of the seedlings. Active growth commences sometime in September or even as late as October i.e. after the rains are practically over. Flowering starts by late **XX** in November and boll development is completed by February. The crop becomes ready for harvest in March. The picking commences by early in March. In the North and the East harvesting begins earlier than in the South and West.

In this tract, the cotton is picked generally in three lots at


the interval of about a fort-night each. About 60 percent of the crop is removed in the first picking. The lot of the 1st and 2nd picking is considered to be of a better grade than the last lot. The produce of the last lot, known as 'Pumdi' in local language, is generally of a poor grade, fetching less price than the earlier lots. As elsewhere in India, picking is done by hand i.e. a boll at a time.

Acreage and Yield of Cotton.

Cotton occupies about 40 to 45 % of the total cultivated area in South Gujarat.

Below are produced the figures recorded by trade for the Acreage, Yield, and Rainfall, for the last Sixteen years.

**TABLE No. 4**

Acreage, Yield, and Rainfall in South Gujarat Cotton Tract.

(From the eleventh Annual Report of the Surat District Cotton Dealers' Association, 1956)

<table>
<thead>
<tr>
<th>Year</th>
<th>Acreage under Cotton</th>
<th>Yield in Bales of 400 lbs each</th>
<th>Rainfall in inches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939-40</td>
<td>6,55,201</td>
<td>2,05,308</td>
<td>33.54</td>
</tr>
<tr>
<td>1940-41</td>
<td>6,97,627</td>
<td>1,55,283</td>
<td>72.58</td>
</tr>
<tr>
<td>1941-42</td>
<td>7,38,974</td>
<td>1,33,296</td>
<td>51.22</td>
</tr>
<tr>
<td>1942-43</td>
<td>5,69,465</td>
<td>1,08,777</td>
<td>56.38</td>
</tr>
<tr>
<td>1943-44</td>
<td>5,27,915</td>
<td>2,22,452</td>
<td>37.40</td>
</tr>
<tr>
<td>1944-45</td>
<td>3,64,379</td>
<td>67,184</td>
<td>69.12</td>
</tr>
<tr>
<td>1945-46</td>
<td>3,57,296</td>
<td>90,991</td>
<td>65.18</td>
</tr>
<tr>
<td>1946-47</td>
<td>4,53,910</td>
<td>96,664</td>
<td>68.45</td>
</tr>
<tr>
<td>1947-48</td>
<td>3,72,065</td>
<td>1,22,830</td>
<td>31.38</td>
</tr>
</tbody>
</table>
1948-49 3,80,846 1,21,000 48.75
1949-50 3,80,846 72,573 16.36
1950-51 4,52,461 1,20,804 28.35
1951-52 5,00,300 94,055 23.40
1952-53 5,15,000 1,27,901 24.30
1953-54 5,13,266 1,70,000 64.80
1954-55 5,77,818 2,08,627 87.6
1955-56 *5,93,634 2,53,453 (Actual) 28.63

It will be noted from the above table that the acreage has risen from 1939 to 1941, in relation to the rise in the price of cotton on account of war-demand. The yield, however is irregular in volume, because of the uneven distribution of rains and the wilt disease. The wilt resistant variety of cotton, was introduced only after 1945. Meanwhile the acreage has diminished from 1941 to 1946 as a result of the "Grow More Food campaign", thus there is a sudden decline in yield for the season 1944-45 as against that of 1943-44, but thereafter the yield was steadily rising up to 1949, on account of favourable climatic conditions and the sowing of a new variety 'Suyog' which was slightly more yielding on the field as well as at the gin. In 1949-50 the rainfall was very scanty leading to a steep fall in the yield on the same acreage. By this time, as a consequence of the Partition, Indian Union experienced a shortage of medium staple and long staple cotton and Surti Cotton began to fetch more premium. The export of all cottons in India stapling over 11/16" was prohibited by the government orders, since 1st October 1946.¹

¹ Bombay Cotton Annual No. 28 P. 6.

* Estimate.
Surti Cotton has the staple length of 14/16" and is now entirely consumed in textile mills of India.

Thus, along with the "Grow More Food" there was, "Grow more Long staple Cotton" campaign. From 1950 onwards, there is noticed a steady rise in the acreage as well as in the yield, except for the season 1951-52, during which despite the rise in the acreage the yield was miserably low. This appears to be the result of late and unevenly distribution of rains. The new variety '2087' was introduced after 1952 to replace 'Suyog', and since then the progress is noteworthy.

The Yield per Acre.

The yield per acre, for South Gujarat Cotton has been recorded as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Average lint per Acre in lbs. for Surti Cotton</th>
<th>Year</th>
<th>Average lint per Acre in lbs. for Surti Cotton</th>
</tr>
</thead>
<tbody>
<tr>
<td>1938-39</td>
<td>110</td>
<td>1946-47</td>
<td>86</td>
</tr>
<tr>
<td>1939-40</td>
<td>97</td>
<td>1947-48</td>
<td>87</td>
</tr>
<tr>
<td>1940-41</td>
<td>98</td>
<td>1948-49</td>
<td>55</td>
</tr>
<tr>
<td>1941-42</td>
<td>79</td>
<td>1949-50</td>
<td>108</td>
</tr>
<tr>
<td>1942-43</td>
<td>83</td>
<td>1950-51</td>
<td>114</td>
</tr>
<tr>
<td>1943-44</td>
<td>126</td>
<td>1951-52</td>
<td>54</td>
</tr>
<tr>
<td>1944-45</td>
<td>74</td>
<td>1952-53</td>
<td>88</td>
</tr>
<tr>
<td>1945-46</td>
<td>73</td>
<td>1953-54</td>
<td>141</td>
</tr>
</tbody>
</table>

The yield depends upon variety of factors such as soil conditions such as soil conditions, climate, cultural operations, genetic factors of the variety etc. Therefore, the variations in the yield are always very difficult to account for. The yield per acre may differ, according to the variance in factors mentioned above, from village to village, even from field to field. In this investigation, it was gathered that the yield per acre, to the South of Surat, is greater than that to the North of Tapti river. The contributing factors are, better soil, comparatively more rains, humidity, air temperature, better financial condition of the growers, more consciousness about the quality and grade of cotton etc. The ginning outturn differs according to the variety of staple, and depends upon the care taken in ginning, and therefore, the lint output per acre may fail to show adequacy or deficiency of other factors. In general one can state that the yield per acre for South Gujarat Cotton is now increased due to the superior variety i.e. '2987' introduced since last three years.

