Crops of Sind: Their geography and statistics

by

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PREFACE

The present bulletin is confessedly a compilation of the information available regarding the area under various crops in Sind and its distribution. But we have found so much difficulty in getting information on the subject, while much of the data have never been published before, that it seemed very advisable to place it on record in an available form. I, therefore, asked Mr. G. R. Ambekar, who is in charge of the Statistical Branch of the office of the Director of Agriculture to get together all the information he could command, and prepare it for publication. This he has done, and I have submitted it to a critical revision. I hope it will be found useful by those interested in Sind on the eve of the new irrigation developments which are likely to transform the country.

HAROLD H. MANN,
Director of Agriculture.

Poona, 15th October 1927.

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CHAPTER I—PHYSICAL FEATURES

The classic name of the river Indus was Sindhu, Sanskrit for an ocean, and Sind was the country created and sustained by the river, without which it would be a Sahara.

This country (Sind)—a long plain, annually flooded and made fertile by the great river Indus—is isolated by a boundary of high mountains on the west and a vast desert in the east, and extends from 23° 35′ to 28° 29′ North Latitude and from 66° 40′ to 71° 10′ East Longitude.

It has an area of 52,994 square miles and a population (in 1921) of 3,472,529 persons, inclusive of the Indian State of Khairpur which encloses an area of 6,050 square miles and a population of 193,152.

The Province, which forms the extreme north-western portion of the Bombay Presidency, is bounded on the north by Baluchistan, the Punjab and the Indian State of Bhawalpur; on the east, by the Rajputana States of Jaisalmer and Jodhpur; on the south, by the Rann of Cutch and the Arabian sea and on the west, by the Territory of the Jam of Las Bela and Khan of Kalat.

Cut off from the rest of the Bombay Presidency by the desert or by the sea, Sind differs widely from it in physical features and climate, as well as in the language, dress and customs of the people.

Sind comprises three well-defined tracts:—(1) the *Kohistan* or hilly country, which lies as a solid block between Karachi and Sehwan and is thence continued north, as a narrow fringe along the skirts of the Kirthar range; (2) Sind proper, the central alluvial plain, watered by the Indus; and (3) the *Registan* or *Thar*, a band of so called desert, on the eastern border, where rolling sand hills alternating with valleys, are often fairly wooded and there are extensive level tracts of pasture land.

Almost every portion of the great alluvial tract of Sind has, at some time or other, formed a channel for the river Indus or one of its many branches. This main central stream of North-Western India, with a total length of about eighteen hundred miles, traverses the Sind Province for nearly a third of that length, namely, 580 miles, and annually, when the snows at its source begin to melt with the advance of spring, rises and overflows its banks, and floods the low-lying country, far and wide.

After collecting into its bed the waters of the five Punjab rivers, the Indus has deposited near its entrance into the Arabian sea, a vast mass of deltaic matter, through which it flows, by several shifting channels, to join the sea, on the southern border of the Province.

The most noticeable characteristic of the river is the extent and rapidity of the changes that take place in its course. The chief reason for this instability is that the soil, over nearly the whole of the Indus valley, is extremely friable and easily disintegrated by the flow of water, in consequence of which, the impingement of the current against a bank, at even a small velocity, is sufficient to cause its rapid erosion. The result of this friable nature of the soil and its extremely finely divided state is that the water always has a large amount of silt in suspension which, in any places where the velocity falls below that which is required to transport it, begins to fall and rapidly forms banks and shoals.

To add to this, the river brings down from the turbid hill torrents a greater quantity of detritus than can be carried forward by its diminished velocity in the plain, and, hence, a constant accumulation of silt takes place, along its various beds, raising their level above that of the surrounding country, and incidentally affording an easy means of irrigation (on which the agricultural prosperity of Sind entirely depends), by side channels drawn from the central river.

The Indus is, generally speaking, broad and moderately shallow. Its breadth, in the cold weather, may be anything from one thousand to four thousand feet while, during the inundation, it spreads over the banks and is only retained by the *bunds* or embankments or by high ground, on either side, and it may, thus, be several miles in breadth.

Corresponding with these enormous variations in its size, the volume of water carried by the river at different periods of the season also varies very widely. When the river has fully risen, the measured discharge at Sukkur approaches the colossal figure of a million cubic feet per second. At other seasons of the year, the volume of water contracts to very small dimensions, falling below twenty thousand cubic feet per second.

In fact, the river occupies such a peculiar position in the agriculture of the Province that a good season in Sind is determined by the behaviour of the Indus. If it rises steadily in the second quarter of the year, maintains a good level in the third quarter and subsides not earlier than the fourth quarter, then

a prosperous year may be assumed. Unfortunately, this standard does not always materialise in practice and many years are characterised by one or other of the following defects :—a later rise, an intermediate drop or a premature fall.

Besides the Indus, there are some hill streams or *nais*, of which the Hab, which may almost be called a river, is important. Appearing as a string of unconnected pools, in the dry season it forms the boundary between Sind and Baluchistan. Other important *nais* are the Malir, from which the city of Karachi obtains its drinking water supply, the Baran, which supplies Kohistan, and the Gaj.

Lakes are rare, the largest being the Manchar in the Sehwan taluka of the Larkana district, formed by the surplus waters of the Western Nara and the rain torrents of the Kirthar hills. During the inundation season, it measures twenty miles in length and covers an area of about one hundred and eighty square miles. At the same period, the flood hollows (*dhands*) of the Eastern Nara form pretty lakelets. The Makhi *dhand*, fifty miles in circumference, in the Sanghar Taluka of the Thar Parkar District is well known as the favourite haunt of the Hur outlaws.

As already noted, the Province, for the most part, is a flat country. The only elevations, deserving the name of mountains, occur in the Kirthar range, which separates Sind from Baluchistan, and attains, in places, a height of about seven thousand feet above sea level, sinking in the south to the Pab hills. The wild and rocky tract of *Kohistan*, in the western portion of the Karachi District, forms almost the only remaining exception to the general flatness of the Province. There are, in addition, a few small chains of hills, such as those which cross the Indus valley at Sukkur or those at Hyderabad, Tatta. Though not unimportant in the economy of Sind, they are quite insignificant in height and deserve no special mention.

The plain country comprises a mixed tract of dry desert and alluvial plain. The alluvial strip which borders either bank of the Indus, for a distance of twelve miles, is superior to almost every other part of Sind in soil and productiveness. The finest and the most productive region lies, however, perhaps, in the neighbourhood of Shikarpur and Larkana where a long, narrow island extends for one hundred and sixty miles from north to south, enclosed on one side by the river Indus and on the other, by the Western Nara. Another great alluvial tract, with an average width of seventy to eighty miles, stretches

eastward from the Indus to the Eastern Nara. In contrast with these fertile regions, there are large tracts in the east of the Province where sand hills abound. Large tracts, rendered sterile for want of irrigation, also occur in many other parts of the country.

The greater part of Sind is occupied by the alluvium of the Indus, frequently covered by sand dunes, in the eastern part of the Province, which is an extension of the Rajputana desert. Western Sind, south of Sehwan, between the Indus and the Baluchistan Frontier, is, on the other hand, mostly a hilly region.

From this, we can infer, with fair accuracy, that except in the desert portion in the east (where the soil is largely of a sandy character) and the hilly portion in the west, the soil is a fine alluvial silt, over a very large part of the Province. This is actually the case. But the character of the soil and the effect it has on different crops differ so widely according to its composition, that is, the proportion of sand and clay in the alluvium, that we must deal with it at greater length.

CHAPTER II—SOILS

Successful agriculture depends, perhaps, more upon the soil and the efficient management of it than on any other factor, assuming the existence of the essentials, such as rain or irrigation and labour.

All the world over, and speaking broadly, poor crops are grown on inferior lands, and with certain striking exceptions, the land which was inferior fifty years ago is inferior to-day. In some countries it is possible to point to the definite improvement of the land over large areas. For example, drainage worked a transformation in England about a century ago, and washing the soil with irrigation water in Egypt has definitely changed the character of the land, in many areas, but, in India, it is difficult to point to any such wholesale improvement. Perhaps, the only striking example has been the wholesale levelling of land in the rice tracts, but this has been the slow work of centuries. In Sind, the only example, which comes to the mind, is the conversion of barren salt lands into rice lands, but this has been brought about more by the advent of irrigation, in any particular region.

The bulk of the cultivated land in Sind is the alluvial plain through which the Indus flows. Alluvial soil means soil formed from the deposit of soil particles which have been suspended in flowing water; and, as is well known, the particles dropped from the water vary with the speed of the water—the heavy or sandy particles being dropped from rapidly flowing water and the very fine and clayey particles from slow flowing or stagnant water. This difference in the speed of water from which the soil has been deposited is the explanation of the great variation in the character of Sind soils.

Broadly speaking, the soil of North Sind has a much superior texture to the soil of South Sind. This is because, in the north, the percentage of relatively large soil grains is high, while, in the south, it is low. Now, the former class of soil possesses certain very valuable characteristics; it is very retentive of moisture, it is easy to plough, clods are easily dealt with, and generally, cultivation is a simple matter and good crops can be raised with a minimum of labour and water. It is here that the fine crops of '*bosi*' wheat are produced, that is, wheat which receives no water during the period of growth. In sharp contrast, the very fine grained soil of South Sind gives the cultivator great trouble. The plough turns up large clods which are difficult to break down into a seed bed. This, in turn, causes much loss of

moisture from the soil, which impedes good germination. In order to produce good tilth, a larger number of tillage operations is necessary. Hence, the cultivator, after expending much energy, may still be rewarded with a bad stand of crop.

In addition to the character of the soils, as determined by the fineness or coarseness of the particles constituting them, as mentioned above, there is another very powerful factor affecting the physical character of the soil and that is, '*kalar*' salts, of which sodium chloride, sulphate and carbonate are the most important. The presence of *kalar* salts in the soil renders them, more or less, unfertile through all stages up to the point when nothing can grow. This *kalar* is distributed sometimes over hundreds of acres, but very commonly it occurs in patches giving the fields a mottled appearance. Fortunately, this *kalar* is not universal but it is never far away. It would, in fact, be difficult to pick out a block of five acres of land anywhere in Sind and to say there is not a single *kalar* patch in this area. The amount of salt present varies very much. It is greater in some tracts than in others. It occurs in huge continuous areas, or merely in small patches with every intermediate condition. Even in a single field, owing to the presence of the *kalar*, the crop may only be slightly stunted in one place while in another it may have failed to germinate.

It has been proved, by careful investigation, that the injurious effect of *kalar* is largely, though not wholly, physical, by spoiling the texture of the soil, rather than directly poisonous to the plant. The *kalar* salts, however, frequently become so concentrated in the soil solution as to cause direct injury to the plants.

When land is receiving irrigation, the exact location of the *kalar* infected land can be recognised without difficulty, because, being composed of soluble salts, it is carried up to the surface by the capillary action of the water and deposited on the surface layers as the water evaporates. On lands which are not under regular cultivation, there may be very little sign of *kalar* on the surface, due to its distribution in the soil and sub-soil, and, hence, the *zamindar* sometimes receives a rude shock by the appearance of *kalar* when he begins to cultivate such a piece of land. In the case of *kalar* infected land under cultivation, there is continuous process of upward and downward movement of these salts. The irrigation water penetrating into the soil tends to carry it downwards while capillary action has the reverse effect. Where the former predominates, the *kalar* can be got rid of, or, at least, kept in check, and this is the

explanation of reclaiming *kalar* land by growing rice on it. It is not, usually, a permanent cure, as, with the discontinuance of rice, there is a strong tendency for the *kalar* to rise again.

Considered from the agricultural standpoint, the great consideration with *kalar* is the damage caused by it to the texture of the soil. In cases where there happens to be a stratum of coarse sand in the sub-soil, the *kalar* does not work much damage, for, in that case, the *kalar*, which is driven down through the stratum of sand, cannot readily come up again, owing to weak capillary action in the sand. In soils of finer texture, however, such as are found over a large part of South Sind, the *kalar* proves very injurious as the fine-grained soils have their stiff character immensely reinforced by it (*kalar*). In fact, when a fine grained soil infected by *kalar* is watered the sequence of events is somewhat as follows: The water remains on the surface for an abnormally long time as though it could not enter the soil. As soon as free water disappears from the surface, the latter passes from the muddy stage with great rapidity to the hard crust stage—this is a matter of only few hours. If such land is left alone for a day or two it becomes so hard that it can hardly be ploughed. Even when dealt with, at the earliest opportunity, after the surface is dry enough for cattle to walk upon, the plough turns up large, rough clods, which soon become as hard as stones, if not broken down immediately. When left untouched after irrigation, these stiff *kalar* infected soils assume a very hard surface like concrete which soon cracks in every direction, with large fissures, about an inch or more wide, separating the soil blocks. The general effect is suggestive of a cobbled stone surface.

With such a soil, it is very difficult to prepare a good seed-bed and secure a good germination. Owing to the rough clods, the moisture disappears rapidly and the general result is that sowing must be speeded up by leaving the land in a relatively rough condition. In such circumstances, good germination is practically out of the question. This is specially so with *kharif* crops, because, the soil moisture evaporates so much more rapidly in the months of May and June than in the autumn months of October and November, when *rabi* crops are sown. Hence, on *kalar* infected lands, it is a common sight to see rough portions of the field where the crop has failed; on the other parts, the crop may be seen wilting or withering owing to excessive loss of moisture from the soil. *Kalar* is, in addition, of course, directly toxic to plants where it is present in sufficient quantity to make the soil solution too concentrated

with salt, but this is not the main effect of *kalar* in Sind which, as explained above, is physical.

In addition to the presence of *kalar* in Sind soils, as detailed above, there is one more factor which, though not of such magnitude as that of *kalar*, is still sufficiently important, at least, in certain areas. This is the sand trouble which is met with in many places in the Province but is especially severe in parts of the eastern desert known as the '*Thar*.' This sand trouble is the result of the alluvial origin of the soil. Everywhere in Sind, sand is met with, if you dig deep enough. Where the sand appears near to the surface, cultivation is most difficult, as nearly all crops greatly deteriorate as soon as their roots enter the sand.

As a result of *kalar* salts and sand in the soil, it is rare ever to see a uniform stand of crop over even a small field Sind. This does not prevent good average yields being obtained, but this is due to some parts of the crop being very good.

Subject to these great limiting factors of *kalar* and sand, however, the soil of Sind is, on the whole, of a very high quality. Where these two effects are not prominent, it is possible to grow some of the finest crops in India and the tree growth is also witness to the strength of the soil. Cotton crops, ranging up to two bales per acre, have been realised, as also rice crops up to two *kharars* (3,120 lbs.). The growth of fruit trees and roses is further evidence of the excellence of the soil.

We have so far dealt with, in a general way, the chief characteristics of Sind soils. The dominant factors are that the soil is, for the most part, alluvial, fairly coarse in the north but of fine consistence in the south and infected with *kalar* and sand in many places.

Apart from the broad distinction between the soil in the north and south of Sind, there is an almost infinite local variation. So much so is this the case that, there is a Sindhi proverb that the soil varies with the span of a partridge and this is literally true, making an even crop an almost impossible achievement. The proportions of sand and clay differ in the soil of different situations, affecting its consistency and porosity and the percentage of organic matter found present also varies. These differences are indicated by many vernacular names loosely used and often local.

The following is an attempt at a rough classification of the principal varieties of soil so distinguished.

(1) *Wariasi*, that is, loose sand, deemed fit only for melon cultivation. But almost any crop will grow in *wariasi*, if it is

sufficiently manured and watered. Groundnuts, *til* and garden roots do particularly well. A large part of the cultivable area in Umarkot and other parts of the Thar Parkar District is classed as *wariasi*. It is also called *daman* in Sukkur.

(2) *Kacho*, that is, the soil resulting from recent inundation. It is called *rao kacho* if used for *rabi* cultivation the same year and *pako kacho* if it has had a season or two to dry and harden. *Latiari*, *latwari* and *lasiari* are local names for varieties of this and *mithi* (sweet soil) is a general term applicable to it. *Gasiari* appears to indicate a larger proportion of sand. This soil is considered fit for almost all crops.

(3) *Chiki* or *paki*, hard baked soil, which has been submerged for a long time, also called *khaturi*, *tak*, *rappa*, *rip* and *dhubai*. When rough and cloddy, it is called *khariro* and *khariari*. It is very cohesive and heavy to work and, therefore, is not liked but rice, wheat, *jambho* and other crops do well in it.

(4) *Rao*, *rai-wari*, that is, the soil enriched by the detritus of hill torrents. It is naturally very various, differing in consistency as the basis of it is sandy or loamy. A light and very dusty soil, found about Hyderabad and called *dasar*, should apparently be classed with this; but the terms *dasar* and *gasar* are widely used for soft and light coloured but productive soils.

(5) Lastly, there is *kalar*, already dealt with. This has some distinguishing names. *Shor* and *that kalar* are quite unfit for cultivation, while *mithi kalar* is capable of producing rice at least. A good clayey *kalar* soil may have as much as six or seven per cent. of sodium chloride and may yet be fit for rice and, after it, for leguminous crops and oil seeds. This is, of course, because, the process of rice cultivation, during which water stands continuously in the fields and is frequently changed, washes out most of the salt. Such soil is known as *dangissi*, or *dangichhi*. *Kalrathi* is another name for soil in which *kalar* is mixed with good earth. In these soils, the salts are generally near the surface and can be washed out, so that regular irrigation, with drainage, may convert tracts which seemed to be hopelessly barren into fertile fields.

In the desert parts of Thar Parkar, all the soil is sand (called *dago*) but, nevertheless, yields small crops of *bajri*, after rain. Cultivation in that country is, however, generally confined to particular situations, such as flat valleys and

shallow, temporary tanks, where there must be a good deal of organic matter, from decayed aquatic vegetation. On the margin of the Rann also, there is hard soil, called *kathi zamin*, which is submerged in summer and yields *rabi* crops (wheat) after it dries.

The above are only the more important of the numerous varieties of soil found in the Province. They are, however, for all practical purposes enough to give us an idea of the agricultural aspects of the Province, so far as they are affected by the natural condition of the land.

CHAPTER III—CLIMATE

Owing to its prevalent aridity, and the absence of the monsoons, the climate of Sind ranks among the hottest and most variable in India. The average temparature of the summer months is 95° and that of the winter months 60°. But the thermometer frequently rises in summer to 114° and, occasionally, to 120°, while in winter, it falls at night a few degrees below freezing point, and ranges, even in the day time, from 40° to 80°. No other part of India has so long a continuance of excessively hot weather, owing to the deficiency of rain.

Hot scorching winds prevail in the hot weather months. These are very strong in the south of Sind, where they cause volumes of dust to pour through the atmosphere. The worst time for such winds is the forty-day period, known as the *Chaliho*, commencing about the end of April. In the north of Sind, these winds do not prevail but, on the contrary, the atmosphere is intensely still and close—but, wherever a breeze does spring up, the air feels like a hot blast from a furnace.

Owing to these hot winds and also because of the intense heat of the sun, shelter is a matter of the greatest importance. This applies particularly to garden areas and public roads. No garden should be established without first providing a strong wind-break or shelter on one or more sides of the area selected. Similarly, the importance of road side trees cannot be overstated. With them, the traveller can get along in reasonable comfort. Without them, he suffers severely, for, the very ground heats up to such an extent, in some places, as to be difficult to walk over, without protection for the feet.

The climate on the sea-coast, however, is much more equable in temperature than in Upper Sind. The air is moist and the climate, on the whole, resembles that of Bombay, though, it is better all round and much colder in the winter. In northern Sind, the conditions of the Central India plateau are exaggerated—the extremes of temperature being strongly marked. The thermometer at Shikarpur often sinks below freezing point in winter and ice forms as late as February; yet, in summer, for weeks together, the readings at midnight do not fall below 100°. Jacobabad boasts of the highest temperature yet recorded at an Indian Meteorological Station (127° in June 1919) and yet, it is also the coldest station in the Bombay Presidency.