The yield per acre, is one of the economic characteristics of Cotton. More yield means more output for the cultivator. It is merely a quantitative factor. More output may give proportionately more income to an individual farmer, but, more total output may mean more supply, with discouraging effect on the price. Trader and the spinner i.e. the textile manufacturer pays the price for the quality of fibre i.e. the grade depending on the colour, purity, strength, uniformity, the spinning performance etc. The cultivator, therefore should care more for these factors and characteristics of cotton than for mere quantitative aspect of the variety. The South Gujarat Cotton, is more known for its qualitative performance.
Original Variety of South Gujarat Cotton:

The variety of Cotton, originally cultivated in the South Gujarat tract was known as Broach Deshi. This is a trade name. 

More specially it was known as Surtee-local or Surti Broach, and that way the South Gujarat tract is known as "Surat-Cotton Zone". 'Surat' Cotton is defined as regards the area of its growth, by the Government of India, in their notification dated 28th August 1954, under the Cotton Control order, 1950, as ...

"Surat' means Cotton recognised as such and grown in the Surat district, Ankleshwar Taluka of Broach District, Navapur Taluka of the West Khandesh District of the Bombay State, and includes 'Suyog', "2087", "Rajpipla" and "Navapur 1027". The 'Suyog', '2087', etc. are the botanical varieties of Surti Cotton, evolved and introduced recently but Surti Cotton was not known by that name three decades before. It was known as Broach Deshi.


Broach Deshi - A variety grown in lower Gujarat, belong to the Botanical specie of Gossipium Herbaceum and it is due to this species that Gujarat Cottons owe their special reputation and character. Other varieties of the same category, known in early days were Lalio, Kanmi, Kumpta, Goghari, and Wagad. These were further known by various local connotations. Wagad was the variety grown in North Gujarat, while Goghari was more popular in South Gujarat. But these were found, not in pure form, but mixed and hybridised in every proportion.
Importance of Improvement in Variety to a Cotton-grower:

Cotton fetches a certain price because of its characteristics. Such of those, as are directly taken into consideration while fixing the price for cotton are called 'Economic Characteristics'. These are, yield per acre, ginning percentage, feel, colour, purity, uniformity, strength of fibre, staple length, capacity to spin a certain number of counts etc. It is already stated that, the cultivator values cotton for its yield. Being ordinarily ignorant of the grade, he prefers that variety which gives more crop. The ginner is interested in the greater ginning percentage for, on this, depends his remuneration. Trader pays price for the grade, whereas, the spinner is interested in the spinning performance of the cotton fibre. All these varietal characters are not found to an ideal extent in any one natural variety. Morphologically, the qualities of economic importance are ultimately influenced by the physiological and botanical characteristics of the cotton plant. For securing the best value for their produce, the farmers have to grow a pure variety, evolved, recognised and recommended for its economic characteristics and grow and market the same in such a pure form as to maintain its quality. Cotton breeding is undertaken with a view to evolution of improved varieties, by observing, experimenting, and improving the hereditary qualities of the cotton plants so as to give the desired combination of economic characteristics e.g. higher yield, more ginning strength, longer staple, better feel, more spinning capacity etc.

Importance of Improvement in Variety for Marketing:

The improvement in the variety of cotton is usually secured through the following methods of cotton breeding viz.
I. Selection: i.e. Searching out an outstanding plant with the expected quality and propagating the same on pure lines. Selection is based on natural crossing.

II. Hybridization: i.e. Deliberate and artificial crossing between the selected varieties, with the idea of combining in one plant, desired qualities found in different plants.

III. Acclimatization: i.e. Transferring the variety of from one region to another and growing the same in the new environments, long enough for it to become adjusted with the new climate. All these methods are tried by cotton breeders in search of suitable variety. Special local problems such as damage caused by the wilt diseases, frosts, droughts are also required to be solved by developing resistance to such damage in the improved varieties. The Agricultural Departments of every state in all cotton growing regions of the world, have now provided Cotton Breeding Stations and experimental farms to evolve the improved varieties for the benefit of agriculture, trade, as well as the industry. Of course, the U.S.A. has given the lead in this respect. It should be noted that the work of improvement does not end at the evolution and introduction of a new variety. It is necessary to maintain the quality by careful cultivation and marketing. The performance of Cotton Plant, on the government farms, richly manured and attended by botanists and technological experts, may not be maintained, at the hands of the ordinary growers and traders. And, therefore, no variety, so evolved after years' research can remain pure for a long time. Hence the Cotton breeding is a continuous work, the success of which depends upon a close cooperation between, the cotton breeder, the cotton grower, and the cotton marketing agency.
Quality of Cotton and Cotton Cooperatives:

Before, we take up the discussion of the cotton improvement work in South Gujarat, it should be emphasised that the cotton cooperatives have a very important role to perform, in popularising the improved varieties and maintaining the quality and grade by ensuring careful cultivation, ginning, and marketing. The quality of Surti Cotton has much to do with the success of cotton cooperative societies of this region. The reverse is equally true. i.e. the growth of organised cooperative marketing will go a long way to prevent the deterioration, in the quality of cotton. For example, the Department of Agriculture of the Bombay State, is running a scheme, subsidised by the Indian Central Cotton Committee for grading and marketing of improved variety in this tract. The scheme is run through the medium of cooperative cotton Sale Societies and lately through unregistered groups of cultivators also who are declared as certified growers. The state departments prefer the cooperative groups as channels to distribute improved and pure seed because it is more convenient to control the cultivators in their care of seed, through their cooperative bodies, than to extend supervision directly or through unregistered groups. Similarly, certain cotton Sale Societies are able to sell their cotton readily because they are reputed to be careful in maintaining the grade of cotton.