The following figures of normal temperature at Karachi, in the extreme south of the Province and at Jacobabad, in the extreme north, will give a better idea of the position. Unfortunately, we have no Meteorological Station in Central Sind to see the conditions there, side by side. The normal figures are based on observations extending over thirty years. The following are the actual figures :—

Month	Normal mean maximum			Normal mean minimum		
	Karachi	Jacobabad	Difference	Karachi	Jacobabad	Difference
	°F	°F	°F	°F	°F	°F
January	76	73	− 3	58	44	−14
February	78	79	+ 1	61	48	−13
March	82	91	+ 9	68	60	− 8
April	85	100	+15	74	70	− 4
May	89	112	+23	79	78	− 1
June	91	114	+23	83	85	+ 2
July	88	109	+21	81	85	+ 4
August	86	105	+19	78	82	+ 4
September	86	104	+18	77	77	*Nil*
October	88	99	+11	74	64	−10
November	85	87	+ 2	66	52	−14
December	78	76	− 2	59	44	−15

From the above, it will be seen that, during the winter months, November to February, there is not much difference between the mean maximum temperature at the two places but as, with March, the summer sets in, the difference gets big, being of nine degrees. This increases to fifteen degrees in April and reaches its maximum during the two following months, May and June, when it is as much as twenty-three degrees. It continues large also during the next three months, July to September, ranging between eighteen and twenty-one degrees and comes down appreciably in October but even then, it is as much as eleven degrees. In other words, the climate of Jacobabad (representing North Sind) is normally very much hotter, by from ten to twenty-three degrees, for nearly eight months in the year, from March to October.

As regards conditions of cold weather, we see the same marked differences between the two stations. Thus, while during the hot weather period from April to October, there is not much difference in the normal minimum temperature at the two places, (the difference varying from nothing to four degrees,) the difference becomes perceptible, in this respect, (minimum temperature) with the advent of the cold weather in November, when it is ten degrees. The difference

remains very large, between thirteen to fifteen degrees, during the next four months, December to March, when it comes down again to eight degrees in March and is only slight further on. In other words, while Jacobabad is very much hotter than Karachi in summer, it is also very much colder in winter than Karachi. It must, here, be remarked that we are dealing here only with normal monthly mean temperatures. On some days in the year, the actual difference, both in the minimum and maximum temperatures, at the two places, is very much larger indeed.

We have, so far, seen the difference between the climatic conditions in the South (as represented by the temperature records at Karachi) and in the North (as represented by Jacobabad). Comparing the conditions, within each station itself, as they prevail at different periods, it will be found that, the climate of Karachi is much more equable than Jacobabad. In other words, Karachi does not exhibit as large a variation in its mean maximum and mean minimum temperatures as Jacobabad does. The following table will make this clear.

Month	Normal mean temperature					
	Karachi			Jacobabad		
	Maximum	Minimum	Difference	Maximum	Minimum	Difference
	°F	°F	°F	°F	°F	°F
January	76	58	18	73	44	29
February	78	61	17	79	48	31
March	82	68	14	91	60	31
April	85	74	11	100	70	30
May	89	79	10	112	78	34
June	91	83	8	114	85	29
July	88	81	7	109	85	24
August	86	78	8	105	82	23
September	86	77	9	104	77	27
October	88	74	14	99	64	35
November	85	66	19	87	52	35
December	78	59	19	76	44	32

The above figures are very illuminating. They clearly show that, while at Karachi the difference between the normal mean maximum and normal mean minimum temperatures ranges from seven to nineteen degrees, this difference varies between twenty-three and thirty-five degrees, at Jacobabad. Speaking in non-technical language, this means that while intense heat

and severe cold are experienced during the same period at Jacobabad, Karachi is aloof from such extremes. This is what is meant by " more equable " climate of Karachi. It may again here be pointed out that the above figures are for monthly mean temperatures. On certain days, the difference between the maximum and minimum temperatures at Jacobabad is considerably more than at Karachi.

This is about the variations in temperature. There is, at least, one more factor in which the two stations show the same marked differences. It is humidity. Owing to the proximity of the sea, the climate of Karachi is much more humid than Jacobabad, where the climate is quite dry.

The following figures of himidity at the two stations will, perhaps, better indicate the position.

Monthly Mean Humidity

Month	Karachi	Jacobabad	Difference
January	62	64	+ 2
February	68	56	−12
March	72	46	−26
April	75	41	−24
May	76	42	−24
June	76	55	−21
July	80	66	−14
August	82	72	−10
September	80	71	− 9
October	70	56	−14
November	62	57	− 5
December	58	66	+ 8
Annual	72	58	−14

It is clear, from the above, that the annual average humidity is greater by fourteen degrees at Karachi than Jacobabad. Except December and January, when Jacobabad is slightly more humid than Karachi, the climate is, throughout the year, very much more humid at Karachi than at Jacobabad, the most marked difference occuring from March to June.

The difference in climate in the south and north of Sind will be clearly seen from the above. But Karachi and Jacobabad are, perhaps, two extreme instances and considerable varieties of climate are to be found within these extremes. In fact, as already remarked before, the climate of Sind is among the most variable in India, and one description will not cover the climates of Sind. We notice marked differences within the same district. Thus, in the Karachi District, the climate along

the sea coast and in the hilly *Kohistan* is very different than the climate in the north of the district in the vicinity of the barren Lakhi range of hills. Similarly, in the Thar Parkar District, the climate in the irrigated west is vastly different from that in the desert east. In Nawabshah again, there is a very sharp division, in this respect, between the south and north of the district. Wide differences are found, in fact, in almost every district and to know these rightly we must review the climatic conditions in each district separately.

The following is a brief account of the nature of the climate experienced in each district of Sind :—

Karachi.—The climate of Karachi City and neighbouring country, which is in every direction open to the sea breeze, possesses a great superiority over that prevailing throughout the remainder of Sind ; the hilly country of *Kohistan* is also cooler in summer and warmer in winter than is the case in the plains. In the north, on the other hand, near the barren Lakhi range of hills, the heat often becomes insupportable. The hot season commences about the middle or end of March, reaches its maximum in the month of July and lasts till the end of August, when the temperature becomes once more tolerably cool. The annual temperature averages 79°. In the Indus valley part of the district, the climate is generally malarious and has very depressing effects on the character and physique of the residents.

Hyderabad.—The temperature of the district, though hot, is mitigated by the breezes from the sea, which blow with considerable force, from the beginning of the monsoon, almost incessantly, till the middle of September. During this period, 100° may be taken as the ordinary maximum of the day. Before the monsoon, however, the weather is extremely hot and dry and in the month of May, a temperature of 119° has often been recorded. The minimum temperature remains at about 80° from the opening of the monsoon to the end of September when it begins to fall ; but the heat of the day does not much abate till the end of November. During January and February, the thermometer seldom rises above 80° and during the night, has been known to fall below freezing point. Fogs are not uncommon in the cold season. In the north of the district, greater extremes of heat and cold are met with, while, in the south, the proximity of the sea adds moisture to the air. In the Tando sub-division, fevers are prevalent in consequence of the swamps, especially as the inundation recedes ; but, on the whole, the district, in normal years, is healthy.

Thar Parkar.—The climate differs considerably in the two portions of the district. In the western or irrigated portion, it is comparatively temperate but very malarious. In the desert or eastern part, it is generally healthy but subject to great variations of temperature—being excessively hot in summer and very cold in the winter—the cold increasing as the sand hills are approached. From the beginning of November to the end of February, the weather is pleasant and bracing, after which, the hot winds set in, accompanied with heavy dust storms. The glare and heat during the summer months are intense.

Nawabshah.—Climatically, the district is divided very sharply into an Upper Sind half and a Lower Sind half. The upper half includes, roughly, the talukas of Kandiaro, Nausharo and Moro and the northern half of the Nawabshah Taluka; while, the lower half includes, the southern half of the Nawabshah Taluka and the talukas of Sakrand, Shahdadpur and Sinjhoro. In the southern or lower portion, throughout the six hot months, a strong, steady sea-breeze blows a great part of every day and the whole of every night and heat is thus appreciably tempered. In the northern or upper half, however, this breeze disappears and the climate has the full rigour of the Upper Sind hot weather.

Larkana.—The climate is, next to that of Upper Sind Frontier, the severest in the Province. The great heat of the summer months is little mitigated by even such breezes as visit Sukkur from off the river at night; while the ubiquitous canals and general submergence of the country add moisture to the heat and bring mosquitos as a further trial. Dust storms also are not uncommon and fierce hot winds are common during the *Chaliho*, the forty days preceding May 15th. The temperature varies from a maximum of 120° in May to a minimum of 35° in January which means frost under the open sky. The cold season which begins in November is delightful as elsewhere in Upper Sind.

Sukkur.—The climate of Sukkur is that which prevails throughout Upper Sind. There are two well defined seasons, the hot and the cold. The former may be said to begin at any time after the middle of March, the latter after the middle of October. The temperature rarely exceeds 120° in May, June or July and to this extent Sukkur is cooler than Jacobabad. Dust storms are common in this district. The weather in December, January and February is ordinarily cold and bracing.

There are, usually, a few days in every year in which frost occurs.

Upper Sind Frontier.—The climate of the district is remarkable for its intense heat, the greatest in India, and its variations in temperature. The hot season extends from April to October and the heat is, usually, at its fiercest in the second half of May and in June, though, in May, there may be a difference of some fifty degrees between the maximum and the minimum temperatures. In June, the thermometer, at times, does not go below 90° for many successive days. There is some relief in September, and from about the middle of October the thermometer rapidly falls and fine bracing weather may be experienced upto March. At nights, during the winter (December, January), the cold is severe and frost is frequent. Jacobabad, the head-quarters station of the district, is the hottest registering station on the list of the Metereological Department and also the coldest in the Bombay Presidency.

CHAPTER IV—RAINFALL

Though it is on the edge of two monsoons, Sind is unrefreshed by either. The south-west monsoon stops at Lakhpat in Cutch in the south-east. The north-east monsoon passes no further than Karachi on the extreme south-west. The rainfall of Sind is, thus, scanty and irregular and it averages only about eight inches. The record of series of almost rainless seasons is occasionally broken by a sudden excessive fall. Of such deluges, one of the most notable occurred in Karachi in 1902 when, over seven inches fell in twenty-four hours. A similar heavy fall occurred in Karachi in 1926, while South-east Sind suffered very seriously from floods which destroyed thousands of acres of crops, as the result of a storm which occurred in the last week* of July 1927.

Over the greater part of Sind, in fact, rain is a nuisance rather than a benefit. Cultivation does not depend upon it but upon the river Indus. And excess of rain means that houses (which are usually all composed of mud) fall wholesale and that the country becomes unhealthy. This being the case, rain is usually not welcomed, and, in this respect, the greater part of Sind differs from most of India.

But there are two areas in Sind which are entirely dependent on the very uncertain rains. The first of these is a tract, largely hilly, on the western border, called generally *Kohistan*, and contained in the Karachi and south Larkana Districts, where irrigation is impossible, and where the scanty population depend, for their crops, on the very uncertain rains. The second tract lies in the south-east of Sind, north of the Rann of Cutch, which is generally known as the *Thar* or desert. Here, the rain is equally uncertain but the people have to depend on it for the growing of their crops, chiefly *bajri*.

Both of these tracts, depending on rainfall, are chiefly inhabited by semi-nomadic cattle and camel breeders. To them, the raising of crops is a subsidiary industry. Their principal wealth is in their cattle which feed on the grass and edible bushes which are found in the desert. The absence of rain is, therefore, much more important for its effect on herbage than on crops. A failure of rain, over a limited area, is of little importance, for, the people can and do go away to other centres; but, a wide failure is disastrous and leads to very big losses in their only wealth.

* During this one week, rainfall varying from 15 to 30 inches was received at a number of stations while falls of ten inches and over on one day were not uncommon in the area affected by the storm.

The following is a short account of the distribution of rainfall in the various districts of the Province.

Karachi.—Rainfall is very precarious in this district. The average for the district, as a whole, is about seven inches. The following table shows the maximum, minimum and average rainfall at the four typical stations in the district :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Karachi ..	West ..	7·62	27·94	1869	0·48	1871
Kotri ..	East ..	6·63	23·23	1908	0·47	1899
Shahbunder ..	South ..	9·96	41·18	1913	0·17	1899
Manjhand ..	North ..	3·88	19·25	1878	0·10	1899

Hyderabad.—The normal annual rainfall is about seven and a half inches. The following are the figures on record of rainfall received at a few typical stations :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Hyderabad ..	Centre ..	7·25	21·12	1913	0·40	1899
Badin ..	South ..	9·35	39·03	1913	0·29	1899
Hala ..	North ..	6·91	18·30	1913	0·84	1918

Thar Parkar.—The rainfall is not equal throughout the extensive area of the district. It ranges between a little over four inches at Sanghar and nearly fourteen and a half inches at Nagar Parkar. The rainfall also varies considerably from year to year as the following table will show :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Mirpurkhas ..	West (centre).	4·76	27·68	1927	0·20	1899
Umarkot ..	Centre ..	7·95	26·36	1913	0·06	1899
Nagar-Parkar ..	South-east.	14·57	40·96	1917	0·66	1899
Diplo ..	South-west.	8·99	29·47	1927	1·70	1918
Sanghar ..	North ..	4·17	12·67	1897	0·73	1904

Nawabshah.—The normal yearly rainfall amounts to about five and a half inches. The following are the maximum, minimum and average amounts received at some representative stations :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Nawabshah ..	South ..	6·42	18·71	1916	0·16	1918
Moro ..	Centre ..	7·22	18·79	1917	0·18	1918
Kandiaro ..	North ..	4·52	17·47	1917	0·45	1899

Larkana.—The mean rainfall for the district is a little less than five inches and though it does not vary much from station to station (the range being from a little over three and a half inches to a little over six inches) it varies widely from period to period. The following table shows the maximum, minimum and average rainfall recorded at a few representative stations in the district :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Larkana ..	North ..	4·44	17·70	1917	0·34	1880
Mehar ..	Centre ..	3·59	15·45	1878	0·34	1918
Sehwan ..	South ..	5·33	18·43	1917	0·26	1918

Sukkur.—The average rainfall for the district is a little above three and a half inches, varying from about two inches and a half at Sukkur to five and a half inches at Ubauro. The following table shows the maximum, minimum and average rainfall recorded at a few representative stations in the district. (There is no rain recording station in the east of the district) :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Sukkur ..	West ..	2·66	12·99	1890	0·03	1898
Rohri ..	South ..	3·07	12·82	1878	0·13	1898
Ubauro ..	North ..	5·31	11·99	1884	0·75	1901

Upper Sind Frontier.—The normal annual rainfall amounts to about four inches for the district as a whole. The maximum minimum and average rainfall recorded during the last fifty years at some typical stations in the district is noted below :—

Station	Situation	Average rainfall	Maximum recorded		Minimum recorded	
			Amount	Year	Amount	Year
		Inches	Inches		Inches	
Jacobabad ..	Centre ..	4·00	10·86	1917	0·13	1922
Kashmor ..	East ..	4·93	14·08	1917	0·06	1880
Shahdadkot ..	West ..	6·02	15·46	1917	0·60	1899

From what has been said, so far, it will be seen that, except in the desert portion (east) of the Thar Parkar District, where the annual average rainfall varies from ten to fifteen inches and is enough to produce, in a normal year, a fair amount of *bajri*, the main staple food crop of the area, the rainfall ranges only from five to eight inches throughout the rest of the Province.

This amount, in itself, is quite insufficient to produce any crop and it is due to this fact that the agriculture of the Province does not depend on the natural rainfall but on artificial irrigation.

If the river Indus rises in good time and maintains a good level for a sufficiently long time, a good agricultural season is ensured. If, on the other hand, it rises late, drops in the middle or subsides prematurely, then the year is certain to be a poor year. How far this rise and fall of the river (and with it of the inundation canals drawn from it) affects the agriculture of the Province is a matter which deserves special attention in a study of the agricultural conditions of the Province. It has, hence, been thought worth while to treat the matter at some length. This is done in a separate chapter (Chapter V—Irrigation) specially devoted to it.

CHAPTER V—IRRIGATION

Crop growing in Sind means inundation or irrigation ; for, the dry character of the soil and the almost complete absence of rain render irrigation a matter of prime importance here. Sometimes, indeed, for two or three years in succession, no rain, worth the name, falls in the Province. Under these circumstances, the Indus is to Sind what the Nile is to Egypt, and from time immemorial the super-abundant waters of the Indus have been restrained and directed by the art of man in irrigating his fields.

When the Province was annexed in 1843, numerous irrigation canals already existed, which derived their supply direct from the river. These canals are carried away from the river bank in the direction the water can most easily flow, to reach the fields that are to be irrigated. None of them has its head where the bank is really permanent and they can draw off water only during the inundation season. The river must, consequently, rise several feet before the canals will fill.

For a proper understanding of this phenomenon—the filling in of the canals after the rise or inundation of the river—it is first necessary to know certain broad principles of irrigation systems and the following is an attempt at elucidating the position.

The canals in Sind depend for their supply upon the river Indus. Canals of this nature, that is to say, canals which rely solely upon the natural flow of the rivers for the supplies, may be divided into two main types—(*a*) perennial canals and (*b*) inundation canals.

Perennial canals are provided with some arrangement in the vicinity of their heads, usually in the form of an obstruction across the bed of the parent stream, by means of which they are enabled to obtain their supplies irrespective of the level of the water in the river. The water is, by means of this obstruction, pounded up to the height required in the canal and seasonal fluctuations in the water level in the river are thus counteracted. The obstruction usually takes the form of a weir or barrage, fitted with shutters and sluices, whereby, surplus water, not needed in the canal, can be escaped down the river.

Inundation canals, on the contrary, have not such weirs and their supplies fluctuate with the natural water level in the river. When this rises, the level in the canal rises ; when

it falls, the level in the canal falls with it. Generally speaking, inundation canals obtain a supply only when the parent stream is in flood and the adequacy or otherwise of this supply—and therewith the area irrigable in the year in question—is consequently solely dependant upon the seasonal conditions. There may be an ample volume in the river but, in the absence of any method of raising its level, it cannot be forced into the canal until the water rises, of its own accord, to a sufficient level.

Now, Sind depends for its irrigation, at present, upon canals of the second type, namely, inundation canals, the supply of which fluctuates daily with the rise and fall of the water level in the river, there being no means, in most places, of regulating this level artificially, as is done in the case of most of the other great canals of India. When the Indus is in flood, the inundation canals obtain a full supply; when it falls in the cold weather, only the most fortunately situated obtain any supply at all and a minimum of twenty thousand cubic feet of water a second, runs waste to the sea. The majority of the channels commence to flow, in an average season, at about the beginning of June and cease to flow early in October, that is to say, they obtain water, and that only in fluctuating quantities, for some months during the monsoon. The only exception, perhaps, is to be found in East Sind where, owing to a special arrangement at Rohri, water is drawn out of the river for the whole year, to feed the system of canals, of which the Jamrao is the best known. Even this supply is not, however, assured and these canals suffer more or less deficiency each year.

It is to remove this uncertainty, arising out of dependence on the "inundation" canals, and to give the Province the security of "perennial" canals, that the construction of the Sukkur Barrage (dealt with later on) has now been undertaken.

Since the time of the conquest of Sind, the great indigenous irrigation systems in the Province had been attracting the attention of Government. The Mirs, although they had levied an additional tax on lands watered from the State canals, had discharged, very imperfectly, their duty of repairing and clearing the same, and the works were generally neglected and, in some cases, had fallen into disuse.

The early administration of the canals by the British Government was unsuccessful, the officers responsible for them being quite ignorant of the subject and it was not until the

appointment of Sir Bartle Frere as Commissioner in 1851 that any real work of improvement was started.

Sir Bartle Frere's first action was the enlargement and extension of the Begari Canal, which had been taken over at the annexation. The Ghar Canal, owing to the efficiency of which the portion of the Larkana District irrigated from it has earned the appellation of the "Garden of Sind," was also one of the first to receive his attention. The Fuleli Canal, one of the largest in Sind, was also much improved during this period (1857).

Since then, the Nara Supply Channel was opened in 1859, the Sukkur Canal was constructed between 1865 and 1870, the Jamrao Canal was commenced in 1894 and completed in 1901 and numerous other canals were constructed and are under construction. In fact, the problem, which first received serious attention in Sir Bartle Frere's time, has never been lost sight of and steady progress has been made in the direction during the last seventy-five years.

The following table shows the various existing canals in Sind, the period when they were constructed, their length in miles and the expenses involved in their construction, which will give an idea of the progress made and the magnitude of the work done so far :—

*Progress of Irrigation in Sind**

Number of work	Name of irrigation work	Mileage in operation		Estimated cost of construction (direct and indirect)	Date of completion of work	Date when system first came into operation	Average discharge in cubic feet per second	
		Main Canals and Branches	Distributaries				At head	
							Kharif	*Rabi*
1	2	3	4	5	6	7	8	9
		Miles.	Miles.	Rs.				
	A—PRODUCTIVE							
1	Desert Canal ..	288	33	27,49,968	1891-92	1872-73	3,439	
2	Unharwah ..	115	5	7,95,700	1890-91	1885-86	1,560	
3	Begari Canal ..	190	52	24,77,798	1890-91	1855-56	4,783	
4	Eastern Nara Works.	684	..	86,16,551	1897-98	1854-55	. ..	
5	Jamrao Canal ..	226	511	99,54,821	1901-02	1900-01	2,122	803

* Irrigation Administration Report, 1924-25. (Pages 504-505 and 536-537.)

Number of work	Name of irrigation work	Mileage in operation		Estimated cost of construction (direct and indirect)	Date of completion of work	Date when system first came into operation	Average discharge in cubic feet per second	
		Main Canals and Branches	Distributaries				At head	
							Khari	*Rabi*
1	2	3	4	5	6	7	8	9
		Miles.	Miles.	Rs.				
	A—PRODUCTIVE— *contd.*							
6	Sukkar Canal ..	128	14	14,84,574	1885-86	1870-71	2,076	271
7	Ghar Canal ..	165	146	6,78,303	1878-79	1856-57	6,298	
8	Alibhar Kacheri Canal.	58	..	1,07,169	1875-76	1873-74	291	
9	Great Marak Canal.	170	..	4,58,028	1881-82	1873-74	1,079	
10	Sarfrazwah ..	115	..	1,24,680	1875-76	1873-74	582	
11	Fuleli Canal ..	1,003	..	32,01,582	1892-93	1861-62	7,993	1,586
12	Hasanaliwah ..	90	..	3,09,579	1906-07	1903-04	712	
13	Navlakhi ..	109	14	1,35,678	Not completed		1,804	
14	Kairi Canal ..	89	..	96,333	1921-22	1922-23	770	
15	Pinyari Canal ..	400		11,78,885	1921-22	1922-23	2,692	
16	Indus Right Bank Canal.	104	..	88,760	1921-22	1922-23	Discharges incomplete.	
17	Indus Left Bank Canal.	192	..	2,58,938	1921-22	1922-23	Do.	
18	Sind Canal and Branches.	134	..	8,34,656	1921-22	1922-23	2,400	
19	Rajib, Chitti and Garang.	23	..	2,86,164	1921-22	1922-23	634	
20	Canals in Rohri ..	149	4	1,97,088	1921-22	1922-23	2,023	
21	Western Nara and Pritchard.	468	9	20,82,928	1921-22	1923-24	4,092	
22	Phitta ..	37	..	26,136	1921-22	1923-24	Discharges incomplete.	
23	Marviwah ..	15	..	9,737	1921-22	1926-24	190	
24	Gharo Mahomudo	225	..	1,09,785	1921-22	1923-24	824	
25	Kari Shumali ..	166	..	15,793	1921-22	1923-24	833	
26	Nasirwah ..	130	..	47,157	1921-22	1923-24	953	
27	Indus Canals, (other Canals, Fuleli Division).	139	..	1,15,783	1921-22	1923-24	..	
28	Dambhro ..	65	..	51,818	1921-22	1923 24	307	
	Total Productive..	5,677	788	3,64,94,392	..	..	..	

Number of work	Name of irrigation work	Mileage in operation		Estimated cost of constuction (direct and indirect)	Date of completion of work	Date when system first came into operation	Average discharge in cubic feet per second	
		Main Canals and Branches	Distributaries				At head	
							Kharif	*Rabi*
1	2	3	4	5	6	7	8	9
	B—UNPRODUCTIVE	Miles	Miles	Rs.				
29	Mahiwah ..	215	87	14,57, 602	1922-23	1901-02	2,257	
30	Dad Canal ..	286	130	27,01,169	1906-07	1901-02	2,545	
31	Nasrat Canal ..	216	69	18,66,759	1906-07	1903-04	1,239	
32	Sattah Canal ..	37	..	1,88,156	1909-10	1904-05	908	
33	Baghar Canal ..	159	..	7,80,847	1921-22	1922-23	7,821	
34	Dadu Canal ..	37	..	28,915	1921-22	1923-24	447	
	Total Unproductive	950	286	70,23,248	..	..	..	
	Grand Total ..	6,627	1,074	4,35,17,840	..	..	..	

Perhaps, however, the easiest way of visualising the growth of irrigation is by reference to the increase in cultivation, brought about by the extension of the canals. The following figures show the total cropped area and the total area irrigated at the end of each ten years since 1885-86—the year for which we have, for the first time, such statistics available :—

(*Area in thousands of acres*)

Year	Net cropped area	Area irrigated by canals	Percentage of canal irrigated area to net cropped area
1885-86	1,470	1,238	84·2
1895-96	2,655	2,009	75·7
1904-05	3,357	2,802	83·5
1915-16	3,254	2,935	90·2
1925-26	3,946	2,840	72·0

The area, no doubt, varies according to seasonal conditions but still the above figures certainly give a definite indication

of much progress. From the figures, it is clear that both the net cropped area and the area irrigated from canals in the Province, is now much greater than it was some forty years back.

The irrigation carried on by means of the canals may be classed under three heads. First, there is land which is above the level of the surface of water in full canals and on to which, consequently, the water will not run without the aid of machinery. In other words, the water has to be lifted on to the land by machinery. This machinery generally consists of a water wheel which is driven by bullock or camel gear. The work goes on night and day and the noise of the unlubricated wooden machinery is a very familiar sound. The bullocks or camels work in shifts, a shift being about six hours. The cultivator and his family erect temporary sheds and take up their positions adjacent to their wheels for the season. Watering the land in this way is known as irrigation by lift.

Second, there is land which is watered with the aid of machinery while the supply in the canal is low, but on to which the water will run without a lift when the canal is full. This method is, in fact, a combination of 'irrigation by lift' described above and of 'irrigation by flow' noted below.

Third, there is land which is so low that after the canal is about three parts full, the water can be run off without a lift; no machinery being ever used. All the cultivator is required to do in this case, is simply to direct the water course from the canal to his field, the water flowing down from the canal to the field by the law of gravitation. Watering the land in this way is known as irrigation by flow.

The cultivation carried on in these three classes of land may be thus briefly described :—

In the first case, the cultivator has his cattle and servants ready by, perhaps, the 15th of May, to commence working the water wheels, ploughing and sowing; but as the supply of water is dependent on the rise of the inundation, it never comes on the same date for two successive years and, of course, his cattle and servants are kept idle till it does arrive. When the water at length makes its appearance, work is commenced with activity and carried on steadily unless, from the river suddenly falling, the supply of water should be cut off, in which case, of course, there is an interruption and the cattle and servants are again idle. After this, a second subsidence of

the river is rare and the work proceeds steadily, but it also proceeds slowly. The rate at which the sowing is carried on is dependent on the number of bullocks the cultivator can procure and, of course, as at this period most of the other cultivators are similarly circumstanced, it is difficult to procure a sufficient number. The land is so hard and dry, that it must be watered before it can be ploughed. Time creeps on and before he has sown all his land, the best period for sowing is past. However, as he commenced early, a very small portion only of his crop is poor from late sowing; and, on the whole, the crop is good, unless, from the early subsidence of inundation in August, he has experienced difficulty in getting his water-wheels to throw up sufficient water—a subsidence of three or four feet in the level of the water doubling the labour and expense and halving the speed at which irrigation is carried on. Should this early subsidence take place, some of his crop will be inferior from being insufficiently watered.

In the second case, where the land is partly watered by machinery and partly without, the cultivator also waits the arrival of the water with his servants and cattle, and is, during the early part of the season, subject to the same losses and interruption. Later, however, he finds that the water is sufficiently high to run on to the land without a lift, and he, therefore, stops his wheel and employs all the cattle in ploughing. The sowing progresses rapidly, but a great part of it is late. Matters progress favourably till the river begins to subside, when a difficulty immediately arises. The river falls, perhaps three inches only, but the canals, owing to the mouth choking, fall a foot, and the water will no longer run on to the land without a lift. The wheel can do little more than water the land sown with its aid, the remainder of the crop suffers from want of water and what was sown, immediately before the water subsided, utterly fails.

In the third case, when the land is irrigated without the aid of machinery, the cultivator rarely commences till late in the season, as the canal must be nearly full of water and this does not take place till the inundation period is nearly half over; a great part of the crop is sown rather too late and when it is *jowar* or *bajri*, blights of various kinds very frequently destroy it. This description of cultivation is, moreover, exposed to two most serious risks; either the water begins to subside too early, and two or three inches of subsidence renders it impossible to water the land, or from some un-expected rise in the river a greater quantity of water comes into the canal

than can be used, it bursts its banks, and, of course, this description of land, which is always low, becomes inundated and the crop is partly, if not totally, destroyed.

With the cultivation exposed to so many risks, arising from the capricious nature of the water supply, it cannot be a matter for wonder that the people should look on the cultivation as a species of lottery. They are successful one season and bankrupts the next. No one who sows can tell what he will reap. Too little or too much water, the supply coming too soon or too late and blight, arising from sowing at the wrong time, combine to render the result of the cultivation very much of a speculation.

Over and above the irregular supply of water in the canals, as noted above, the striking features of the canal system are the irregular directions and numerous bends. In the north and centre of Sind, huge spoil banks mark the whereabouts of the canals. These are the consequence of clearance work which is a characteristic piece of cold weather work. The water entering the canals is heavily laden with silt and this becomes deposited so much so that if clearance is not regularly done many canals would cease to draw water. On the right bank, this is less noticeable in Larkana District owing to the lower level of the country, much of which receives 'flow' water; whereas, on the left bank, it is usual for the water to be lifted on to the land by *hurlas* and *nars* (Persian wheels).

In spite of these defects, however, irrigation by canals is the chief mainstay of agriculture in Sind. Normally, from about seventy-five to eighty per cent. of the net cropped area in the Province is served with irrigation (almost the whole of which is from Government canals). In fact, except two areas which are dependant for their cultivation on the very uncertain rains, almost the whole of the Province is dependent on irrigation for the raising of crops.

The first of the two areas dependent on rain is a tract, largely hilly, on the Western border, called generally *Kohistan*, and contained in the Karachi and South Larkana Districts, where irrigation is impossible and where the scanty population depend, for their crops, on the very uncertain rain.

The second tract lies in the south-west of Sind, north of the Rann of Cutch, which is generally known as the "*Thar*" or desert. Here, the rain is equally uncertain, but the people have to depend on it for the growing of their crops, chiefly of *bajri*.

The following table shows the proportion of irrigated area to cropped area in different districts. The figures are for 1924-25 which is a recent normal year :—

District	Net cropped area	Irrigated area	Percentage of irrigated to net cropped area
	(Acres	in thousands)	
Karachi	408	334	81·9
Hyderabad	663	663	100·0
Thar Parkar	964	391	—40·6
Nawabshah	532	484	90·9
Larkana	808	586	72·5
Sukkur	514	296	—57·6
Upper Sind Frontier	536	533	99·4
Total Sind ..	4,425	3,286	74·3

It will be seen from the above that in the districts of Thar Parkar and Sukkur the proportion of irrigated area to cropped area is low. This is because these districts comprise a very large area known as the "*Thar*" or desert, dependent entirely on rain for its cultivation. Similarly, in the Karachi and Larkana Districts, each of which comprises the tract known as '*Kohistan*' dependent on rain, this proportion (of irrigated area to net cropped area) is not again as high as it otherwise would have been. In the remaining three districts, Hyderabad, Nawabshah and Upper Sind Frontier, which do not comprise any such large tract, the proportion of irrigated area to net cropped area varies between ninety-one and hundred per cent.

For the purpose of irrigation administration, the canals in Sind are divided into two divisions (1) the Indus Right Bank Division and (2) the Indus Left Bank Division; very recently, a third division, the Sukkur Barrage Division, has been formed.

These divisions comprise five or six "Canal Districts" or 'Circles' each canal district including a number of canals some of which run in more than one district. The "Irrigation Districts" are not, thus, conterminous with the "Revenue Districts." The more important canals as they serve the various districts in Sind are noted below.

Karachi District.—The principal irrigation systems in this district, besides minor direct canals, are :—

(1) Baghar, (2) Pinyari, (3) Kalri and (4) Sattah. These systems traverse the talukas of Tatta, Mirpur Bathoro, Sujawal, Jati, Shahbunder, Ghorabari and Mirpur Sakro.

Hyderabad.—Almost all the canals in the Hyderabad District, except the Fuleli, issue from the Indus in Sakrand and Hala Talukas. All these canals were in existence before the annexation of the Province by the British but they have been since greatly improved. They are all purely inundation canals flowing from the end of May till October. The main canals are (1) Gharo Mahmudo, (2) Sarfraj, (3) Nasir, (4) Fuleli and (5) Hasanali.

Thar Parkar.—The principal canals which serve the district are the Jamrao Canal and the Eastern Nara Canals. The well-known Jamrao Canal is a perennial canal and gets a very good supply in the *kharif* and only a small supply in the *rabi* season. The three chief crops grown on the canal are cotton, wheat and *bajri*. The Eastern Nara Canals comprise the Eastern Nara, the Mithrao, the Khipro, the Thar and the Hiral.

Nawabshah.—The main canals in this collectorate are the (1) Nasrat, (2) Naulakhi, (3) Dad, (4) Alibhar Kacheri and (5) Great Marak. These canals, which are all ancient, were probably old channels of the river adapted to the purposes of irrigation and gradually improved. They are all inundation canals.

Larkana.—The main irrigation systems of this district are the (1) Ghar Canal, (2) Sukkur Canal and (3) Western Nara. The Ghar Canal is, evidently, a natural channel, some centuries old, and fed by the River Indus. The length of the main canal is forty miles. It takes off from a *dhand*, about thirty miles south of Sukkur, and traverses Rato Dero and Larkana Talukas. The chief crop on this canal and its branches is rice. The Sukkur Canal takes off from the right bank of the Indus, immediately above the island of Bukkur and passes through the Sukkur, Garhi Yasin, Rato Dero and part of the Shahdadkot Talukas. The chief crop on this canal is rice. The Western Nara system traverses the greater part of the Larkana District. The cultivation along this system is greatly rice.

Sukkur.—The main canals in this district are (1) Seharwah, (2) Mahiwah System comprising the Mahiwah and its important branch the Dehar and two other independent canals the Masuwah and Mahrowah, (3) canals in the Rohri Division which comprise the Ludiwah, Dengrowah, Mahesrowah, Koraiwah and Janibwah, (4) Sind Canal which is an old inundation canal and takes off direct from the Indus and (5) the Sukkur Canal which is a semi-perennial canal of old standing. Besides these, there are some minor canals like Rajib, Chitti, Garang, Garkino, etc.

The Seherwah is an old canal taking from the Gudu *dhand* and running through Ubauro Taluka. The Mahiwah runs through the Ubauro and Mirpur Talukas. The canals in the Rohri Division all run through the Ghotki and Pano Akil Talukas. The Sind Canal forms the boundary of the Sukkur and Shikarpur Talukas. The Sukkur Canal has already been noted under the Larkana District.

Upper Sind Frontier.—This district is mainly served by three canals, known as the Desert, the Unhar and the Begari Canals, besides by portions of the Ghar and Sukkur Canals which have been described in the Larkana District. The Desert Canal serves the eastern portion of the district. The Adio Wah, an independent canal, forms part of this system. The Unhar Wah takes off from a *dhand* in Khandkot Taluka and runs through it and the Thul Taluka. The most important branch of this canal, and one equally as big as the main canal itself, is the Nasirwah. The Begari Canal takes off from the Indus, north of Sukkur, in the Khandkot Taluka and, for above fifty miles, forms the boundary between the Sukkur and the Upper Sind Frontier Districts. It then runs through the Jacobabad Taluka. The more important branches of this canal are the Mirzawah and Nurwah.

The above is a description of the canal systems in Sind, as they, at present, serve the various districts. All of these canals are, however, 'inundation' canals and, as such, the supply of water available from them is not assured. To remedy this defect and to give the Province the benefit of an assured 'perennial' supply, the construction of the Sukkur Barrage has now been undertaken.

As the Sukkur Barrage, when completed, will be the largest work of its kind and will revolutionize agriculture in Sind, a rough idea of the Project will not be out of place here.

The Barrage is to be constructed across the Indus below Sukkur where the river passes through a deep gorge. The site chosen is some three miles down-stream of the gorge and from this point seven canals, four on the left bank and three on the right, will run southwards, taking up the irrigation at present effected from the existing inundation canals and extending facilities for cultivation to an enormous area, at present waste. The Barrage will consist of a masonry floor across the river, at a level somewhat lower than the average level of the river bed, above which an overbridge will be constructed. From this overbridge, shutters can be lowered on to the floor, when the river falls, thus pounding up the water to

the level required in the canals; Conversely, when the river rises, they can be lifted and the whole of the waterway of the bridge left free for the passage of floods.

The Barrage, with the canals necessary to utilise the water, when completed, will cost over eighteen crores of rupees. It commands an area of 7½ million acres, of which 6½ million acres is culturable. An annual area of irrigation of 5½ million acres is anticipated, of which two million acres represents existing inundation irrigation which will be given an assured supply by the new canals.

The estimated net return is 194 lakhs from water rates alone, but the bringing under cultivation of 3½ million acres, now lying waste, must lead to an increase under practically every head of revenue, such as railways, customs, stamps, excise and the like, not to mention the addition to the country's wealth, owing to the production on land, at present barren, of crops to the value of twenty-five crores of rupees per annum.

We have so far dealt with irrigation by Government canals. There is a very small area irrigated by sources other than Government canals but it is quite negligible. Thus, in 1924-25, a normal year, the total area irrigated from all sources amounted to 3,286 thousand acres. Of this, Government canals alone claimed 3,080 thousand acres or 93·7 per cent., the remaining 206 thousand acres or 6·3 per cent. being distributed among "Private canals," "wells," "tanks" and "other sources."

The following is the share per cent. of the various sources in the total area irrigated :—

Source of Irrigation	Area irrigated in thousands of acres	Per cent.
Government canals	3,080	93·7
Private canals	25	0·8
Tanks	⅓	..
Wells	43	1·3
Other sources..	138	4·2
Total ..	3,286	100·0

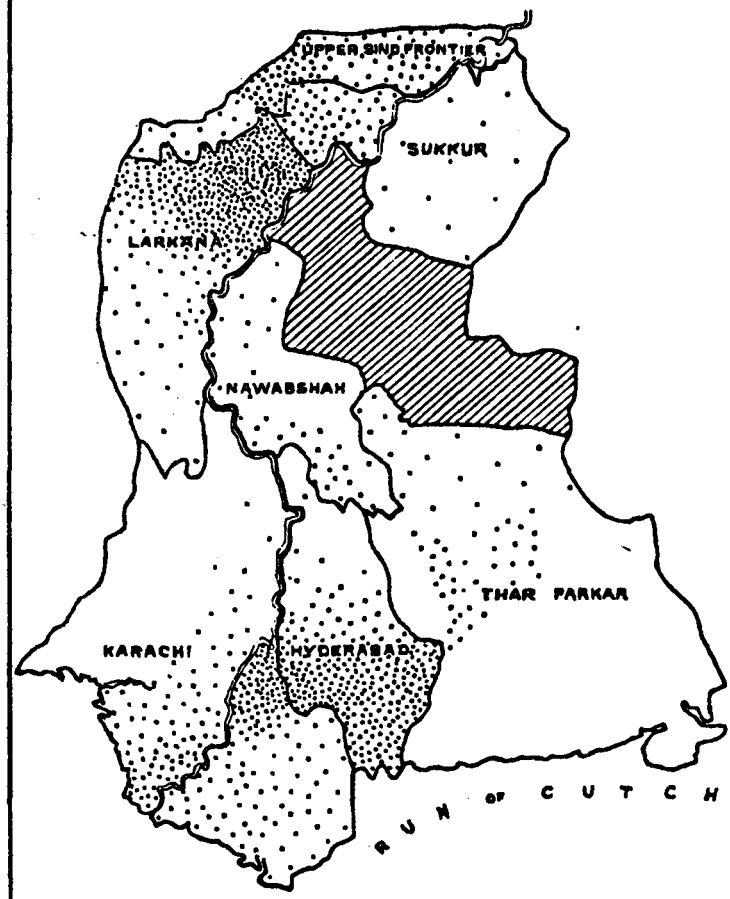
The "**Private canals**" are water courses constructed by the cultivator at his own expense. The irrigation from them, as will be seen, is quite small. There is practically no irrigation from "**tanks**" in Sind. The small irrigation from "**wells**" is not general but is practiced in certain regions where water is

found near the surface, though vegetable gardens and orchards are very commonly watered from this source (wells). The "**other sources**" include chiefly irrigation practiced on the margins of *dhands*; this does not differ materially from irrigation by lift on canals.