1. In his article on "marketing of cotton in Southern Guj. and role of Ag-marking", in the Indian Cotton Growing Review, January 1952, Shri R.T. Mirchandani, analysed the factors contributing to the extra price realised by the member-growers of the Cotton Sale Societies, and in conclusion, stated that the grading of the lint and sale of 'improved' seeds and 'agmark'certified cotton contributes a major share towards the extra price realised by the cooperators and the success of cooperatives in South Gujarat tract, to a greater extent is attributed to the Agmark grading. Page. 43. of the Journal.
Cotton improvement work in the South Gujarat dates from 1884 when attempts were first made to acclimatise some American Varieties in this soil. However, these attempts were not successful as American Varieties were not suited to the climatic conditions of this tract. The Government Agricultural Research Station was set up at Surat (Athwa lines) in 1896, and cotton became the principal crop for improvement by research. As the attempts of acclimatizing the foreign varieties proved abortive, the further work was continued on lines of selection and hybridization.

Earlier Selections and Their Morphology:

The improvement of the Broach Deshi Variety, known as Surti local, began as early as the very beginning of this century, and six pure line strains, were isolated from the Broach Deshi Cotton Plant.

'B-1'

The first strain, named as 'B-1' was derived from a selection originally made in 1916-17 on the basis of the size and shape of the Cotton boll. It was a leafy variety, maturing earlier, giving maximum yield in the first pickings. In lint index and the staple length, it was not an improvement. Its only peculiarity was that the lint was strict superfine, with good colour and nice feel. The value of lint per candy of 784 lbs. in 1922 was Rs. 80/- more than that of fully good Broach.

'C-1-'

The Second strain was 'C-1-' selected alongwith 'B-1' in 1918 at Surat. It grew pure, and absolutely true to type. Morphologically its cotton bolls were long, narrow, and tapering. The

1. The discussion is mostly based on the records from the memoirs of Dept; of Agr. Botanical Series.
seed was lighter than that of 'B-1' while the lint index and
yielding capacity was higher. It fetched only Rs.30/- more than
the local variety.

'1-A Cylindrical Boll'

The third was known as '1-A Cylindrical Boll' selected for
its easily recognisable form in the field. The bolls of this
strain, were cylindrical, i.e. they taper only slightly. It was
found pure line in 1920, and was introduced on a large scale in
1922. The plant was monopodial i.e. with the largest number of
vegetative branches, usually leading to a high yield. The flower
shedding was less than in earlier strains. The seed was heavier
and the lint index larger. The ginning percentage was greater than
the earlier selections. In price it superceded the earlier strains.

(1-A Long Boll)

Next improvement was the selection of '1-A Long Boll' largely
grown in Surat district after 1922. This plant had a merit of
possessing late flowering habit, yet the number of flowers,
formed in the later part of the flowering period was large. Thus,
due to late flowering the produce of the boll was free from
disease, whereas, owing to sunny whether, it was superior in class.
The yield was larger, and the bolls did not open so completely
as most of the deshi varieties did. This rendered picking rather
inconvenient. The ginning percentage was higher and constant.
This strain was particularly valuable on account of its high
yield, high and constant ginning outturn, an a good staple length.
The lint of this variety is recorded to have fetched Rs. 30/- more
per candy than the price quoted for fine Broanh Deshi.
Another strain, selected in 1915 but propagated since 1920 was 'Selection 2'. It was not very prominent in botanical and economic characteristics, in comparison with above strains; but it was held useful simply for its peculiar spreading habits of the tracts which made flower buds, less susceptible to boll-worms. It fetched only Rs. 5 more than fine 'Broach Deshi'.

'1027 A. L. F.'

Among the five selections described above, '1-A Long Boll' became more popular, due to its superiority in the yield of Seed-Cotton and ginning percentage. Now, the attempts of the cotton breeders at the Research Station were directed to secure a strain with more staple length. With this aim in view, the selection of '1027 A. L. F.' was made in 1910-11 from the cottons that were grown nearabout Navsari. It was a selection made from 'Goghari' Cotton, which was very popular due to its higher yield. The selected strain was crossed with 'Kumpta' a variety from South of Karnatak. Thus, the strain, '1027 A. L. F.' which was result of the crosses between 'Kumpta' and 'Goghari' proved to be superior to '1-A L.B.' in point of staple length (0.95" for '1027 A. L. F.' as against 0.86" for 1-A Long Boll) and had a silky feel. It was considered to be equal to middling American Variety. Its spinning capacity was 30 warp counts. It ginned 3% to 4% lower than 1-A Long Boll, but higher than Surti Local. Therefore, '1027 A. L. F.' was valued for its spinning performance, and was preferred by mills.

Each of the above six strains had some special quality cultural or otherwise, for which they were valued. Their capacity to retain the quality in a period of cultivation differed
from season to season. However, the following table gives the comparative view of the economic characteristics of these types in respect of the yield per acre, the ginning percentage, the length of the lint, and the market value of the lint.

**TABLE No. 6**

The Economic Characteristics of the Selection strains. Figures indicate averages of three years, i.e. 1919 to 1922.