The various methods employed in watering the lands, such as irrigation by flow, irrigation by lift, etc., etc., have already been fully dealt with. In some cases, the crops are not helped with irrigation throughout the period of their growth but the land is copiously watered before the inundation subsides and crops grown on moisture thus available. Most of the canals in Sind flow during the inundation only and supply water for the *kharif* cultivation, the water arriving at the fields about the beginning of June and ceasing to flow in September or some time later; but by flooding the fields, just before the water subsides, *rabi* crops can be grown, to some extent, on such canals. This is known as '*bosi*' cultivation. In many low-lying parts, a similar *rabi* cultivation is carried on in lands which are annually submerged by floods; but this, which is called '*sailabi*,' has nothing to do with the irrigational system.

RICE.

Indian States are shown in the map thus _____ ▨



One dot in the above map represents 1,000 acres.

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P.Z.O. 1926

CHAPTER VI—CEREALS

RICE—(*ORYZA SATIVA*)

By far the most extensively grown crop in Sind is rice, though this Province has, in no part, where rice is cultivated, a greater average rainfall than ten inches per annum. As a result, it is exclusively an irrigated crop depending, at present, on the flow in inundation canals from the river Indus, in which water is available, as a rule, only from June to September. In spite of this limitation, the total area under the crop is about one and a quarter million acres, divided between two tracts of very different characters, widely separated from one another.

The attached map shows the distribution and the relative intensity of rice cultivation in these tracts and the following table indicates the area in the different districts :—

Area in 1925-26

District	Acres	Per cent.
Larkana	412,774	34·3
Sukkur	78,933	6·6
Upper Sind Frontier	111,285	9·2
Nawabshah	36,443	3·0
Hyderabad	261,717	21·8
Thar Parkar..	61,203	5·1
Karachi	240,907	20·0
Total, Sind ..	1,203,262	100·0

The Upper Sind rice tract is centred on the Larkana District, but extends into the Sukkur and Upper Sind Frontier Districts. These are among the hottest areas in India, but are supplied with water by flow irrigation in the inundation season. The land is alluvial and is usually well drained naturally. The conditions are very suitable for rice cultivation, yields upto 3,200 pounds of grain per acre are not un-common and high class rice is grown. Almost all the crop is transplanted from nursery beds.

The Lower Sind rice is grown in an area which is, to a great extent, actually in the delta of the Indus, with an extension to the east into the Nara valley. It comprises the lower parts of the Hyderabad and Karachi Districts (known as the "*Lar*") and a portion of the Thar Parkar District. The area differs from Upper Sind, in a considerably cooler climate during the rice growing season, both by day and night and far more moist

atmospheric conditions. The water is much less under control than in Upper Sind and, hence, the rices have to be and are adopted to the deep water conditions which prevail in a large part of the tract. The crop in the Nara Valley and in a large part of the "*Lar*" is broadcasted; in the remainder of the "*Lar*" it is transplanted as in Upper Sind.

The broadcast method of cultivation is usually followed in the case of low-lying lands, beds of *dhands*, natural depressions etc., which retain moisture for a long time and are not suitable for transplantation. As soon as such land is dry enough, it is ploughed several times and rolled; then the seed is put in broadcast about April and the land ploughed again. Water is not usually admitted until the plants have grown a few inches. Sometimes, the seed is put in with a drill and sometimes, the land is flooded and the seed is thrown on the water. From one to one and a half maunds* of seed are required per acre for this kind of cultivation. Transplantation, though more troublesome, gives far better results and is practiced wherever the nature of the land admits of it.

When the canals begin to flow, the seed-beds, which are generally a *guntha* (one-fortieth of an acre) in area, are prepared in the following way:—

The bed is levelled and scraped of its grass, etc., with a *kudal* (spade). The surface is packed and smoothed and the *bunds* repaired. Then a layer, about two inches thick, of cow-dung is evenly spread with a rake and packed and beaten down with its head-piece. Wherever there is scarcity of this material, it is supplemented by a six inch layer of paddy straw or a three-inch layer of grain husk, got from the mills. Cow-dung always forms the top layer when used in conjunction with any of these.

A day before sowing, fire is applied to the manure, preferably at noon, by spreading over it burning cinders which ignite the bed simultaneously all over. In about a couple of hours, the manure completely burns away. Next morning, seed is broadcasted over it, at the rate of forty to fifty pounds for a bed of about a *guntha* (one-fortieth of an acre). The water is immediately let in, a man constantly tapping down, with a bushy branch, the seed from floating on the water. In this process, the wet ash covers the seed and weighs it down. The nursery bed is watered every day so as just to cover the surface. After a couple of days, the seed germinates, after which, watering

* One maund is equal to 82⅔ pounds.

is given every second or third day, till the seedlings are fifteen to twenty days old, when they are ready for transplanting.

There are two methods of preparing the land for transplanting (1) puddling just at the time of transplanting, (2) ploughing after harvest once or twice when the land is moist enough. Puddling is resorted to in the case of hard, clayey soils where there is too much weed growth, or on soils which soon dry out and set too hard, after the harvest, for the plough to break them. In the puddling system, water is allowed in the field and when it has well soaked into it and softened it and some remains still on the surface, the soil is ploughed and cross ploughed. Immediately after, a light plank is rolled over, which buries in the mud all grass and smoothes the surface. In winter-ploughed lands (that is, land ploughed after harvest) no further treatment is given except repairing the *bunds* (embankments).

The water is then allowed in the fields and the work of transplantation commenced. This operation is generally done on contract. At the same time as the seedlings are plucked, bundled and brought in head-loads to the fields, the transplanters hold a bundle each in the left hand and, with the right, separate a bunch of six to twenty fair plantlets and force, with their thumb and fore-fingers, their roots into the soil. The bigger the plantlets the smaller is the number in the bunch and *vice versa*. About five hundred bundles are needed to plant a *jireb* (half an acre). The operation is undertaken during the morning only between 7 a.m. and 12 noon.

After transplanting, water is let in from the channels and allowed to remain in each plot. In the beginning, water is used carefully till the seedlings take root but in the later period of their growth the *hari* (cultivator) lets in as much water as the embankments can hold. They are generally from nine to fifteen inches high. The *hari* prefers a small quantity of water always flowing in the rice field afterwards. Beyond taking out weeds once or twice, there is no attention paid to the crop and one man is sufficient to keep off stray animals and attend to the watering of about fifteen acres.

Over and above the two most common methods of rice cultivation noted above, *viz.*, broadcasting and transplanting, a third and a rather peculiar method obtains in the deltaic lands of the Ghorabari, Ketibunder and Shahbunder Talukas of the Karachi District, which are within the reach of tidal influence of water, and liable to submergence of water, more or less salt. These lands are never ploughed, except by the feet

of the buffaloes which are turned in, after the harvest, to feed on the stubble and weeds. They knead the mud most effectively. When, with the rise of the Indus, fresh water predominates over the salt, it is admitted into the fields, which are enclosed with high *bunds*, and allowed to stand in them until the seed is ready to put in.

The seed undergoes a curious preparation. It is first packed in bags made of rushes and laid to soak for four days, in pits, filled with sweet water, then spread on platform of hardened clay, covered with mats and earth, and left for four days more. At the end of that time, having begun to germinate, it is washed, laid on mats and watered well for two days more. It is then ready for sowing, which is accomplished by throwing it in handfuls into the air and allowing it to alight, with the radicles lowermost, on the soft mud of the field, from which the water has previously been drained away. For the next three days, until the seeds are established and able to bear submergence, they are a sore temptation to birds and must be watched day and night. Heavy crops are obtained by this method of cultivation but only a species of red rice thrives on it. The mature grain which resembles wheat is utilised by the local inhabitants for food, while the straw is eaten by cattle, especially by buffaloes.

The time of maturing varies very widely among the different varieties of rice, some varieties ripening much earlier than others. Roughly speaking, however, the crop is ready for harvest by about the end of October. Four men or six women can cut a *jireb* (half an acre) per day but if the land is too wet it takes six men or ten women for the job. If the operation is done by contract by outside labour, the wages are paid in kind from one and a half *kassas** to three *kassas* per *jireb* cut, with a liberal allowance of straw to feed their cattle, during the period of engagement. The harvest extends over one month and a half, chiefly owing to different varieties maturing at different times. As the crop is cut, it is kept on the field to dry, for a couple of days and then removed in head-loads to the threshing yard.

The threshing is done, as with all other crops, under the feet of cattle. A hard piece of ground is selected, levelled with the *kudal* (spade) and mud plaster applied if the soil surface is soft. Generally, a team of four or five cattle are made to tread out paddy by walking over a circular heap. Paddy grain easily separates from the straw and, unlike wheat, as the grain

* The *kassa* is a measure and the grain in it weighs twenty-six pounds.

of each charge separates, the straw is removed to one side with a wooden fork and a new charge is added on to the heap until the whole stock is finished up this way. Then, the grain with the fine straw or chaff is heaped up and kept for winnowing and the paddy straw made into head-loads or bound into big cylindrical rolls. The threshing is generally started at 10 in the morning and the day's work is over by about 4 in the afternoon. Four cattle, with a man and a boy, can thresh out a maund (eighty-two pounds) of grain per hour. The straw rolls are very neatly bound. Each roll weighs about three to four maunds and will fill one whole cart.

The winnowing is done in the usual way when the wind blows. With a good breeze, one man can clean out twenty maunds of grain in a day of eight hours.

The yield of rice varies considerably with the variety, date of sowing, nature of soil and irrigation conditions, from eight hundred to twenty-five hundred pounds of grain and from about twelve hundred to thirty-two hundred pounds of straw per acre.

Recent crop experiments show the average yield as follows in the various districts of the Province :—

Out-turn in pounds per acre of rice (clean) irrigated

Karachi	830
Hyderabad	1,030
Thar Parkar	1,760
Nawabshah	1,100
Larkana	1,850
Sukkur	980
Upper Sind Frontier	1,450
Average for Sind ..	1,360

There are very many varieties of rice proper (*Oryza sativa*), both wild and cultivated. The wild forms often appear as weeds in cultivated rice and are frequent sources of contamination. All the wild forms have the character of shedding most or all of their grain.

The cultivated varieties of rice of Sind are also many and thirty-five of these have been classified in the following table. In this table, the first distinction has been made into beardless and bearded rices and then the various types further separated according to the colour of the leaf-sheath and of the inner and outer glumes, the colour and character of the grain, etc.

Variety	Colour of leaf sheath	Colour of grain	Character of grain	Colour of inner glumes	Colour of the tip of inner glumes	Colour of outer glumes
A—BEARDLESS VARIETIES						
1. Parsad	Green	White	Fine	White	Colourless	Colourless.
2. Barsati	,,	,,	,,	,,	,,	,,
3. Jirashahi	,,	,,	,,	Yellow	,,	,,
4. Jajai	,,	,,	,,	,,	Coloured	Coloured.
5. Un-named type A.	,,	,,	,,	,,	,,	,,
6. Chajrai	,,	,,	,,	,,	,,	,,
7. Un-named type X.	,,	,,	,,	,,	,,	,,
8. Red Kangro	,,	,,	,,	Red	Colourless	Colourless.
9. Bidri	,,	,,	,,	,,	,,	,,
10. Sathri	,,	,,	,,	,,	,,	,,
11. Ratrya	,,	,,	,,	,,	Coloured	Coloured.
12. Ganjro	,,	,,	Coarse	White	Colourless	Colourless.
13. Pista or Kariaro.	,,	,,	,,	Black	Coloured	Coloured.
14. Kangni	Red	,,	Fine	White	Colourless	Colourless.
15. Sathrya	,,	,,	,,	,,	,,	,,
16. Kanjro	,,	,,	Coarse	,,	,,	,,
17. Torh	,,	,,	,,	,,	,,	,,
18. Un-named type G.	,,	Red	Fine	,,	Coloured	,,
19. Sindhi Kambro	,,	,,	Coarse	,,	Colourless	,,
20. Un-named type Y.	,,	,,	,,	,,	Coloured	,,
21. Ganja	,,	,,	,,	,,	,,	,,
22. Lari	,,	,,	,,	,,	,,	,,
23. Motio	,,	,,	,,	,,	,,	,,
B—BEARDED VARIETIES						
24. Sighro	Green	White	Long	Yellow	Colourless	Colourless.
25. Sonahari	,,	,,	,,	Red	Coloured	Coloured.
26. Sada Gulab	,,	,,	,,	,,	,,	,,
27. Un-named type B.	,,	,,	Fine	White	Colourless	Colourless.
28. Un-named type C.	,,	,,	,,	Yellow	Coloured	Coloured.
29. Prong	,,	,,	,,	,,	,,	,,
30. Bengalo	,,	,,	,,	,,	,,	,,
31. Motiaro	,,	,,	Coarse	White	Colourless	,,
32. Un-named type 2-A.	Red	Red	Fine	,,	Coloured	,,
33. Un-named type D.	,,	,,	Coarse	,,	Colourless	Colourless.
34. Un-named type Z.	,,	,,	,,	,,	Coloured	,,
35. Un-named type E.	,,	,,	,,	Black	,,	Coloured.

The above table represents the whole of the types of rice which have so far been found in various parts of Sind. It will be seen that they present great variety. Out of the thirty-five varieties, twenty-three are beardless and twelve bearded. The leaf sheath is green in twenty-one and red in fourteen cases. Twenty-five rices have white grains and ten have red grains. Thirteen types are classed as coarse grained, three as having long grains and the remaining nineteen as fine-grained.

The following notes indicate the status of each of these varieties in the cultivation of the crop.

A.—Beardless Varieties

1. *Parsad*, also known as *sukh parsad*, has a fine, white grain and is an early variety. The straw is strong. It is not grown on a commercial scale.

2. *Barsati.*—This is Lower Sind rice. It gives a fine, white grain, is early and yields fairly well. It is not grown on a very large scale.

3. *Jirashahi.*—This comes from Hyderabad. Its grain is very small, like cumin seed, as its name implies. It ripens late, has strong straw and has a large tillering capacity. It is not grown on a commercial scale.

4. *Jajai.*—This is an important *sugdasi* (scented) variety ranking among the highest quality rices of Upper Sind. The area under this variety is not very large being chiefly in the Mirokhan and Kambar Talukas of the Larkana District. The straw is tough and not liked by cattle.

5. *Un-named type A.*—This is a new *sugdasi* type discovered as a strong plant which has a fine grain like *jajai*. It is very early but a poor yielder and shows much sterility.

6. *Chajrai.*—This is a Lower Sind rice not grown on a large scale. Its grain is fine and white but it is a poor yielder.

7. *Un-named type X.*—This is a *sugdasi* type found in a field of *jajai* ripening earlier than the latter. It yields fairly well and the grain is fine and white.

8. *Red Kangro.*—This is an early Upper Sind variety with a superior white grain, though with a red husk. The yield is higher than the common, quick maturing types. It is not grown on a large scale.

9. *Bidri.*—This early rice, grown in Larkana on high lands, is a dwarf variety with a coarse grain. It can withstand a good deal of salt in the soil. It is grown on a fair scale, on high lying lands.

10. *Sathri.*—This variety, commonly grown on high lying lands in Upper Sind, is early in ripening but gives a poor grain, though the straw is much liked by cattle. It can withstand a good deal of salt in the soil.

11. *Ratrya.*—This is a variety common in the Nara Valley, where it is known as *Nara* rice. It is also grown in the Tando area of Hyderabad under the name "*khorwa*" rice. It is the best in quality of Lower Sind rices, giving a white, medium quality grain and yields fairly well. It has a very light husk.

12. *Ganjro.*—This is a very early Upper Sind variety, which is grown on high lands in small patches. Its grain is coarse and the straw is brittle but much liked by cattle.

13. *Pista or Kariaro.*—This variety is termed "*pista*" owing to its small grain resembling a pistacio nut, and "*kariaro*" (nigerseed), on account of its black husk. It is an Upper Sind type and is tall, late in maturity and yielding fairly well.

14. *Kangni.*—This is the standard type of rice for Upper Sind and is grown on all kinds of soils except those which lie low. The grain is white and medium in quality and the straw is good. It forms the diet of the mass of the population and is parboiled and then exported on a large scale.

15. *Sathrya.*—This is a type, very similar to *kangni*, in the Nara Valley in Lower Sind. It gives a tall plant which lodges badly, matures early and only gives a small yield.

16. *Kanjro.*—This Upper Sind variety is very rarely grown. It is a late type, has medium sized plant with a white, small but coarse grain.

17. *Torh.*—This is an important variety in Upper Sind for high lands and it can withstand salt in the soil fairly well. It is a heavy yielder and has good straw but sheds its grain badly. The grain is coarse and fetches a low price in the market.

18. *Un-named type G.*—This was found as a stray plant, with a fine red grain, in a field of *kangni* rice.

19. *Sindhi Kambro.*—This is an early variety from Lower Sind, with coarse, red grains. It is not extensively grown.

20. *Un-named Type Y.*—This was again found as a stray plant. It is a type with a very heavy grain, yielding high and giving a coarse red grain.

21. *Ganja.*—This is a Lower Sind variety, grown on high lands. It lodges very badly, its grain is rather coarse and brittle and is very low priced.

22. *Lari.*—This is an Upper Sind variety whose name implies that it was originally obtained from "*Lar*" in Lower Sind. It is grown on low lands and the plant is tall and matures late. It lodges very badly. The grain is very poor and sells at a very low price.

23. *Motio.*—This is a low land variety from the south of the Hyderabad District. It is a tall plant and matures late. The grain is coarse, red and heavy and fetches a low price. It is largely used in Hyderabad.

B.—Bearded Varieties

24. *Sighro.*—This is an Upper Sind variety, early in ripening and occasionally grown on patches on high lying lands. The plants are not tall and the straw is much liked by cattle. The grain is fine and the yield fairly good.

25. *Sonahari.*—This is an Upper Sind variety which has a very light, thin, brittle grain. The plant tends to lodge badly.

26. *Sada Gulab.*—This is a superior *sugdasi* variety in Upper Sind with a rose coloured husk. The grain is very brittle. This rice is not commonly grown.

27. *Un-named type B.*—This was originally found as a stray plant in Upper Sind. The plant is tall, late in ripening and yields a long, heavy grain and a strong straw.

28. *Un-named type C.*—This is again developed from a stray plant in Upper Sind. It has a fine, white grain but the yield is low.

29. *Prong.*—This is second only to *kangni* in extent of cultivation in Upper Sind. It is tall and matures late. The grain is long, thick and heavier than all the other *sugdasi* varieties. The straw is tough and not liked by cattle.

30. *Bengalo.*—This is a scented rice from Lower Sind. It is a fair yielder and the grain is fine and white.

31. *Motiaro.*—This variety is found in the south of the Larkana District, where it is much appreciated and fetches a good price. It is a low land variety, is tall and matures late. The grain is coarse.

32. *Un-named type 2-A.*—This is a wild rice in Upper Sind, with very luxuriant growth and coarse red grain.

33. *Un-named type D.*—This again is a wild rice in Upper Sind. It has a coarse red grain and is a low yielder.

34. *Un-named type Z.*—This is also a type from Upper Sind with a very long, thick, red grain. It has a large yield, ripens late and the grain sheds badly.

35. *Un-named type E.*—This is another wild rice from Upper Sind, dwarf in character, the leaves being very conspicuous with a dark margin. The grain is red and coarse and has a black husk. The shedding of grain, in this variety, is very great.

As is well-known, in India, rices are brought and sold on the character of the grain and a general preference is shown for rice which has a slender grain. All so-called coarse rices have a broad grain and so slenderness is essential for a rice to be counted as fine. As regards the length of the grain, opinions differ as to whether long grain is to be preferred to a short grain but the consensus of opinions is that a long slender grain is a finer rice and this commands a higher price in the market.

If we classify, in this manner, some of the principal Sind varieties of rice, *prong*, *sighro*, *red kangro*, will have to be counted as long rices. Among fine rices, may be mentioned the *bengalo*, *sonahari*, *jirashahi*, *chajrai*, *parsad*, *kangni jajai*, *barsati*, *bidri* and *sathri*, while among coarse rices must be put the *lari*, *torh*, *Sindhi kambro*, *motiaro*, *pista* and *kangro*.

Generally speaking, it may be said that nearly all the commercial varieties of Upper Sind, including *kangni*, the *sugdasi* varieties and *sathri* are oval grained and, hence, highly valued for quality in the market. The Lower Sind varieties are mostly flat grained and, hence, are valued lower. Exceptions are the *torh* and *motiaro* varieties in Upper Sind which are flat grained but are grown for their high yield. Slender rices are practically unknown in Sind and have little or no market.

Over and above the size and shape of the grain, there are one or two more factors to which the consumer attaches vital importance at the time of purchasing rice. These are the aroma and flavour in the grain and its cooking qualities. Rices with high flavours and good cooking qualities bring in much more than those not possessing these qualities.

The so-called '*sugdasi*' varieties of rice in Sind derive their name from the presence of flavour and aroma in the grain and in the plant,—"*sugdasi*" meaning flavour in *Sindhi*. Graham describes this fragance as a mouse-like smell possessed by the grain and also noticed when the rice is in flower in the field. It is usually not appreciated by Europeans but is held in high esteem throughout India. The *jajai* variety is the typical *sugdasi* rice.

In addition to their flavour and aroma, the *sugdasi* varieties have good cooking qualities, as, for instance, they are said to

swell up on boiling, to an extent that no other rice does. They are reputed to require less *ghi* in cooking than the coarse types.

The best known *sugdasi* rices are *jajai* and *prong* of Northern Sind, but the following varieties are also considered to come within the *sugdasi* group: *sonahari, sada gulab, type A* and *bengalo.*

It may here be mentioned that, though the cultivator knows that some varieties of rice are decidedly superior to others he has to restrict his selection to such varieties only as will grow in his field and under the water supply available. The choice of variety from the cultivator's standpoint depends on the following factors: (1) quality of the inundation, (2) low or high situation of the field, (3) kind of soil. If the inundation is too late, the cultivators will put in early ripening varieties, like *sighro* or *sathri,* rather than late ripening varieties like the *sugdasi* varieties. In low-lying fields, where there is likelihood of too much water standing, they put in *lari* and *motio* and not *torh* and *kangni* which should be sown on higher levels, where there is no danger of too much water standing. Poor salt lands should receive a variety like *torh* rather than the *sugdasi* varieties which must be sown on good, retentive soils, with natural drainage. Among the late ripening varieties may be mentioned (1) the *sugdasi* varieties in general, (2) *torh,* (3) *kangni,* (4) *motio,* (5) *lari,* (6) *sathri,* (7) *sighro* as the principal ones. Among varieties which will stand a good deal of water may be mentioned the (1) *lari,* (2) *motio,* (3) *kangro,* (4) *torh,* (5) the *sugdasi* varieties, (6) *sathri* and (7) *sighro.*

Sind rice is immune from many diseases to which it is subject in other parts of the world. '*Ufra*' of Eastern Bengal and '*Blast*' of America have happily no brother in Sind rice. Even insect pests are few and none of them is a serious danger. The '*Cantharid*' beetle, feeding on the flowers, the '*Leptocorisa*' bug, sucking the ripening grain, and grass-hoppers eating leaves may be observed in parts but the danger is not great. Among the fungus diseases, smut is one of the most important and it is reponsible almost every year for some definite damage to the crop. There is also one more malady which assumes serious proportions in certain years and in the case of some fields. It is sterility or semi-sterility of the heads. This is termed '*Khas*' in Sind and the term is applied to any condition in which the grain fails, to an abnormal extent, to set or to mature. Wholly sterile heads are rare in Sind, even in a year when *Khas* is prevalent. The corresponding condition is known as *Brusone*

in Italy, as *Falla* in Spain, as *Imotsi* in Japan, as *Tiem* or *Tiu* in Cochin China, as *Gwabo* in Burma and, perhaps, as *Mentek* in Java. All attempts, so far, have not enabled this malady to be connected very clearly with either insect or fungus attack. It seems, however, that the malady increases under certain condition of weather, water and soil. Thus, it has been found that, there has been excessive sterility (*Khas*) in years in which westerly winds occurred at the time of flowering of the late varieties. Sudden and repeated changes of temperature seem also to encourage the malady. Similarly, it has been found that late varieties of rice, for which the water partially fails in the latter part of the season, show a very high percentage of sterility. In a year of very high floods, sterility has also been found to be considerable. As regards soil conditions, it has been found that, in very poor soils, where the growth of the plants is stunted and the earheads small, the percentage of sterility is high. It must here be pointed out that the question of finding the root cause of the evil is yet under investigation and the above are only tentative conclusions which subsequent investigations may or may not confirm.

There are, however, two serious animal pests to which the crop is susceptible and which take a very heavy toll of the crop annually. These are (1) the rat and (2) the crab.

There is no other tract in the Bombay Presidency, which reports such a heavy loss of crops due to damage by rats as Lower Sind. The rats are known to do damage over very large areas of the rice growing tract of the above region (Lower Sind) almost every year. During some years, the damage is little, while in others, it is enormous. The years of heavy damage are actually known as plague years.

The hot and dry climate, absence of heavy rain, abundant supply of shelter and food throughout the year and a soil suitable for farming burrows seem to be some of the factors which favour the existence and breeding of rats in Sind. The shrubs, standing in the middle of the fields, the surrounding uncultivated area abounding in bushy growth and the luxuriant grassy growth all over the lower lands, afford the rats excellent shelter and protection from their natural enemies. For, it has been observed that, the rat burrows are generally situated under these bushes or, where these are absent, in the midst of thick grass and very rarely in the open. The tubers of *dheer* (*Scirpus subulatus*) and *kal* (*Scirpus maritimus*) and the roots of *dab* (*Eragrostis cynosuroides*), which are very

nutritious, supply them with food material, even after the rice crop is harvested and they migrate towards such grassy areas, generally standing in low situations near *dhands* or reservoirs of water where they also get water to drink. Under these favourable conditions, the rats live and breed profusely, increasing in number from year to year.

The rats are in the habit of moving from place to place according to the season, to be near enough to their food supply. They are mostly attracted to the rice fields, during the months of August to November, and to the grassy areas during the remaining period of the year.

There are three distinct species of Sind field rats, *viz.*, (*a*) *Gunomys sindicus* (*b*) *Nesokia huttoni* and (*c*) *Meriones hurrianae.* The first one only is, however, seriously harmful and is responsible for the rat plagues, the other two being almost or quite harmless.

The damage done by the injurious rats mainly affects rice and is of three different types, namely, the cutting of the seedlings, the sucking of the ear heads in the milk stage and the removal of the ear heads when fully developed. The last type of loss is by far the most serious and, in plague years, may mean the loss of a large proportion of the crop. In ordinary years, it comes to one or two annas in a rupee, that is, from six to twelve per cent.

So far, three methods have been found of use in reducing the evil, *viz.*, (1) Hand digging of the burrows and destruction of the rats, (2) Poisoning the rats by attractive baits and (3) Fummigating the burrows with poisonous vapours. The first method (hand digging of burrows) has only a limited scope on account of the difficulty of getting skilled labour and the very heavy cost. Poisoning by baits, made of cooked flour and crushed wheat, mixed with about 0·5 grains of strychnine, was found to be effective but as only fifty per cent. of the rats eat the baits, the method cannot be said to be entirely satisfactory. The surest method, yet deviced, seems to be fumigation of burrows with carbon bisulphide or still better with hydrocyanic acid from calcium cyanide dust, by means of a good fumigator.

With regard to the crab trouble it may be stated that this is confined chiefly to South Sind. The species is *Paratelphusa spinigera.*

The crabs occur both in *bunds* as well as in the fields themselves and are distributed equally all over. Fields lying near

reservoirs of water, however, contain a greater number of them and are more affected by them as agricultural pests. The crabs live inside burrows in the soil. This affords them shelter from their enemies and from the extremes of temperature. The season of activity of these creatures begins just after the first showers in June and lasts till October or part of November. The damage done to the rice crop by crabs may be briefly described as (1) direct, that is to say, the actual eating of the crop in (*a*) the seed bed and (*b*) after transplantation in the field and (2) indirect, that is to say, the effect of a number of breaches in the embankments (*bunds*) in reducing the yield. A third kind of loss, which is of still greater importance is the cost of repairs to the *bunds* on account of the habitation of crabs in them.

With regard to the damage to the seed-bed, it may be said that, as soon as the seedlings come up, the crabs come out of their burrows at night and nip off the tender seedlings. The damage on this account, is not, however, very large.

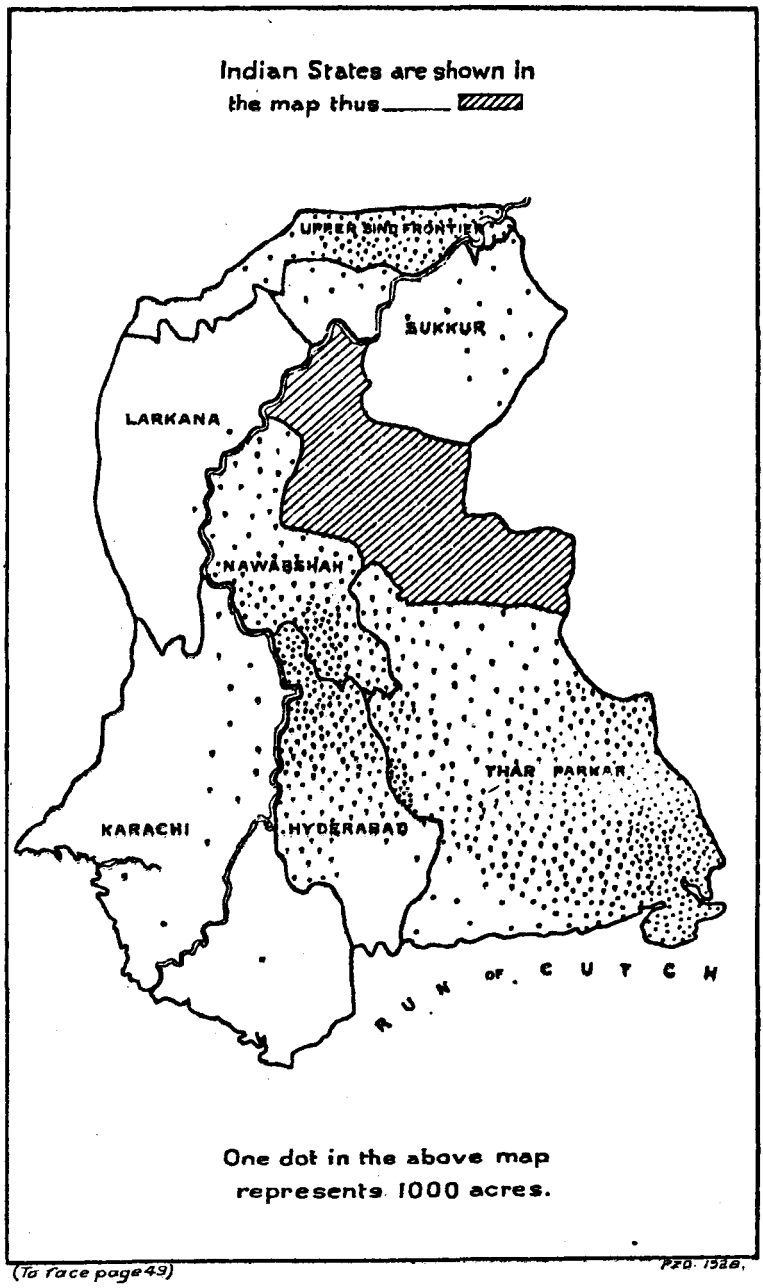
The damage to the transplanted crop begins just after transplanting and continues almost till the crop is harvested. The damage is greatest when there is a large quantity of water standing in the field. For, then the crabs can float to the most luxuriant growth of the crop and eat to their heart's content. The damage considerably diminishes when the water is drained off.

Besides the damage described above, there is another kind of damage, *viz.*, the indirect effect of breaches, produced by the burrows of crabs in the *bunds*, in reducing the yield. On account of the breaches, water immediately begins to leak out of the field. In course of time, the water, as it flows, widens the breach and a big current is formed, which washes off a large part of the fine material in the soil. Rice is a crop which requires a constant supply of water to stand in the field and in the absence of water and the fine soil rich in plant food, the crop suffers. The cultivator must, therefore, either suffer this loss in crop or must bear the expenses incurred in repairing properly the breaches in the *bund*.

It is not, of course, possible to say in money value the amount of damage done by the crabs, though, in certain cases, it must be fairly large.

Fumigation by carbon bisulphide has proved a method of destroying crabs in their burrows. It can be practised any time from June to October, when all the burrows are open.

BAJRI.



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BAJRI—*SPIKED MILLET*

(PENNISETUM TYPHOIDEUM)

After rice comes *bajri* in order of importance. This grain and *jowar* constitute the principal food of the working classes, but *bajri* is the more wholesome and is much more extensively cultivated, especially in Thar Parkar and in Nawabshah. In the other districts, there is more *jowar* than *bajri*. The following table shows the distribution of area under *bajri* in the various districts of Sind :—

Area in 1924-25

District*	Acres	Per cent.
Thar Parkar	630,239	61·3
Hyderabad	156,127	15·2
Nawabshah	121,378	11·8
Upper Sind Frontier	83,731	8·1
Sukkur	20,852	2·0
Karachi	14,906	1·5
Larkana	1,496	0·1
Total, Sind ..	1,028,729	100·0

As soon as water enters the canals, generally in the early part of June, the Persian wheels are set at work to irrigate the land preparatory to ploughing. When the surface moisture has been partially absorbed, seed is scattered and the land ploughed again. The seed rate ranges from six to sixteen pounds per acre. The field is then divided into compartments, by low earthen ridges, for convenience of irrigation, and the land irrigated. Another watering is given ten days or a fortnight later and after that the waterings succeed each other at intervals of a week or ten days; sandy soils require water more frequently. The spike in its sheath appears in about forty days. A fortnight later, the grain begins to form in the spike and watching of the crop becomes necessary. This is done very carefully by the cultivator or some one of his family. *Bajri* is ready for the sickle in three months. The spikes are cut off by the reapers, men and women hired for the occasion, and stacked at a previously prepared threshing floor. The reapers are commonly paid in kind. The spikes are cut off quite short, the stalks being reaped afterwards. When all the spikes have been collected, they are spread out to an even depth, around a pole fixed in the ground, and the grain trodden out by cattle. The outturn of grain averages about six hundred

*Note.—The districts are arranged in order of importance, that is, the one with the largest area coming first, that with second largest area standing next and so on. This arrangement is followed throughout.

pounds per acre for the Province as a whole. In the different districts, the average yield, per acre, for an irrigated crop, as ascertained from recent crop tests, has been as follows :—

District	Lbs. per acre
Karachi	1,050
Hyderabad	560
Thar Parkar	640
Nawabshah	825
Larkana	...
Sukkur	495
Upper Sind Frontier	660
Average for Sind ..	610

The method of cultivation, above described, prevails in the Hyderabad District and, with little modification, throughout Sind, in irrigated lands. In the desert portion of Thar Parkar and wherever cultivation depends on rain, the farmer has to adapt himself to quite different conditions. He cannot begin till rain falls, which may be in June or in July or not till it is too late to be of any use. Dams are usually put up across valleys or hollows, to confine the precious water. Immediately after the ground has been sufficiently moistened, it is ploughed and then rolled with the *sanhar* to prevent the moisture evaporating. A few days later, it is again ploughed and the seed sparingly distributed with a drill. Six pounds suffice for an acre. After that, the progress of the crop depends on more rain. The time of reaping should be October, but varies with the time of sowing. The outturn is small compared with that of irrigated lands—a little over three hundred pounds per acre—.

JOWAR—*GREAT MILLET OR INDIAN MILLET*
(SORGHUM VULGARE)

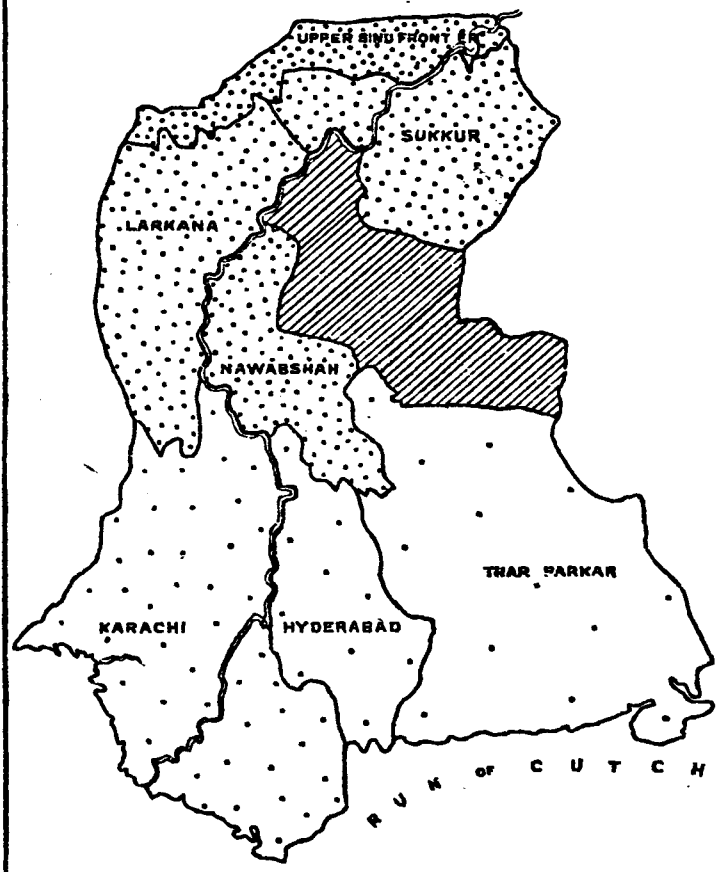
Jowar occupies an area of over half a million acres and stands next in importance to *bajri*. The chief cultivation of *jowar* is in the four northern districts of the Province, as will be seen from the following table :—

Area in 1924-25

District	Acres	Per cent.
Sukkur	141,976	25·2
Larkana	132,686	23·6
Upper Sind Frontier	113,947	20·2
Nawabshah	103,931	18·5
Karachi	46,400	8·3
Thar Parkar	13,460	2·4
Hyderabad	10,023	1·8
Total, Sind ..	562,423	100·0

JOWAR.

Indian States are shown in the map thus ——



One dot in the above map represents 1,000 acres.

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The cultivation of *jowar* is similar, in all respects, to that of *bajri*, save that the crop matures in four instead of three months and, consequently, requires water for a longer time. Manure is not usually employed unless the land is cultivated without fallows. The seed, which is soaked over-night in water, is scattered by hand, the usual rate being from eight to twenty pounds per acre. Subordinate crops such as *saon* (*Panicum miliare*), *guvar* or field vetch (*cyamopsis psoralioides*), *mug* or green gram (*Phaseolus mungo*), *channro* (*i.e.*, *chavli*, *Vigna catiang*) are frequently sown with *jowar*, either mixed with it or along the edges of the compartments. In some parts, such as the south of the Karachi District, *jowar* and *bajri* are grown together. Seedlings are transplanted from patches of the field, where they are thick, to patches in which the seed has not germinated well and it is the popular belief that transplanted *jowari* sends its roots deeper and yields more than that which has not been moved.

Jowar grows to a height of ten to twelve feet and the heads therefore have to be cut off after the reaping; the grain is threshed in the same way as *bajri*.

Jowar straw, called *kadbi*, is excellent as fodder for cattle and horses and is sheaved and stacked in ricks (*dan*). The stalk (*gano*) is sweet and is eaten to a small extent by the cultivators, like sugarcane.

The crop grown in the *adhava* season, or hot weather months between the regular *rabi* and *kharif* crops, which is called *arhari jowari* is simply cultivated as a fodder.

The average outturn of *jowar* comes to about eight hundred pounds per acre for the irrigated crop and nearly half this quantity for the unirrigated crop, though there are considerable variations from district to district. Recent crop experiments with *jowar* have given the following amounts of yield per acre in the case of the different districts :—

Average yield of Jowar (in lbs. per acre)

District	Irrigated
Karachi	715
Hyderabad	480
Thar Parkar	640
Nawabshah	1,100
Larkana	1,090
Sukkur	685
Upper Sind Frontier	725

If rain falls near harvest time, *jowari* sprouts again from the roots after being cut and a second crop is obtained in March

or April. If rain falls again in May, another *kharif* crop may be obtained from the same roots.