<table>
<thead>
<tr>
<th>Name of 'Strain'</th>
<th>Yield of Kapas per acre in lbs.</th>
<th>Yield of lint per acre in lbs.</th>
<th>Ginning percentage</th>
<th>Average length of staple in cm.</th>
<th>Value per candy of 784 lbs. Colour in Rs.</th>
<th>Feel</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>469</td>
<td>N.A.</td>
<td>34.5</td>
<td>2.4</td>
<td>467</td>
<td>Coarse Whitish</td>
</tr>
<tr>
<td>C-1</td>
<td>518</td>
<td>N.A.</td>
<td>34.1</td>
<td>2.25</td>
<td>458</td>
<td>&quot;</td>
</tr>
<tr>
<td>1-A Long Boll</td>
<td>640</td>
<td>248</td>
<td>38.2</td>
<td>2.52</td>
<td>490</td>
<td>&quot;</td>
</tr>
<tr>
<td>1-A Cylindrical Boll</td>
<td>718</td>
<td>278</td>
<td>38.7</td>
<td>2.43</td>
<td>482</td>
<td>&quot;</td>
</tr>
<tr>
<td>Selection 2</td>
<td>485</td>
<td>185</td>
<td>38.2</td>
<td>2.45</td>
<td>N.A.</td>
<td>&quot;</td>
</tr>
<tr>
<td>1027 A.L.F.</td>
<td>586</td>
<td>206</td>
<td>35.2</td>
<td>2.7</td>
<td>488</td>
<td>Silky &amp; creamy white.</td>
</tr>
<tr>
<td>Average of local Broach Deshi</td>
<td>502</td>
<td>171</td>
<td>34.1</td>
<td>2.2</td>
<td>440 at Surat</td>
<td>458 at Navsari.</td>
</tr>
</tbody>
</table>

Thus, next to 1-A long Ball, '1027 A.L.F.' began to sell well. Its pure seed was distributed since 1923, when for the first time, 'Surti' Cotton was regarded the best, and distinct among Broach Deshi Cottons. It was responsible for restoring the reputation of South Gujarat tract, which was once, threatened on account of the intrusion of 'Goghari' a high ginning but inferior Cotton.

**Suyog**:

Further it was thought to increase the ginning percentage of 1027 A.L.F. To serve this objective a cross was made between 1027 A.L.F. and Selection 1-a Long Boll in 1930, and a synthetic variety called 'Segregate-1' was evolved therefrom. It was later named as 'Suyog'. As compared with 1027 A.L.F. 'Suyog' gave 8% more yield of seed cotton, 6% higher ginning outturn and a slightly longer staple than that of 1-A Long Boll. It was more profitable to grow. The 'Suyog' was taken up for multiplication and extension in the South Gujarat tract since 1945 through a scheme financed by the Indian Central Cotton Committee, and within five years i.e. by 1951-52 season covered whole of the tract excepting the two talukas of West Khandesh district which forms a part of Surti Cotton Zone and where 1027 A.L.F. continued to be a recommended variety on account of the adaptability to the soil.

**Its limitations**

However, 'Suyog' variety had certain limitations. In the first place, it was not as silky in appearance and feel as 1027 A.L.F. Secondly, it was somewhat late in maturing and was adversely affected in yield, by shortage of rains. It was also slightly inferior in staple length and less in warp counts than 1027 A.L.F.
It was preferred by cultivators, simply because its yield and ginning capacity was higher. Further, when the extension work was going on it was observed that, in certain parts of the tract, it was to some extent affected by wilt disease. Particularly in the region, to the North of River Tapti, there was a problem of wilt disease. For such areas, a wilt resistant type possessing, all other desirable economic characters was required. New aim was to evolve a variety earlier in maturing than Suyog, wilt resistant, as well as superior in yield and fibre qualities.

'2087'

As a result of the coordinated research work, done at Shera, near Ankleswar, and at Surat, three types viz. 3652, 2334, and 2087 were evolved from the crosses and back-crosses, among the above strains. Of these '2087' has stood the constant trials. It is a back cross between 1027 A.L.F. and 'Vijay' a wilt resistant variety of the region to the North of Narmada. This new strain distinctly earlier in maturing than Suyog and a powerful wilt resistant. On an average it gave 40 lbs. more yield of Seed Cotton per acre, and equals Suyog in ginning percentage. It has slightly longer and finer fibre than Suyog resulting in better spinning performance.

The acreage, comparative performance of strain "2087" relative to that of 'suyog', and 1027' A.L.F., both on the Surat State farm, and in district trials is given in the table below:

<table>
<thead>
<tr>
<th>Strain</th>
<th>Acreage</th>
<th>Comparative Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suyog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2087</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Fusarium Vasinfetum.

2. The Sub-Research Station at Shera, near, Ankleswar in Broach district was established in 1937 with the financial aid of the Indian Central Cotton Committee purely for preliminary tests in wilt affected fields.
**Table 7**


<table>
<thead>
<tr>
<th>Name of Variety</th>
<th>Yield per Acre in lbs.</th>
<th>Ginning percentage</th>
<th>Mean fibre length in inches</th>
<th>Mean fibre length per inch 10-6 oz.</th>
<th>Spinning Value (Highest standard Warp counts)</th>
<th>'on' allowance for Surati Cotton over I.C.C. in Bombay Market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seed Cotton</td>
<td>Lint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1027 ALF</td>
<td>347</td>
<td>118</td>
<td>34.0</td>
<td>1.00</td>
<td>0.183</td>
<td>36's</td>
</tr>
<tr>
<td>Suyog</td>
<td>349</td>
<td>131</td>
<td>36.7</td>
<td>0.96</td>
<td>0.194</td>
<td>34's</td>
</tr>
<tr>
<td>2087</td>
<td>387</td>
<td>147</td>
<td>37.3</td>
<td>0.98</td>
<td>0.170</td>
<td>35's</td>
</tr>
</tbody>
</table>

(a) on Surat Farm


2. For Surti 2 ‘10231 Bombay Cotton Annual 38-39 No. 20 Page. 161
   For Surti Suyog - " " " 45-46 No. 27 Page. 103
   For Surti 2087 - " " " 52-53 No. 34 Page. 113

In 1953-54, May, the tendering difference, for Surati Cotton was Rs. 240/- over Basis I.C.C. Bombay Cotton Annual No. 35. Page. 115.
It will be seen from the above table that the variety '2087' yields more seed Cotton as well as lint per acre. It has a slightly longer and finer staple and creamy white colour of lint. The lint is lighter than earlier two varieties and, therefore, is capable of better spinning performance. The most outstanding merit of it is that it is wilt-resistant. On average it has been fetching at least about a premium of Rs. 50/- per candy of 784 lbs. Over Suyog. The new strain was issued to the growers in 1952-53. The cultivators as well as traders welcomed this variety with unusual enthusiasm. The mills are showing a distinct preference for '2087'. Thus, while giving a higher income to Cotton Growers in areas free of disease, on account of its higher yield, and better quality, the variety prevents the recurrence of damage to the crop in an area of about 25,000 acres to the North of the River Tapti, where the soil is diseased to a some extent. Now this variety has covered the entire south gujarat Cotton tract.

Long Staple Indo-American Variety - '170-Co-2':

The outstanding success of the Surat Research Station is the evolution of 170-Co-2, an Indo-American Variety with a staple length of more than one inch. Every year, India has to import, long staple cottons from America, Africa and Egypt for textile mills. These cottons have staple length of 1 1/16 inches and above and finer fibre than that of Deshi varieties and are, therefore, suitable for manufacture of fine and superfine cloth. Attempts to grow these foreign varieties in our country were continued upto 1920, but failed because the introduced varieties in our country were continued upto 1920, but failed because the introduced varieties suffered heavily from the attack of pests. However,
crossing and back-crossing of local varieties with American varieties have given two strains, viz. 170-Co-2 and 134-Co-2 M. for the first time in 1943-44. Since 1952-53 season, the seeds of '170-Co-2' were supplied to enterprising cultivators of South Gujarat, and the arrangements for marketing the crop were made through departmental officers. In general, the cultivators preferred the variety on account of its staple length and attractive price. They have been reported to have realised an extra cash return of Rs. 100/- per acre for rainfed cultivation. When the Kakrapar Weir Will give the benefit of irrigation, '170-Co2' will find more popularity in South Gujarat, where it is expected that it may cover about a lakh of acres of land. In all economic characteristics, it supersedes the local improved variety i.e. '2087'. In surat market 170-Co2 fetched about Rs.1300/- per candy while '2087' fetched on average Rs. 925/- per candy in 1954-55 season.2

The production of such cottons in India is of extra-ordinary importance from the point of view of saving a part of foreign exchange, now spent annually on importing such cottons. This variety is not meant for the South Gujarat alone but for the region with black soil and irrigation facilities. However it is one of the varieties now grown in this tract and may occupy a prominent share in future.

1. The original cross for 170-Co-2 was between Dharwar American 2-6-5, and Gaorani 6. The result was the 'type 170' which was further crossed to the American Cotton- 'Madras Co-2' and hence the name 170-Co-2: Patel; G. B. and Patel C.T. 'Long Staple Indo-American Cotton type 170' – The Farmer, June 1955 pages. 27-32.

2. Its economic performance, as compared with those of 2087 in 1952-53 season was as follows:

<table>
<thead>
<tr>
<th></th>
<th>Yield per acre in lbs.</th>
<th>Ginning Percent age.</th>
<th>Staple length in inches.</th>
<th>Fibre weight per inch</th>
<th>H.S. W.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>170-Co2</td>
<td>354</td>
<td>36.4</td>
<td>1.06</td>
<td>0.138</td>
<td>42°</td>
</tr>
<tr>
<td>2087</td>
<td>127</td>
<td>36.3</td>
<td>0.96</td>
<td>0.189</td>
<td>32°</td>
</tr>
</tbody>
</table>
The Standard and the Grade of Surti Cottons:

The above review of the botanical evolution of the cotton of South Gujarat should evidence the standard of the Surti Cotton. Surti '2087' is now included the list of the standard Indian Cottons under the name 'Vijalpa' since 1955-56 season. Such standards are set with a view to offering a scale of comparison so that subsequent varieties evolved by the Cotton breeders may be judged in their merits. The standard cottons are examined in every crop season, at the Technological Laboratory of Matunga, by the Indian Central Cotton Committees. The yearly reports of the performance of the technological varieties and trade varieties of Standard Cottons, help to determine the extent to which the seasonal variations in climate and other factors affect the standard cottons and thus to provide the cotton traders with detailed information concerning them. The standard for a variety may not continue for all times but may change, improve, or deteriorate, creating the necessity of further research to evolve fresher varieties to replace the old ones. Secondly, it is necessary to note, as already stated, that trader pays for cotton according to its grade. Therefore trade varieties are different from the technological varieties of cotton. The factors that determine the grade for cotton, are the standard of purity i.e. the amount of leaf fragments, trash, dirt, broken seeds, etc. in it; the colour whether white, tinged, stained, spotted, blue, gray, etc., and the ginning performance whether smooth and well-ginned or neppy or gin-cut etc. According to the grade, the class is fixed such as fine, superfine, extrafine, etc. The grade of cotton is also determined on the fibre properties such as feel, staple length, staple strength, etc. It will be worth while to produce here, the reports of the grade of Surti 'Suyog' since the same was introduced in 1945.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value under Contract</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
<td>Rs. 125</td>
</tr>
<tr>
<td>类</td>
<td>Fairy</td>
<td>Fine</td>
<td>Super</td>
<td>Super</td>
<td>Extra</td>
<td>Extra</td>
<td>Super</td>
<td>Super</td>
<td></td>
</tr>
<tr>
<td>Clean</td>
<td>Clean</td>
<td>Fine</td>
<td>fine</td>
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<td>SupFine</td>
<td>SupFine</td>
<td>fine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>White</td>
<td>Whitish white</td>
<td>white</td>
<td>white</td>
<td>white</td>
<td>white</td>
<td>white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peel</td>
<td>Soft &amp; Silky</td>
<td>Silky</td>
<td>Silky</td>
<td>Soft</td>
<td>Soft</td>
<td>Soft</td>
<td>Soft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staple Length</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>Staple Strength</td>
<td>Fairly Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Fairly Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularity</td>
<td>Regular</td>
<td>Regular</td>
<td>Regular</td>
<td>Regular</td>
<td>Rather Regular</td>
<td>Regular</td>
<td>Regular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value above &amp; below contract Rate</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
<td>Rs. 140 on</td>
</tr>
<tr>
<td>Basis</td>
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<td>Rs. 450</td>
<td>Rs. 450</td>
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<td>Rs. 450</td>
<td>Rs. 450</td>
<td>Rs. 450</td>
<td>Rs. 450</td>
</tr>
<tr>
<td>Date of Valuation</td>
<td>25-5-46</td>
<td>17-4-47</td>
<td>15-3-48</td>
<td>17-5-49</td>
<td>17-5-50</td>
<td>24-5-51</td>
<td>22-3-52</td>
<td>27-4-53</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td>Report on Yarn for all the above years is as follows.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
It will be seen from the Grader's Report that Suyog Variety has maintained its standard of performance for all the year past. As a matter of fact the technological standards rarely deteriorate. Trade Varieties may show irregular performance because, cent-percent purity of seed sown by the cultivator cannot be guaranteed. Despite the prohibition of certain inferior varieties under the Cotton Transport Act 1923, the growers continue to mix, for the temptation of large yield. Traders, too, resort to mixing either while selling seeds under the name of superior variety or while ginning the seed cotton. It is because of these reasons, the reports on 'Surat' Cotton given by the Technological Laboratory, show irregular performance.¹

The spinning Performance:

However, the spinning performance of 'Suyog' cotton has, shown a deterioration since 1951. The following are the highest standard counts for which this cotton has been adjudged suitable in the different seasons:

<table>
<thead>
<tr>
<th>Year</th>
<th>Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948-49</td>
<td>34S</td>
</tr>
<tr>
<td>1949-50</td>
<td>36S</td>
</tr>
<tr>
<td>1950-51</td>
<td>40S</td>
</tr>
<tr>
<td>1951-52</td>
<td>30S</td>
</tr>
<tr>
<td>1952-53</td>
<td>30S</td>
</tr>
</tbody>
</table>


² Technological Reports on Standard Indian Cottons 1953 - I.C.E.C. Technological Laboratory, Page. 38.
The highest standard count is defined as the finest count to which a cotton can be economically spun with a twist multiplier of 4, to give a standard lea strength.

The Variety '2087' has been in sowings since 1952, and has covered almost the entire tract of South Gujarat in the 1955-56 Cotton Season. Thus, Suyog has gone out of cultivation and will not appear as standard cotton hereafter. In its place, '2087' will appear, under the name 'Vijalpa' as standard Cotton for South Gujarat Cotton Tract. The spinning performance of '2087', therefore, is yet to be reported.

SEED DISTRIBUTION AND COTTON COOPERATIVES:

The work of cotton improvement is primarily undertaken to benefit the growers by enabling them to earn more price for their improved quality of crop. An adequate supply of pure and good quality seed of adapted, high-yielding, and commercially acceptable variety is one of the essentials for efficient and profitable cotton production. Use of improved seed of a suitable variety increases the average yield, grade, and staple length of the cotton produced. Particularly, when the region in question is a single variety tract so as to produce on a large scale a uniform variety to meet the spinner's want for a substantial and steady supply it may mean that the grower will receive a premium for his entire crop. Thus growers should be naturally interested in increasing their income from cotton through seed improvement programmes undertaken jointly on a cooperative basis. In India there is very little effort in this direction. On the contrary, the cultivators solely rely upon the state research departments for obtaining the improved seeds. As stated already in this chapter, the scheme of breeding, grading and distributing improved varieties of cotton in South Gujarat tract is run by the Department
of Agriculture of the Bombay State, at the instance of the Indian Central Cotton Committee. The seed of the recommended variety is distributed by the department's staff, through the cooperative Cotton Sale societies and recognised groups of cotton growers.

The cotton Sale Societies are also registered as Seed Supply societies meaning thereby, that members are to obtain seed from their respective societies. The work of Cotton improvement itself is not undertaken by growers on Cooperative basis, as one finds in case of cotton growers of the United States of America.

Cotton Seed Improvement Associations of the U.S.A.

In the U.S.A. many farmers, in the cotton growing states have been working to gether through various types of cooperative organisations to produce high-quality seed of the best suited varieties. These cotton seed improvement associations have received considerable aid and encouragement from the United states Department of Agriculture, the states extension services, and other federal and state agencies. These voluntary cotton improvement plans are known as 'one variety community' programmes. Their purpose is to provide cotton growers with a suitable plan for growing and distributing seed of known origin and purity at reasonable cost. These programmes are worked through state-wide seed Improvement Associations. Such Associations carrying on seed-improvement work on a State-wide basis, were 10 in 1945.¹ Their programme is to get foundation seed from the breeder into the hands of selected growers and to supervise the growing, ginning and distribution of seed. These associations sprang during

The period of the Second World War. Today the cooperative cotton seed improvement associations, operating on a state-wide basis, are scattered throughout the cotton-producing regions of the United States. The membership of the associations consists of farmers interested in growing pure seeds true to their genetic types. Very often, they are also members of local cotton seed improvement associations, one-variety communities, cooperative cotton-gins, and other cooperatives. The local associations assist the State Associations by taking up the distribution of seed, controlling and supervising the ginning of seed cotton, advising members on the best methods of planting, cultivating, roguing, and in numerous other ways. The State Associations assist the locals by coordinating seed improvement work in the state, keeping the local units informed of new developments, testing and certifying seeds, acting as purchasing and selling agents, and by performing other helpful services.