WHEAT—(*TRITICUM SATIVUM*)

As regards wheat, Sind may be said to be intermediate between Bombay and the Punjab. In certain parts of the Province, the methods of cultivation, the nature of the soil and the character of the wheats are similar to those in the Punjab, but in other parts, an approximation is seen to the wheats of Northern Bombay. The Sind wheats are generally pronounced superior to those of Bombay and possess a larger proportion of soft, white forms. The Delta wheats, however, are specially liable to rust.

In Sind, wheat closely follows *jowar* in point of area. It is chiefly grown in the three northern districts of the Province, which occupy more than 70 per cent. of the total area under the crop.

The following table shows the distribution of area under wheat in the different districts of Sind :—

Area in 1924-25

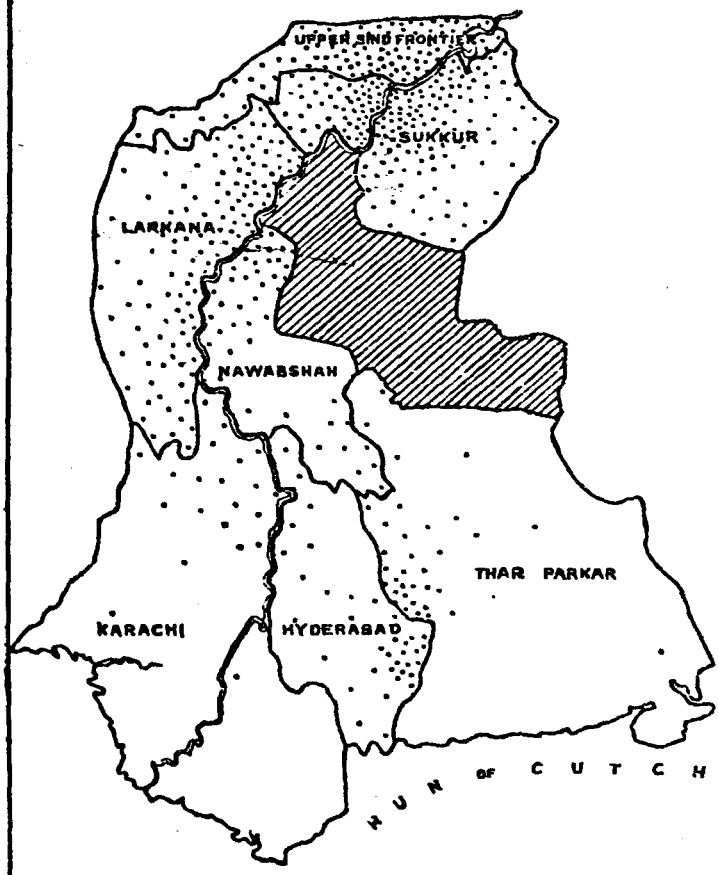
District	Acres	Per cent.
Sukkur	180,052	33·3
Larkana	122,749	22·7
Upper Sind Frontier	89,253	16·5
Hyderabad	50,059	9·3
Nawabshah	43,390	8·0
Thar Parkar	34,691	6·4
Karachi	20,575	3·8
Total, Sind ..	540,769	100·0

Wheat is grown either in lands submerged by the spill of the river or of a canal, in which case, it is known as *sailabi*, or on lands which have been given a flooding, by irrigation, towards the end of the inundation, when it is known as *bosi*. These methods are also supplemented by winter irrigation, obtained by means of a wheel erected on a well (*chahi* irrigation) or on the river or lake (*dhako* irrigation).

The land intended for wheat, is first allowed to be well-soaked with water, either by the spill of the river or canal or by artificial irrigation. It is then ploughed once or twice, when dry enough, and levelled with a heavy beam, drawn by bullocks, the drivers of which stand on the beam. This is partly to break the clods, partly to pulverise the soil and partly to consolidate the surface. The object of the cultivator

WHEAT.

Indian States are shown in the map thus _____ ▨



One dot in the above map represents 1,000 acres.

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on such soils is to prepare a seed-bed and at the same time to lose as little of the moisture as possible.

The beds of *dhands*, etc., are prepared in the same way as above, as soon as the excess water dries off them.

As a rule, the wheat crop is not directly manured. Indigo refuse, where available, used to be a favourite fertiliser. *Sailabi* lands and lands commanded by the inundation canals do not require manure as they are annually enriched by deposits of silt.

On the inundation canals in Sind, the rotation is usually *jowar* or *bajri* one year and wheat another but, in some cases, wheat alone is grown. On the Jamrao Canal, the rotation is cotton one year and wheat the next, with catch crops of *jowar* and *bajri*. In all cases, long fallows are given periodically.

The best cultivators usually keep their own seed and in some cases select the ears in the field for sowing the next crop. The poorer classes of cultivators obtain seed from the grain dealer or money lender and this is often poor in quality.

Wheat is, as a rule, drilled on *sailabi* lands where it is essential that the seed should reach the moisture. If, however, the *sailabi* lands are moist enough, the seed may be broad-casted on the unploughed surface and worked into the land by two cross ploughings. A common form of drilling is to drop the seed into a bamboo tube attached to the plough. This work is generally done by women and children, while the ploughs are driven by the men of the family. Except in the case where the seed is drilled, the land, after sowing, is smoothed and the surface is consolidated by a beam. By this means, a firm seed-bed is obtained and the upper moisture is conserved.

The seed rate varies enormously—the range being from fifty to one hundred and fifty pounds per acre but about one hundred pounds may be taken as the average quantity of seed required per acre.

The last operation of all, on irrigated land, which is carried out before germination takes place, is to divide the land into compartments for greater convenience of watering. This is done by means of ridges, made of earth. The compartments vary in size according to the lie of the surface and are always much smaller in well-irrigated lands than where water is obtained from canals.

As a rule, the wheat crop is not weeded except by the best cultivators. This is mainly due to the scarcity and dearness of labour.

The sowing of wheat usually takes place in November and December. Harvest begins about the middle of April and extends well into May. The grain is cut by hand, by means of a sickle, the workers usually squatting on the ground. Large bundles are made, so that, they may be readily counted and are usually stacked roughly for threshing. The extreme dryness of the straw makes this possible and no loss is suffered by the wheat in the bundles heating. Indeed, so dry and brittle is the straw that the straw bands for tying have to be soaked in water to make them tough enough for the purpose.

The labourers are paid usually in kind, from one-twentieth to one-fifteenth of the quantity each reaps but where the area to be reaped is large and where labour is scarce, the hired labour has often to be paid in cash.

Bearded wheat is generally grown in preference to beardless in Lower Sind, as this is less liable to the depredations of birds and sheds its grain less easily, thus suffering less damage if it remains standing in the field.

The grain is generally trodden out by the feet of cattle assisted by the *phala* or threshing frame. This frame consists of a hurdle covered with brushwood and weighted with bricks or clods of earth. The bullocks are yoked to the frame and fastened to a post in the centre of the threshing floor of beaten earth. They are driven round and round the stake, about which the wheat is heaped and, in a short time, the brittle straw is broken up into short pieces and the grain is freed from the chaff. One pair of bullocks will tread out the produce of an acre in about four days.

The grain is separated from the chaff by being thrown into the air by a pitch-fork when the hot winds which prevail at this time carry the dry chaff to a distance, while the grain falls back on the threshing floor. The winnowing basket (*chhaj*) is then used to clean the grain so obtained.

The chaff (*bhusa*) is used for fodder and is especially valuable when mixed with gram chaff. When grown with gram, the two plants are threshed together and the resulting grains are often ground and eaten together.

The yield naturally varies according to the season and other conditions, so that an average produce estimate is difficult.

Recent experiments on the crop have, however, given the following as the average yield obtained in different districts :—

Average yield of Wheat (in lbs. per acre)

District	Irrigated
Karachi	670
Hyderabad	640
Thar Parkar	800
Nawabshah	900
Larkana	1,400
Sukkur	710
Upper Sind Frontier	920
Average for Sind ..	930

Wheat is stored in the houses of the cultivators as a rule but the old practice of keeping it in pits is still in vogue, in some of the districts. The pits are lined with wheat chaff but after about a year, grain so kept is apt to darken and deteriorate. For household use, the grain is kept in large earthen jars. The well-to-do cultivators have granaries of mud or even of brick in some districts. After the monsoon, the wheat is sunned and dried, as a protection against weevils.

We have so far dealt with the cultivation of wheat as a main crop, that is, when its outturn is the principal consideration. Sometimes, however, wheat is sown as a *dubari* or second crop after rice, in soils retentive of moisture and of good texture. In doing this, the object in view is not so much the otturn of wheat, as the improvement of soil and subsequent benefit to the following rice crop. When wheat is sown as a *dubari* crop, in rice fields, the method of cultivation adopted is something like this.

The soils which support *dubari* wheat are, as noted above, generally more retentive of moisture and of good texture.

After the paddy harvest, when land comes in condition for ploughing, the seed is broadcasted, at the rate of about sixty pounds per acre, and ploughed and cross ploughed. No other tillage is done. The variety of wheat sown is *thori*. The moisture is ample at the time and the germination is good; but the after-growth of the crop is not vigorous, due to constant cropping of the soil. The plants are stunted, the grain heads small and the yield very poor, not more than three to five times the quantity of seed sown. Manure is not generally added to the soil. But such soils as come in condition for ploughing soon after harvest, so that ample time intervenes before sowing

of wheat, are manured lightly, with well rotten goat manure, ploughed and *samared* four times and then seeded with a drill, like *bosi* wheat. In such soils, the yield is from seven to eight hundred pounds per acre. Sometimes, in order to keep up the fertility of the soil, a mixture of wheat and *matar* (*Lathyrus*) is sown. The cultivator, on his own part, is not very eager to grow *dubari* wheat, as the labour entailed in maintaining it, is relatively high, considering the amount of wheat usually obtained. But the *zamindar* (landlord) compels the *hari* (tenant) to do it in his ow self interest, as not only does the *zamindar* get a share of wheat produce, however small, but that, at the cost of the *hari*, he indirectly gets his lands ploughed up. This tillage is recognised as beneficial to the succeeding paddy crop. *Dubari* wheat is rotated sometimes with gram and *matar*.

Rusts are the most important diseases of wheat in Sind. Indeed, the damage, caused every year by these diseases, far exceeds that resulting from all other wheat pests put together. Fortunately, the damage from rust is small in Sind, as compared with that in some parts of the Bombay Presidency, the Central Provinces, the United Provinces and Bengal. The Delta wheats, however, are rather badly attacked with rust in some years. In general, the most widely accepted view is, that long continued rain or cloudy weather in January or February gives rise to those conditions under which rust spreads with great rapidity. It is certain also, that rust is sometimes caused by over-irrigation. The only remedy, so far found effective, has been the sowing of certain varieties of wheat which are rust-resisting.

Wheat is also attacked by smut at times, though the damage is not generally serious. Smut is caused by the fungus '*Ustilago tritici*' and makes its appearance as the wheat is flowering. Infected ears are found to be black in colour and to be composed of a loose dusty mass of spores. These spores are usually entirely blown away by harvest time, leaving only the naked stalk where the ear should be. The only remedy is to burn the smutted ears as quickly as possible, to avoid the use of seed from infected fields, and to treat the seed with solution of copper sulphate.

Wheat is sometimes attacked by mildew, a disease caused by the fungus *Erysiphe graminis* but the damage done is slight.

Among diseases caused by insects, may be mentioned the wheat stem-borer (*Nonagria uniformis*). This caterpillar bores out the stem of the wheat, giving rise to white, prematurely withered ears which are easily distinguished among the green crop. The best remedy is to collect and burn the wheat straws

which are first attacked, so as to destroy the caterpillars and thus check the spread of the pest. Prevention is possible, if attention is paid to the destruction of the stubble of the previous crop (rice or *jowar*), from which the pest usually comes over to the wheat crop.

Another insect pest, which damages the crop, is the wheat aphis (*Macrosiphum granarium*). This appears on the young plant, feeds on the young leaves and, during the ripening period, is often found in large numbers, sucking the juices out of the ear. If the weather during January, February and March is favourable to wheat, little damage results, but if wet and cloudy weather, which gives rise to an unhealthy condition of the crop, occurs at this time of the year (which is rarely the case in Sind), the ravages of this pest are considerable and poor grain is formed.

Surface grasshoppers, of a peculiar type, do injury to young wheat, in years of short moisture. These insects live in the soil and are found feeding on seedling crops. They are themselves the colour of the soil and are found principally in fallow or newly sown lands. Large areas of land can be freed from them, at very small cost, by the use of the bamboo frame and cloth bag. Surface weevils, flea beetles, caterpillars, the rice-stem fly are among the other insect pests attacking the crop. The damage, from any of them, has not been, so far, considerable.

It may be generally said that, none of the insect pests of wheat need be feared, if the weather has been favourable to the crop and if the supply of moisture has been abundant. It is only when external conditions have been unfavourable to the wheat, and the crop is unhealthy, that any of these insects cause appreciable damage.

Besides the diseases due to insects and fungi which have been described above, the wheat crop suffers damage through other causes. Rain, for instance, at harvest time or when the grain is still on the threshing floor causes much injury. This is, however, a rare occurrence in Sind. Severe frost about January, often damages the crop seriously in the Province. Dry winds, just before harvest time, sometimes dry up the crop and lead to shrivelling of the seed.

Many attempts were made for many years to introduce exotic wheats in Sind, as in other parts of India. Until recently, such introductions had been a long record of failure. But, of late, great success has been obtained, either with the introduction of wheats from Northern India or in making

selections in the wheats grown locally. In thus determining and developing types of wheat suitable for Sind conditions, two methods have been followed. Either the kinds of wheat, more recently developed in North India, have been imported and grown, or, else, selection has been started in the local "*Phandani*" and "*Thori*" types grown hitherto in Northern Sind and in awned wheats, grown in Lower Sind. Both methods are proving successful in the great wheat growing areas of the Province and "Pusa 12" wheat is now the standard type in Larkana, Sukkur and Upper Sind Frontier. The selections made from "*Phandani*" and "*Thori*" are also proving a success in North Sind, and are giving twenty per cent. higher yield than the varieties from which they are selected.

MAIZE—(*ZEA MAIZE*)

Maize is not a common Sind crop except in areas near Karachi, as a fodder, but recent experiments on it clearly indicate that it is a crop which has great possibilities in the Province, with a regulated water supply.

The crop, at present, occupies an area of about two thousand five hundred acres, almost the whole of which is to be found in the Karachi District. Hyderabad and Thar Parkar also grow it to the extent of three to four hundred acres each, but the cultivation is practically absent in the remaining districts.

The following table indicates the present position of the crop with regard to its area and distribution in the different districts :—

Area in 1925-26

District			Acres	Per cent.
Karachi	..	..	1,832	69·8
Thar Parkar	..	..	444	16·9
Hyderabad	..	..	259	9·9
Nawabshah	..	..	79	3·0
Upper Sind Frontier	..	..	10	0·4
Sukkur	..	..	1	*nil*
Larkana	..	..	*nil*	*nil*
	Total Sind	..	2,625	100·0

Maize is grown, chiefly as a subordinate crop, in the *kharif* season and, as a fodder crop, in the *adhawa* (hot weather) season. The *kharif* sowing takes place in June or July.

The seed is mixed with cotton, *jowar* or *bajri*. The crop ripens in September, but the cobs are cut, while the grain is still soft in them, if intended for use as a vegetable.

Two types of maize, grown at Sakrand (Central Sind), one from Gujarat (Panch Mahals) and the other from the Deccan, in the *kharif* season, as a grain crop, gave a yield of twelve hundred pounds of grain per acre, in the case of the Deccan variety, but a very poor yield (of only four hundred and thirty pounds of grain per acre), in the case of the Gujarat variety. Not only was the yield of the Gujarat variety much lower but the crop never had the healthy development which the Deccan type showed, being neither as tall nor as luxuriant as the Deccan one.

It is clear, from the above, that though all the varieties of maize are not suitable for cultivation in Sind, at least some of them, if properly selected, have a future.

BARLEY—(*HORDEUM VULGARE*)

Barley occupies an area of from fifteen to twenty thousand acres in Sind which is distributed as follows in the various districts of the Province :—

Area in 1924-25

District			Acres	Per cent.
Karachi	..	..	9,707	60·1
Larkana	..	..	3,002	18·6
Hyderabad	..	..	1,625	10·0
Nawabshah	..	..	1,149	7·1
Sukkur	..	..	399	2·5
Upper Sind Frontier	..	..	147	0·9
Thar Parkar	..	..	131	0·8
	Total Sind	..	16,160	100·0

Barley is a *rabi* or spring crop, being sown in October and reaped in March or April. It is not usually grown alone but is mixed with wheat, gram, peas or lentils. Rapeseed and mustard are also commonly sown in barley fields, either as a border or in rows.

The soil, which is generally light and sandy and but sparsely manured, is prepared in September-October, by ploughing and cleaning and the fields are irrigated, by turning a stream into them, from some neighbouring canal. The seeds are sown, in plough furrows, either by hand direct or down a hollow bamboo, fastened to the plough stilt, to the average amount of about one hundred pounds per acre. After the sowing is completed, the seeds are covered in by the plough, the coarse clods of earth are broken and again smoothed by a heavy, flat, wooden log, drawn by oxen and kept steady by a man standing on it. The amount and frequency of irrigation varies with the character

of the soil and climatic conditions. Barley requires very little weeding or at least receives little, so, with the exception of possible irrigation, the crop is left very much to itself, till the season of ripening in March-April, when it is reaped like wheat, by being cut in the middle of the stalk with a sickle, tied in sheaves and stacked near the homestead to dry. When quite dry, these sheaves are unbound and threshed out by a flat board with a short handle. The grain, thus separated, is usually mixed with the ashes of cowdung before being stored, to prevent the attacks of insects.

The outturn of barley varies very widely, according to the character of the soil, climatic conditions and amount and frequency of irrigation. In some experiments, made at the Government Experimental Farm at Hyderabad (Sind), the crop gave a yield of from two to three thousand pounds of grain and from four to four and a half thousand pounds of fodder, though this would appear to be rather above the average.

Barley grain is a good feed for both horses and cattle, either given alone or mixed with gram.

OTHER CEREALS

In addition to the principal cereals, dealt with so far, a few other minor cereals are cultivated in Sind. The chief among these are, **ragi or nachni** (*Eleusine coracana*), **vari or small millet** (*Panicum miliaceum*) and **rala or Italian millet** (*Setaria italica*) which, normally, occupy the following areas, in the various districts of the Province :—

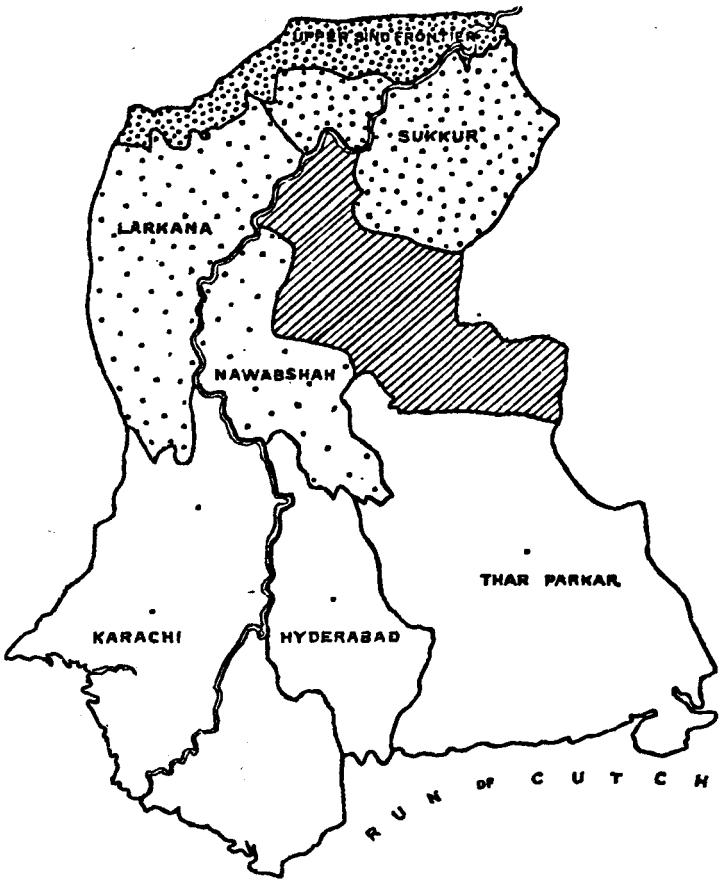
Area in 1924-25

District	*Ragi*	*Vari*	*Rala*
	Acres	Acres	Acres
Karachi	327	34	..
Hyderabad	5	87	..
Thar Parkar	4	968	1
Nawabshah	..	646	1
Larkana	..	82	521
Sukkur	5	..	1,017
Upper Sind Frontier	..	..	2,484
Total Sind ..	341	1,817	4,024

All the above three crops are grown in the *kharif* season and as the methods of cultivation generally correspond with those adopted for the major *kharif* crops, which have already been dealt with previously, it does not seem necessary to treat the same here, in any detail, again.