Seven of the associations doing cotton seed improvement work are members of the International Crop Improvement Association which is a federal body of the seed-improvement cooperatives of the U.S.A. and Canada. It sets up standards for the production, registration and certification of high-quality seeds. All the states have seed certification laws and their seed improvement associations are frequently designated by law as the state seed certification agencies. All associations make one or more field inspections during the growing season to determine whether the plants are true to type and free from other varieties. If the crop fails to meet the necessary qualifications, it is automatically disqualified for certification or sale under the Associations' Seal. The picking and ginning are also carefully supervised.
Thus, the cotton-growers of the U.S.A. obtain their seeds from the Seed Associations with ample assurance of their varietal purity and high quality. Probably in no other country the work of cotton seed improvement is conducted by growers themselves on cooperative basis.

Seed Distribution in Egypt:

In Egypt, which is another important cotton growing country in the world, 99 percent of the seed for the cotton crop is now derived from the Ministry of Agriculture. Practically the whole seed maintenance system is centred on the giza farm controlled by the Cotton Research Board with links radiating to other government and private farms throughout the length of the Egypt. Private growers are allowed to produce seed but under the contract that it must pass certain tests for purity and the seed must be returned to the government for distribution. Under the provisions of the Seed Control Law of 1926, the seed intended for sowing must not be ginned without a licence and ginning must be carried on under the supervision of an inspector of Ministry of Agriculture, one such inspector being attached to every licensed ginnery. The thorough cleaning of the ginning equipment is insisted and a sample of seed or seed Cotton is examined in the Ministry's laboratory. The seed failing to pass the standards laid down from year to year is not certified and its sowing is prohibited. Egyptian Cotton is best known for its staple and spinning performance.

Seed distribution in India:

It was pointed out to the Cotton Marketing Committee of 1951 that in several cotton growing tracts of India the growers were not able to get pure seeds of improved varieties. It was also

reported to them that the seed of improved varieties get deteriorated after a certain stage and therefore it was necessary to maintain a regular flow of pure seed of approved generations. At present the seed improvement and the seed distribution work is entirely done by the Agricultural Departments of the various states. Although nearly 47 per cent of the area under cotton is reported to be covered by improved varieties, the seed distributed by the Agriculture Departments in different states is enough to cover only about one fourth of this area. This means more that 70 percent of the area under improved varieties is sown from seeds obtained by growers from their previous crops or from some other sources. This crop cannot be, however, called a pure variety; and the textile industry does not get the fullest benefit of improved strains of medium and long staples, evolved after years of strenuous work. The committee referred above, has strongly urged upon the government to expand the work of seed multiplication and distribution to at least four times of its present extent so that seed of approved quality may be available at least for sowing such lands where improved varieties are being grown at present and also any additional land which could be usefully put under such varieties.

**Grading Under the Agmark**

Once the improved variety is sown and the purity standards are maintained the crop should be certified for its grade so that the grower can get premium price for the superior quality of his seed-cotton. The grading of improved variety on the basis of purity is at present done under the Agricultural Produce (grading

2. Ibid. Page. 39.
and Marketing) Act of 1939 in consultation with the Indian Central Cotton Committee. The aim is to secure for the producer proper premium and thereby to help the rapid spread of such varieties. The specifications for the improved varieties of cotton are prescribed under the above act, and two grades are certified for its variety viz. (1) Agmark certified pedigreed and (2) Agmark certified, the former with the 98% of the purity of its lint and the latter with 87%. These specifications also require that the lint shall be obtained from machine ginned Kapas and shall be dry and free from any trace of added moisture and that it shall be clean and reasonably free from leaf, seed, trash, and other impurities. On each graded bale is fixed a label showing the variety, grade, and area of production. This agmark label is fixed on front side of a bale and is held securely in its position by at least three hoops. The grading in India is done on the purity standards alone; and not on the basis of staple length, strength and colour as in case of Egyptian cottons. Agmarking of cotton is however, limited at present mainly to Surat and Broach areas. In certain Parts of Bombay bales are simply certified instead of agmarking by the officers of the local departments of Agriculture.

Seed Distribution and Grading in South Gujarat:

Considered on the background of the conditions in India we find that the work of seed improvement, seed distribution and Agmark grading is better organised in South Gujarat Tract.

The 'Nucleus' seed of the present variety '2087' is multiplied by sowing 'Selfed' on the 'Nucleus' Plot of the Government farm at Athwa lines, Surat. The 'Selfed' seed for sowing is
usually obtained from selected plants with possess the true morphological and economic characters of the approved variety.

Natural crossing is prevented by fixing galvanised iron rings over large sized unopened flower buds thus rendering pollination by insects impossible. The seed obtained from this 'Nucleus' Plot is passed on to the Cotton Superintendent Surat for distribution to registered or approved cotton growers in the district. There are seven selected centres at which this distribution of the 1st stage seed takes place. These are (1) Ankleswar (2) Zagadia (3) Olpad (4) Surat (5) Navsari (6) Bardoli (7) Nawapur. The registered growers to whom the 1st stage seed is given are generally influential and trustworthy cultivators and they bind themselves to grow the variety under desired conditions and to allow rouging and ginning of Kapas under departmental supervision and also to sell the entire seed produced to the Department i.e. to the Cotton Superintendent. They are generally paid a suitable premium for the price of such cotton seed. The distribution is generally done through the cooperative cotton sale societies and unregistered groups of cultivators usually organised by the ginning merchants. At each centre the record of the distribution giving the name of the grower, the name of the Society or the group, taluka, village stage of the seed, the quantity of the seed given, the area, the expected quantity of crop etc., is maintained. These records are consolidated at the Surat Office. The resultant third stage seed is given to the Societies and groups for the distribution among their members. The fourth stage seed is held by the Societies and groups and is used to supplement where the 'pedigreed' seed or the 1st and 2nd stage seed is not available. The fifth stage seed is sold to oil mills for crushing.
Before the Agmark labels and certificates are issued the purity of the cotton crop in the field vis-a-vis of the resultant cotton seed is to be certified. The determination of purity of crop is done in the fields at the boll formation stage. Temporary assistants known as 'Kamgars' are employed by the Agricultural department for the work of field inspection. Before commencement of the work they are given a training at the government farm in differentiating various types of cotton plants on the basis of the size of boll, seed, lint characters etc. The Kamgars go round the fields and observe at random, sample plants on the basis of which the purity of the whole crop in the field is determined.

On the basis of the observation the list of certified cultivators is prepared. The crop with purity below 95 percent is rejected. The crop from the second stage seed with 98 to 100 percent purity is given 'Red Agmark Label'; the crop from 3rd stage seed with 97 to 98 % purity is given 'Black Agmark' label and one of the fourth stage seed with more than 95 % purity is given certificate only.

The labels and certificates are issued only at the stage when the cotton is ginned and pressed into bales. Pooling, heaping, ginning and pressing at the factories are done under the supervision of the departmental assistants. Whenever there arises a doubt in respect of purity at any stage the cotton is rejected for certification. In the crop season i.e. 1954-55 the 2nd stage and 3rd stage seed distributed by the Cotton Superintendent covered 3,73,513 acres in this tract whereas, 4th stage seed covered 1,06,487 acres, thereby, showing 4,80,000 acres, under the improved and pure variety '2087'. In 1955-56 season the entire

1. Figures from the Cotton Superintendents' office, Surat.
area under 2087 is about 6,00,000 acres.

Cultivators and the Seed-distribution:

In the present investigation it was found that most of the farmers knew the name of the variety they were sowing and got the seed from their respective societies or groups. The majority of the Cotton Sale Societies expressed their opinion that the seed distribution should be done exclusively through the cooperative societies. They believed that the distribution of seed to unregistered group of cultivators acting through the leadership of the ginnning merchants leads to the adulteration and mixing which ultimately damage the reputation of the entire cotton tract. On the other hand, traders maintained that such a discrimination amounts to forcing the growers to become members of a cooperative sale society. What is more important is the preservation of purity which is to be verified by the staff of the Agricultural Department. If the cultivator grows the variety with the necessary purity standards he must be given the benefit of premium irrespective of whether he is a member of a cooperative or not. So far as the mixing and adulteration are concerned it is very difficult to attach the guilt to either dealer in cotton or to a cooperative society. The traders argued that they are likely to be more careful for the grade of cotton than the cultivators or their societies for the simple reason that, the cotton purchased by them is to be resold, whereas, the interest of a cultivator is over as soon the crop leaves his hands. Secondly the price of certified lot does not differ according whether the seller is independent dealer or a cooperative society. Thirdly any mixing must have the effect on price of cotton as it affects the grade of cotton and therefore is not in the interest of the dealer. What is essential is
that there should be a stricter supervision over the cropping, ginning and pressing than what it is at present. The employment of temporary assistants for field inspection and a random checking by the departmental officers is rather superfluous in effect.

Secondly, as was brought to the notice of the cotton marketing Committee of 1949, the methods of sampling differ considerably even in the adjusting districts of Surat and Broach. The sampling techniques need to be standardized.

The controversy on the point of the distribution of pure seed, can be best solved by organising cotton seed improvement societies on lines of similar associations in the U.S.A. At present a cotton grower who has decided not to join a cotton sale society for one reason or the other (which we shall discuss later in this work) finds it difficult to obtain a pure seed unless he joins a certain group. The cotton seed improvement society will meet the need for propagation and distribution of the seed of a recommended variety and at the same time will retain the liberty for the grower to sell his cotton independently without compelling him to join a sale society. Besides, the work of inspection and supervision can be organised on better footing when the association will maintain the permanent staff for that purpose. The state agriculture department is bound to give all the necessary assistance to this venture. The idea deserves a trial and calls for a bold and unanimous approach on part of the cultivators in South Gujarat Cotton Tract.

CONCLUSION:

South Gujarat is known for the quality of its Cotton. The soil and climate of this tract have furnished the environments

1. Page 44 of their Report.
to grow a staple of 7/8" in length with silky feel and creamy white colour. The natural variety of this tract itself was superior to other Indian Cotton. Scientific Research and careful breeding have provided with still improved varieties, that have, besides adding to the income of the cotton growers, enhanced the reputation of Surti Cotton in cotton markets of India. To-day it is entirely consumed within the country being preferred mostly by mills in Bombay and Ahmedabad. Surti Cotton has maintained its economic performance throughout and has become a reliable fibre for the Indian spinners. The Cotton Research station at Athwa in Surat has done a commendable work and Cotton Sale and Seed supply societies have been utilised as agencies for the distribution of pure seed of the improved variety to the cotton growers of this tract. However, the cooperatives can play a more significant role than what they do at present. It may be noted that in the U.S.A. the third-year-increase seed is sold to oil mills for crushing, and only the second-year-increase seed is available for the general distribution. In contrast with this, the fourth stage seed is also given certificates in South Gujarat Cotton tract, and there is no provision to prevent sowing of 5th stage seed. It is necessary to extend the supply of pure seed and to prohibit the sowing of seed beyond 4th stage in order to retain the quality of Surti Cotton. This can be best achieved by encouraging cultivators to form a cotton Seed Improvement Association for the entire tract which will also create the necessary atmosphere to promote cooperative efforts for marketing of cotton.