GRAM

Indian States are shown in the map thus _____ ▨



One dot in the above map represents 500 acres.

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CHAPTER VII—PULSES

GRAM—(*CICER ARIETINUM*)

Among the pulses cultivated in Sind, gram occupies an important position, in point of area, and also in point of consumption, being extensively used in the form of *dal* and in confectionery, and also as a food for horses.

The crop occupies an area of about two and a half lakhs of acres, nearly half of which is to be found in the Upper Sind Frontier District alone. The cultivation is also fairly extensive in Sukkur and also in Larkana. In fact, the crop may be said to be confined, almost exclusively to Upper Sind, where the four districts of Upper Sind Frontier, Sukkur, Larkana and Nawabshah occupy over ninety-nine per cent. of the total area.

The following table indicates the extent of cultivation of the crop in the different districts of the Province :—

Area in 1924-25

District	Acres	Per cent.
Upper Sind Frontier	116,487	48·6
Sukkur	71,063	29·6
Larkana	37,028	15·4
Nawabshah	13,344	5·6
Karachi	1,033	0·4
Thar Parkar	657	0·3
Hyderabad	309	0·1
Total, Sind ..	239,921	100·0

Gram, like wheat, is cultivated either in *kacha* and other lands, which have been submerged by the spill of the river or of a canal (*sailabi*), or on lands which have been given a flooding by irrigation, towards the end of the inundation (*bosi*).

Sowing takes place late in September or in the early part of October. The seed is generally scattered but sometimes drilled, the usual seed rate being something less than a maund (eighty pounds) per acre.

The tender shoots of the plant are nipped off and cooked as a vegetable. This nipping off the shoots or what is known as "topping" encourages the growth of the plant and the pruned crop is generally vigorous and gives a higher grain yield. The same purpose is often reached by allowing animals to graze gently over the growing crop.

The crop is sometimes cut green for fodder, though usually, it is allowed to mature its grain.

The crop is ready for the sickle about April or May. The reapers are either paid in cash or allowed one-fifteenth of the produce. In reaping, the whole plant is pulled up. The

gram plant, after harvest, is not made into hay but bruised chaff, obtained after threshing of gram, forms a good mixture in cattle food.

Gram cultivation is very popular with the cultivators, owing to its restorative qualities on the land. It makes also excellent fodder for horses and cattle.

In the rice tracts of Sind, gram is often taken as a *dubari* or second crop, after the rice is harvested. In this case, the cultivation is similar to that described under *dubari* wheat, except that the seed is covered with one ploughing only.

The yield of gram varies considerably from district to district. Thus, in the Upper Sind Frontier District, which has the largest area under the crop, the yield comes to over nine hundred pounds per acre, for an irrigated crop and to a little over five hundred pounds, in the case of an unirrigated crop. In the Nawabshah District, the out-turn of the irrigated crop approaches six hundred pounds per acre, while that of the unirrigated crop comes to about five hundred and fifty pounds per acre. In the absence of any systematic crop cutting experiments with gram, in the other districts, it is not possible to say what exactly the crop will return. As a *dubari* crop, gram yields from four to six hundred pounds per acre.

LAKH, LANG OR MATAR, CHICKLING VETCH—(*LATHYRUS SATIVUS*)

The pulse cultivated in Sind to the greatest extent is, perhaps, *lakh*, *lang* or *matar*. The continued consumption of this pea is said to induce incurable paralysis of the lower limbs* yet it is more grown in Sind than any other pulse, occupying about three hundred thousand acres annually.

The share of the different districts in the cultivation of the pulse will be seen from the following table :—

Area in 1924-25

District			Acres	Per cent.
Larkana	..	..	179,825	61·9
Upper Sind Frontier	..	..	39,130	13·5
Sukkur	..	..	32,318	11·1
Nawabshah	..	..	25,695	8·8
Karachi	..	..	7,280	2·5
Hyderabad	..	..	6,184	2·1
Thar Parkar	..	..	176	0·1
	Total, Sind	..	290,608	100·0

*It seems now certain that this paralysis is not caused by the *lang* itself but by other seeds often mixed with it.

The cultivation of chickling vetch is simple, like that of gram. In *kacha* lands, the soil is frequently not even ploughed, the seed being scattered over the cracked surface; and no further irrigation is given nor any manure. The seed rate is about seventy-five pounds per acre. The crop is frequently grazed in order to strengthen it and the leaves are used as a vegetable by the cultivating classes.

The crop ripens in March, when the plants are pulled up by the roots and the pods trodden out by cattle.

An average yield of nine hundred pounds of pulse per acre is obtained.

Lang is a hardy plant and grows even in soils containing moderate quantities of *kalar* salts. As a *dubari* crop, wherever the soil is pretty retentive of moisture, this pulse invariably follows paddy. The month of October is the sowing season. At this period, whether the paddy be cut or standing the seed is sprinkled at the rate of about sixty pounds per acre. The soil is generally muddy at the time. After a month and a half, the crop completely covers the ground and the cattle are allowed to graze it off. The grazing continues for a couple of months and is then stopped as soon as flowers appear in abundance. Early in March, the crop is ready for harvest, the average yield being two hundred pounds per acre. The crop is sometimes grown only for the sake of its green fodder.

The crop is restorative to a moderate degree. Horses will not eat the crop though the chaff makes a good mixture in cattle food.

TUR OR ARHAR—*PIGEON PEA*

(*CAJANUS INDICUS*)

Tur or *arhar*, perhaps the most popular pulse crop in India, is not usual in Sind, except to a very limited extent in the Jamrao area (Thar Parkar District) where the crop occupies annually from one hundred to two hundred acres.

The crop was tested as a *kharif* crop, with controlled water, during the *kharif* season of 1926, by the Agricultural Department at Sakrand (Central Sind), to find out, whether given proper conditions of soil and irrigation, the crop had any possibility of growing well and, consequently, of extension in the future, when, owing to the completion of the Sukkur Barrage, very large areas, with a perennial water supply, would be available for cultivation.

The crop was sown in the first week of August, in two areas, one with Deccan *tur* and the other with the crop from Gujarat.

Both of these flourished well and grew luxuriantly, being drilled on land which had already received a dressing of four inches of (irrigation) water. The total amount of water received by the crop was twenty inches of irrigation water and three inches of rainfall.

The Gujarat *tur* flowered three weeks earlier than that from the Deccan, namely, in the last week in November, while the latter (Deccan) only came into general flower after the middle of December. Locusts attacked the Gujarat crop in places near the end of October, but did not do very material damage. Frost, however, occurred early in January and did serious harm, completely ruining the very luxuriant crop on the Gujarat *tur*, which was fast ripening. The Deccan *tur*, which had not developed so far, was also badly damaged, but not completely ruined. While in fact, the Gujarat *tur* gave no crop at all, the Deccan *tur* produced over five hundred pounds of seed (to be accurate 534 lbs.) per acre, reaped in March 1927. This is small, of course, and represents only about one third of what would have been obtained if frost had not occurred, judging from the luxuriance of growth and the amount of flower and pods.

The result shows that we have, in *tur*, a crop which is a very doubtful one, unless it can be made to ripen early. It flourishes exceedingly, but, being very sensitive to frost, is liable to be entirely lost, on this account. It is clear, in fact, that under Sind conditions, a much more rapidly ripening type is needed than those grown in the Deccan or even in Gujarat.

OTHER PULSES

Over and above the pulses noted so far, the following pulses are also cultivated in Sind to the extent shown against them in the following table :—

Area in 1924-25

District	*Mug*	*Udid*	*Math*	*Chavli*
	Acres	Acres	Acres	Acres
Karachi	14,602	7,601	1,066	25
Hyderabad	329	3	1	143
Thar Parkar	1,536	172	..	94
Nawabshah	152	31	..	4
Larkana	319	85	..	170
Sukkur	1,662	92	147	78
Upper Sind Frontier ..	1,715	142	333	90
Total, Sind ..	20,315	8,126	1,547	604

It will be seen, from the above, that **mug or green gram** (*Phaseolus mungo*) and **udid or black gram** (*Phaseolus radiatus*) are grown to an appreciable extent in the Province, especially in the Karachi District. The cultivation of **math or kidney bean** (*Phaseolis aconitifolius*), though of some importance in the Karachi District, is very small in the other districts while, the area under **chavli or cow pea** (*Vigna catiang*), though very small, is to be found in all the districts of the Province.

All the above pulses are principally grown in the *kharif* season, either as associated with some other chief *kharif* crops like *bajri* and other millets or alone. In either case, the method of cultivation followed does not differ materially from that of the other *kharif* cereals and pulses which have been treated so far. It has not, hence, been found necessary to repeat the details of cultivation here.

Vatana or field pea (*Pisum sativum*), and **masur or lentils** (*Ervum lens*) occupy only a negligible area and deserve no special mention.

Guvar, cluster bean or field vetch (*Cyamopsis psoralioides*) is grown to an appreciable extent in all the districts of Sind, either as a pulse crop or as a vegetable or fodder. The cultivation of the crop for fodder has been dealt with in detail in Chapter XVI "Fodder Crops" and need not be described here, as the methods of cultivation, the condition of soil, climate and water supply do not differ materially from each other—whether the crop is grown for pulse, for vegetable or for fodder—except, perhaps, in the period of harvesting. Thus, the crop is cut when in flower when grown for fodder. When the pods are intended to be used as a vegetable, the crop is allowed to stand till the pods are well-developed yet tender; while, when pulse is the object, the crop is allowed to be fully mature, so that the pods and the seed in it have dried.

CHAPTER VIII—OIL-SEEDS

Among oil-seeds cultivated in Sind, rapeseed and *jambho* are, by far, the most important, followed at a distance, by sesame which also occupies a fairly extensive area. These together occupy about ninety-nine per cent. of the total area under oil-seeds—leaving only one per cent. for all the other oil-seeds such as linseed, ground-nut, castor seed, cocoanut, etc.

RAPESEED AND JAMBHO

(BRASSICA CAMPESTRIS AND ERUCA SATIVA)

Rapeseed and *jambho* occupy an area of about three and a half lakhs of acres, which is distributed, in the different districts of the Province, as shown in the following table :—

Area in 1924-25

District	Acres	Per cent.
Larkana	126,680	36·1
Hyderabad	59,612	17·0
Upper Sind Frontier	59,564	17·0
Nawabshah	42,425	12·1
Karachi	34,834	9·9
Sukkur	26,655	7·6
Thar Parkar	1,145	0·3
Total Sind ..	350,915	100·0

Rapeseed and *jambho* (which is a variety of mustard) are both invariably grown either in *kacha* or other lands which have been submerged by the spill of the river or of a canal (*sailabi*) or on lands which have been given a flooding by irrigation, towards the end of the inundation (*bosi*).

The seed is put in the ground late in September or early in October—or even later. It is generally sown broadcast but is sometimes drilled. The amount of seed required to sow an acre is about fifteen pounds.

The crop is, frequently, grazed a little, in order that the plants may grow more vigorously. The leaves of the rapeseed plant are also used as a vegetable by all classes.

The crop is harvested in March or April—the reapers being paid in cash or one-fifteenth of the produce. An outturn of four hundred to six hundred pounds per acre is considered normal.

The seed is threshed out by bullocks.

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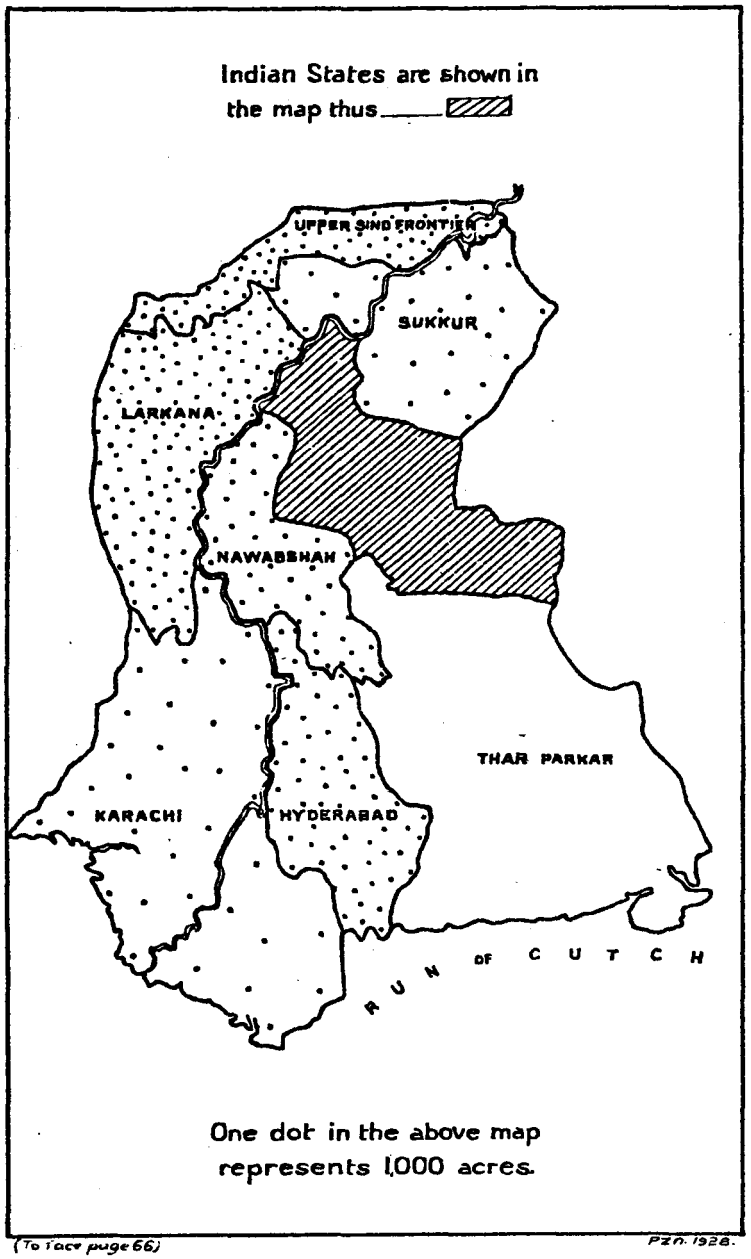
RAPESEED AND MUSTARD.



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Recent crop experiments have shown the yield of rapeseed and *jambho* in the different districts, to be as follows :—

Average yield in pounds per acre

District	Rapeseed		*Jambho*	
	Irrigated	Unirrigated	Irrigated	Unirrigated
Karachi	..	330	..	..
Hyderabad	..	..	..	..
Thar Parkar	..	..	480	..
Nawabshah	400	400	..	..
Larkana	560	220	560	350
Sukkur	..	230	..	..
Upper Sind Frontier ..	520	350	..	390
Average for Sind ..	430	320	480	370

These oil-seeds are also sown as *dubari* crops mixed with *matar*. The seed, at the rate of five to six pounds, is broadcasted in wet soil with *matar*, at the end of October. The crop is ready in March. The yield from the mixed crop is about six hundred to eight hundred pounds per acre.

Both rapeseed and *jambho* yield oil which is used for burning, and, to a small extent, in cooking, while it is also mixed with Fuller's earth and applied to the body before bathing. It is a very good, cool substitute for soap.

There are good many country oil-mills located in important villages of the tract where these oil-seeds are grown.

SESAMUM—(*SESAMUM INDICUM*)

While the area under rapeseed and *jambho* is about three and a half lakhs of acres, the area under sesamum is only about one-tenth, that is, about thirty-five thousand acres. Sesamum is, however, still the second important crop in Sind, there being no other oil-seed occupying an intermediate position between the two.

The area under sesamum is not confined to any particular district or districts but the crop is distributed in all the districts of the Province.

The following table shows how the area is distributed among the various districts:—

Area in 1924-25

District			Acres	Per cent.
Nawabshah	..	..	7,943	23·5
Karachi	..	..	5,423	16·1
Upper Sind Frontier	..	..	5,418	16·0
Thar Parkar	..	..	5,366	15·9
Hyderabad	..	..	3,758	11·1
Sukkur	..	..	3,524	10·4
Larkana	..	..	2,351	7·0
Total Sind		..	33,783	100·0

The method of cultivation of sesamum is the same as that employed for *bajri* and *jowar*, with which, in fact, sesamum is generally sown, either in separate compartments of the same field or along the ridges of the field channels.

White and red varieties are grown ; the former commands a better price. The seed-rate is generally from four to six pounds per acre and the average outturn is about three hundred pounds per acre.

The crop matures in three months and is reaped with a sickle, the stalk being cut near the roots. When dry, the capsules open and the seed is shaken out by hand.

The crop is a somewhat delicate one and hence the produce is uncertain.

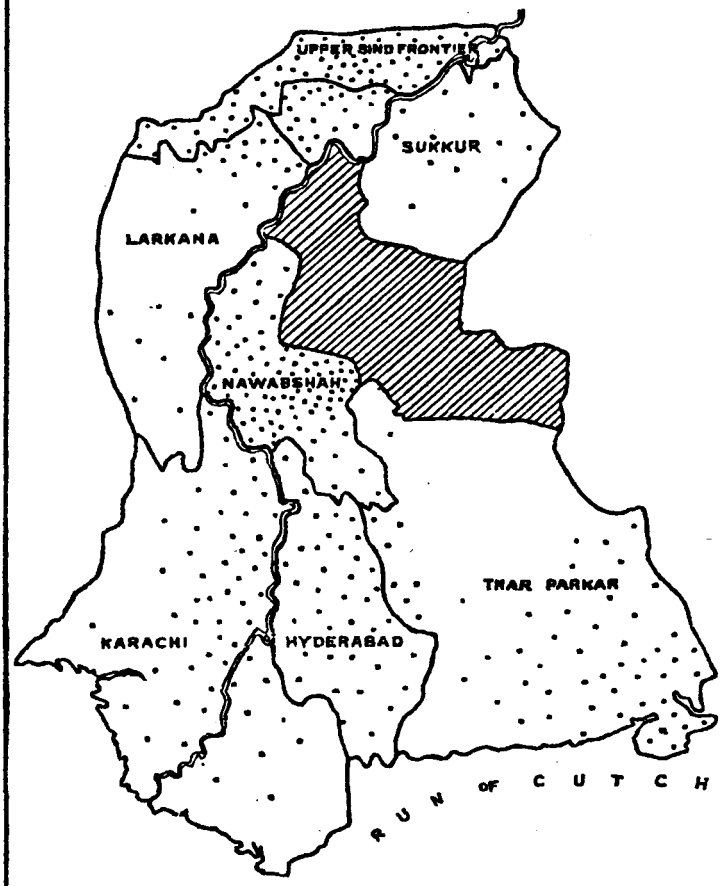
CASTOR SEED—(*RICINUS COMMUNIS*)

Among the crops which seem to have considerable promise everywhere, owing to the rapidly increasing demand for castor oil, is castor, and there is a special opportunity for this crop in the Sukkur Barrage area in Sind, as the soil is exactly of the kind on which this crop flourishes.

The crop is hardly now grown in Sind, except as odd plants and as borders to fields and the total area under it hardly exceeds a few hundred acres usually, in the whole of the Province, though, in some years, it exceeds a thousand acres. Thus, for instance, the crop occupied only ninety acres in the Karachi District and three hundred acres in the Thar Parkar District in 1925-26, but in 1924-25, the area amounted to 1,185 acres in Thar Parkar District and 79 acres in the Karachi District.

SESAMUM.

Indian States are shown in the map thus ▨



One dot in the above map represents 100 acres.

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P.Z.O. 1928.

To test the suitability of the crop under Sind conditions, the crop was tried at Sakrand (Central Sind) by the Bombay Agricultural Department.

One acre was put under the crop in 1926, half being grown with seed from the Deccan and half with seed from Gujarat. The whole was sown, by dibbling seed, at three feet apart, about the middle of August 1926, and the land was then watered with four inches of water. The sowing was very late but the crop flourished luxuriantly from the beginning. It was watered at first every ten days, two inches of water being given at each watering, and afterwards at longer intervals. The total water received by the crop amounted to twenty-five inches, out of which irrigation contributed twenty-two and rain-fall three inches.

The first pods were ripe early in March and reaping, once a fortnight, continued till the end of April 1927. The yield of clean seed obtained was 810 lbs. per acre with Gujarat castor and 758 lbs. per acre with Deccan castor. This is worth about rupees seven per maund in Karachi or about rupees seventy per acre for Gujarat castor and about rupees sixty-five per acre for Deccan castor.

The crop shows promise of being very valuable, as the cost of cultivation was small, only one hoeing being given after the seed was sown and no watering being required. Further, in 1927, it has proved itself a crop very resistent to salt in the soil, flourishing where a number of other crops have refused to grow. In a Province like Sind where *kalar* soils abound, this is a factor of very special importance and considerable economic significance.

OTHER OIL-SEEDS

Information of area under oil-seeds other than those dealt with so far, is not returned separately from the various districts except in two cases, linseed and cocoanut; the areas being all included under one indefinite head "other oil-seeds." It is not, thus, possible to know exactly, the extent of cultivation of oil-seeds, like **nigerseed** (*Guizotia abyssynica*) or **safflower** (*Carthamus tinctorius*) though, from the total area under "other oil-seeds," there is reason to believe that the area under these is comparatively very small.

The area under "**Cocoanut**" (*Cocos nucifera*) and "**Linseed**" *Linum usitatissimum*) is noted below :—

Area in 1924-25

District			Cocoanut Acres	Linseed Acres
Karachi	..	..	31	..
Hyderabad	..	..	..	..
Thar Parkar	..	..	..	..
Nawabshah	..	..	..	247
Larkana	..	..	..	..
Sukkur	..	..	..	..
Upper Sind Frontier	..	..	..	1
	Total Sind ..		31	248

It is evident from the above that both the crops are of very minor importance and deserve no special consideration.

There is no cultivation of **groundnut** (*Arachis hypogæa*) anywhere in Sind.

CHAPTER IX—FIBRE CROPS

COTTON—(*GOSSYPIUM NEGLECTUM*)

Of the fibre crops grown in Sind, cotton is the only one of real importance, occupying over 99·9 per cent. of the total area under fibre crops. In fact, of the total area of four lakhs of acres found under all the fibre crops put together, the share of the fibre crops other than cotton is not more than five hundred acres. The cotton crop may, hence, be said to be *the* fibre crop of the Province.

The following is an account of its distribution and method of cultivation.

Cotton cultivation in Sind appears to be of ancient date, but previous to the British Conquest, all indications suggest that its area must have been very small. Its growth received much stimulus from the general development of trade after the conquest, and the recent extension in irrigation facilities of the Province.

At present, cotton occupies, in point of area, the fourth position among the crops grown in the *kharif* season, being only exceeded by rice, *bajri* and *jowar*. Its rise to this position is comparatively recent. Previous to 1900, the area was much smaller and was almost limited to the land under the irrigation canals of the present Hyderabad and Nawabshah Districts. In recent years, there has, however, been considerable extension. Among the causes of this extension may be mentioned the following :—

(1) Opening of the high level Jamrao Canal in 1900.

(2) Reformation and extension of the Nasrat and Dad Canal Systems.

(3) Conversion of some of the rice lands into dry crop lands on the Eastern Nara System, due to shortage of water, consequent upon the Jamrao System sharing part of its original supply of water.

(4) Improvements in the inundation canals of the Hyderabad District.

These factors, coupled with a cotton market ruling high since about 1910, have brought the area under the crop from about three and a half to four lakhs of acres annually.

Further extension of cotton cultivation must be limited till after more assured supply of water becomes available, with the construction of the Sukkur Barrage canals, because, the present canals in Sind depend upon the state of the river

and as the latter is never steady, the late flow of the canals and, consequently, late sowings may expose cotton to the risk of damage by frost in the cold weather or the earlier fall of the river may result in only partial maturing of the crop.

A slump in prices has also been found to affect the area adversely, as was proved during the commencement of the Great War, when the area in the year 1915-16 came down to half of that in the previous year.—(One and a half lakhs of acres in 1915-16 as against three and a quarter lakhs of acres in 1914-15).

The variety of commercial importance usually grown in Sind is a mixture of several types of *Gossypium neglectum.* This is a short stapled cotton, showing, with '*Bengals,*' the lowest position on the Indian market. This variety, however, suits Sind admirably, being hardy, early maturing and prolific—capable of yielding two thousand pounds or over per acre under very favourable conditions. For these reasons, it is very popular with the people.

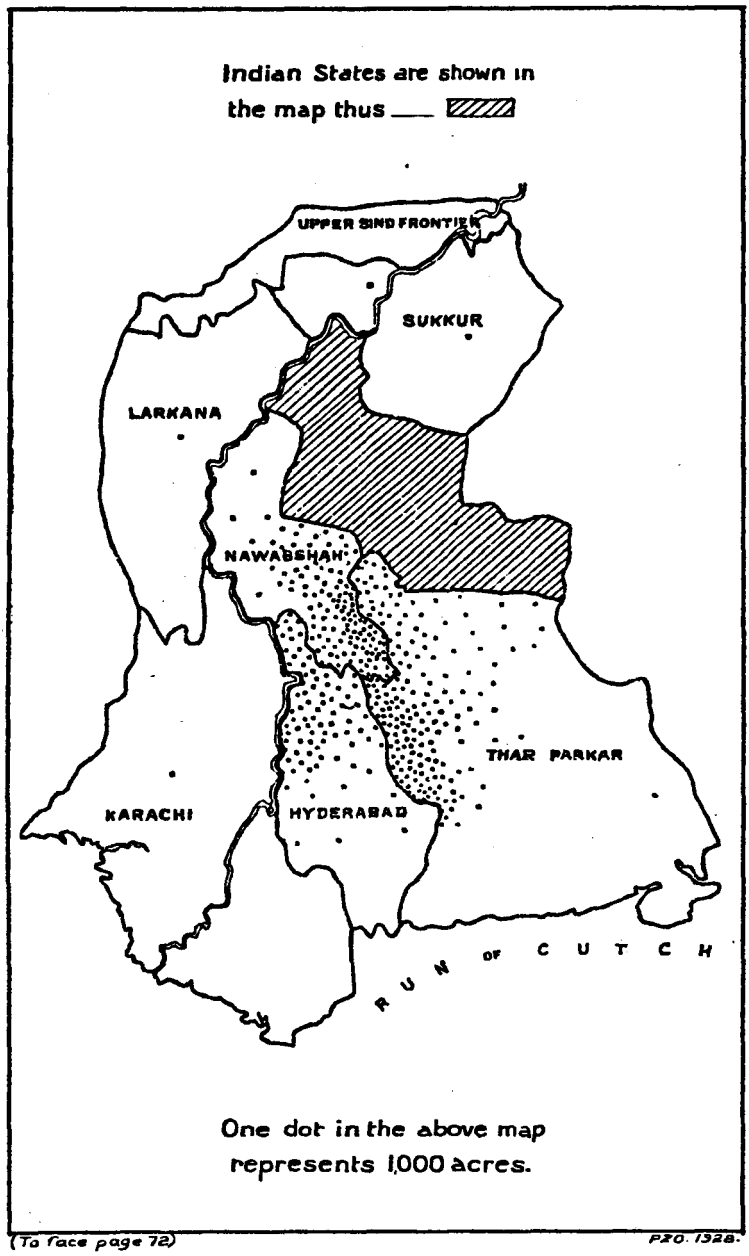
The chief cotton growing districts in the Province, are Thar Parkar, Hyderabad and Nawabshah, which together occupy about ninety-nine per cent. of the total area under the crop in the Province. The following are the actual figures of cultivation in 1924-25, a recent normal year :—

Area in 1924 25

District	Acres	Per cent.
Thar Parkar	181,803	45·5
Nawabshah	131,810	33·0
Hyderabad	81,944	20·5
Sukkur	1,665	0·4
Karachi	1,035	0·3
Larkana	946	0·2
Upper Sind Frontier ..	363	0·1
Total Sind ..	399,566	100·0

Cotton grows on various kinds of soils but it thrives best on *dasar* (loam) or *varyasi dasar* (sandy loam). Stiff soils (*khuhuri*) are not desirable, as the soil surface cakes and hardens after irrigation and the growth of the young seedlings is, consequently, retarded, but, with a little extra care and cultivation, a good crop of cotton is often raised. Such soils are popularly known to be very fertile and take longer to exhaust than any other kinds of soils.

COTTON.



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P.Z.O. 1328.

Kalar (salt) lands are not suited to cotton cultivation but if the soil is only slightly impregnated with salt, and if germination takes place, the crop makes a wonderful growth, under irrigation, on such soils.

Sandy soils (*varyasi*) are not suited for cotton but with an addition of much organic matter, such soils often carry tolerable crops of cotton. '*Buth*' soils, with coarse bright sand underlying the surface soil, are unfit for cotton cultivation.

Soils along the banks of the river, receiving a considerable amount of silt annually, during high inundation of the river, are often utilised for growing cotton in Upper Sind, as these soils are very retentive of moisture.

Cotton in Sind is essentially a *kharif* crop. The *kharif* season extends normally from June to October and coincides, for the first three months, with the height of the inundation. The time of sowing, on inundation canals, is normally June and on the Mithrao and Jamrao Canals, May to June; but when the rise of the river to a high and steady level is late (which is not uncommon) the sowings are correspondingly delayed. After about the middle of July, cotton sowings are stopped and replaced by *bajri*.

Rotation of crops, based on any regular system, is not practiced in the cotton zone. Fallowing is, however, commonly observed as a result of limited water supply. Cotton will not generally thrive on the same land for two successive years. Accordingly, cotton is followed by *bajri* in the second year and cotton again in the third year. On larger holdings, in the inundation canal tracts and on lands on the Jamrao, Dad, Nasrat and Mithrao Canal Systems, cotton is sown the first year, the land is then left fallow the second year, and in the third year, it is devoted to *bajri* in the *kharif* season or wheat in the *rabi* season, followed again by cotton in the fourth year.

Farm-yard manure, wherever available, is often taken advantage of, by resourceful cultivators and applied to the cotton land. Canal silt and earth blown by wind and collected near the base of jungle bushes are also valued for manure. Sheep and goat folding is also practiced, particularly on the Jamrao and in the Eastern Nara Tract and in the Nawabshah District. Goat manure is said to be very effective on light lands and the crop responds to it very quickly.

The methods of cultivation in all cotton growing districts do not differ very materially from each other, though, there

is a slight difference according to the kinds of soil, the period of inundation, the quantity of water available, etc. Thus, for instance, on the Jamrao Canal (Thar Parkar District) the water supply in the canal is normally available earlier and lasts longer than on the inundation canals of Hyderabad and Nawabshah Districts and therefore, the sowings are done somewhat earlier. Similarly, the mode of irrigation on the Jamrao differs from that on the inundation canals, as most of the lands are commanded by flow water supply and consequently Persian wheels are rare. The volume of each watering being also heavier under flow conditions, waterings are given at longer intervals than on the inundation canals.

With these exceptions, the following may be said to be the most typical method of cotton cultivation in Sind.

The preliminary preparations begin by February, when the first operation is to remove the old stubbles and the roots of weeds, etc. The land is next ploughed in a dry condition, once or twice and the big clods produced, are broken. Manure is then put and the land divided into suitable compartments for the purpose of irrigation. Immediately on the flowing of the canals, if the land is lift land, a Persian wheel, erected in advance, is worked to give a preliminary watering (*rej*). Usually, two preliminary waterings, locally called '*katcha*' and '*paka*' *rej*, are given to allow the land to get sufficient moisture. The second watering follows the first, immediately on the drying up of the latter. As soon as the land comes into a friable condition, cotton seed, which is previously prepared by mixing it with mud, is broadcasted on the land and ploughed in. Usually, one ploughing is given to cover the seed but sometimes, two are given.

It is not common to level the ploughed up land with a *samar*. The crop, after sowing, is not watered for three to four weeks, after which it is watered at intervals of twelve to fifteen days, till the canals dry up (October.) The crop is weeded twice or thrice at intervals of a month.

The seed rate differs, according to the nature of the soil and according to the preparatory tillage, from twelve to forty pounds per acre. Stiff soils and soils which are not worked well before sowing, require thick seeding whereas, sandy loams and lands worked well, require thin seeding. Soils containing *kalar* or salt patches, on which the germination is very uncertain, receive a larger quantity of seed than sweet soils.

Cotton is generally grown with a sprinkling of *jowar*, *bajri*, maize and *til* (sesamum). These latter crops, having a shorter growing period, grow more rapidly than cotton and by the time the main crop is about a foot high, they are about twice its size. They are then gradually removed for fodder for the plough cattle and the wheel cattle. *Til* (sesamum), *math* (kidney bean), unless sown for seed along the border of the field and water channels, are also cut and fed green to camels working on the Persian wheels. A few plants of maize are often left to form grain and the cobs either removed in an unripe condition, roasted as vegetable, or the grain, when ripe, is harvested in the usual way. *Guar* (field vetch) is also sometimes seen growing along the embankments and water channels in a cotton field. This is also removed green for fodder. All these mixtures are, however, removed before the cotton crop has begun to flower. On the Jamrao Canal, water-melons and musk-melons are sometimes sown along with cotton in April-May, provided, water is available. *Tur*, *bhendi* (edible hibiscus) and castor are also sometimes grown along a cotton field, to serve as a windbreak and the last of these (castor) is also stated by the cultivators to be a remedy against white ants.

Cotton comes into flower by September and the out-turn is considerably affected by the character of the weather at this period.

Cotton occupies land for six to eight months according to the availability of water and also according to the nature of the season, that is to say, to its freedom from frost. On the Jamrao Canal, the crop remains normally longer than on the inundation canals, because, on the former canal (Jamrao), the crop goes on receiving water up to November or December. On the other hand, the inundation canals normally dry up in October and, hence, the crop has no other source of irrigation.

Cotton pickings of spring-sown crop (*Arhari*) begin by about September and last until the middle of December. The crop sown in May or June, begins to yield from October and by Christmas, three to four good pickings are obtained. If the crop is not affected by frost, which often occurs late in December or early in January, it goes on giving small pickings till February. These latter pickings are, however, very small in quantity and inferior in quality. The second and third pickings are usually the most important ones. The work of picking is begun in the morning and is carried on throughout

the day. It is generally done by women and boys, though sometimes, men also do the work.

Picking is generally done on a share system. For the first three to four pickings of a good crop, one twentieth to one sixteenth of the seed cotton picked is given to a picker. For subsequent pickings and in case of poor crops, a higher share is charged; the share, in some cases, reaching one half the total quantity picked. The quantity of seed cotton, picked per day, by one picker, from a fairly full field, is about forty pounds.

When cotton is finally picked, cattle are turned to graze on the leaves of the cotton plant and any unopened bolls which may have been left on the plant. The stalks are either allowed to remain in the field till the next crop is grown after one or two years, or are gradually cut and used as fuel, or utilised for making huts for the use of the *haris* (cultivators) and labourers.

It is very difficult to give any accurate idea as to the average out-turn per acre of seed cotton (*phutties*) because it chiefly depends upon the soil, which varies considerably from place to place, and also upon irrigation, fallow and manure conditions. Under *very* favourable conditions, an acre may yield as much as two thousand pounds. Probably, the average out-turn, on fairly good land and in normal season, may be put down from four hundred to five hundred pounds per acre of *kapas* on the Jamrao Canal and about as much in the Nawabshah District. In Hyderabad District and some parts of Nawabshah, where the cultivation under lift irrigation is superior, the average per acre may be put down from six to eight hundred pounds of *kapas*, in a normal season.

The principal cotton diseases and pests which cause damage in Sind may be described in order of importance as follows :—

1. *Spotted Boll Worm.*—Both species of spotted boll worm, *Erias fabia* and *Erias insulana* are found, but the latter preponderates. Adverse winds and a damp atmosphere seem to favour this pest.

2. *Wilt.*—The wilt disease of cotton is associated with a fungus called *Fusarium vasinfectum* which enters the roots of the plants from the soil. It occurs, in patches, in the cotton field and appears to prevail most generally in soils of bad texture through which water cannot pass freely. This form of wilt does not, as far as is at present known, attack American cotton in Sind.

3. *White Ants.*—This pest is commonly known as '*Murahi*' and appears to attack the plant when the main stock has sufficiently grown to be woody. Constant application of water to the crop, at short intervals, is said to reduce the attack. There is no other practical remedy known.

4. *Red Cotton Bug.*—This is not a serious pest. This insect pierces the boll with its long beak and sucks the seeds. It damages the seed and stains the lint but is seldom noticed.

5. *Anthracnose.*—This is commonly known as the boll rot and is mostly visible on the boll. The lint from such bolls is usually stained and rotten. Diseased bolls often fail to open. This disease occurs from season to season, in a greater or less degree, being worse in a wet season. It has occurred widely on exotic (chiefly American) cottons recently introduced but is insignificant in case of local Sind cotton.

6. *Migratory Locust: (Acridium perigrinium).*—This has been found to do considerable damage in some years (as in winter of the year 1926). The damage is especially heavy if the crop is young. The crop attacked is entirely denuded of its leaves.

7. *Rats.*—Rats sometimes damage the crop when the bolls have matured. They climb the plant, pull out the seed cotton from the boll and feed on the seed.

We have so far dealt with cotton cultivation, as generally carried on in the Province of Sind, up to the present. It is obvious that in many directions there are possibilities of improvement, in the type of cotton grown, in the method of cultivation and in the improvement of soil, and the present note will not be complete unless we review very briefly what has been done so far in the matter of improving the crop. The improvement has so far been confined to three factors, namely, the introduction of foreign varieties as will suit Sind conditions, the improvement of the indigenous cotton, and the improvement in the methods of cultivation.

With regard to the introduction of foreign (exotic) varieties, it may be said that, in the years from 1904 to 1908, efforts were largely concentrated on the introduction and extension of Egyptian cotton, on the areas like the Jamrao Canal where water was available at an early date in the year. After showing great promise at first, this cotton finally proved a failure chiefly because of the great length of the growing period and of its susceptibility to boll-worm. Hence, the pushing of its cultivation was stopped after 1908, and its culture was finally abandoned about 1912, when the decision was reached that,

as far as exotics are concerned, American cotton showed far greater promise. Egyptian cotton, as a matter of fact, seemed to require very early sowing, so as to get the first picking by the latter part of October, and, even on the Jamrao, water has rarely been available as early as the sowing time then considered necessary.

After 1912, a number of American varieties were tested and, among these, the *Triumph* type was selected as most suitable to Sind conditions, its early maturity being a strong point in its favour.

After extending over several thousand acres and becoming very popular, this variety seemed to become subject, very seriously, to red leaf blight and to lose the characteristic of producing very large bolls which had recommended it in the first instance.

In 1916, American varieties called *F. 4* and *F. 285*, evolved by the Punjab Agricultural Department, maturing early and with considerable resistance to red leaf blight, were introduced in Sind and have since attained very considerable popularity due to the characteristics described, and to the fact that their yield has proved equal to that of local cotton. The area under these types reached nearly thirty thousand acres on the Jamrao Canal, in 1926. The hindrance to their further extension are two in number. The first is the necessity for early sowing, preferably in early May, while the second is that the ginning percentage is lower than with the best form of Sindhi cotton. These American types, however, have two substantial advantages. If they can be sown early, the crop is essentially complete before the end of November or early in December and so, there is no serious danger of frost. Further, once they are established, the irrigation required is very little and they do not suffer very much from long intervals in watering. Balancing the advantages against the disadvantages, it seems, at the present moment, that these American types have a good future, at least under the conditions of the Jamrao Canal.

Other exotic cottons, whether from other parts of India or from abroad, have, so far, given little promise. Indian types, so far tried, namely, *Broach*, *Kumpta*, *Goghari*, *Bani*, have proved unsuitable. All these are slow maturing varieties, compared with the Sind types and yield relatively a small crop.

With regard to the improvement of the Sindhi cotton, it may be said that, the indigenous cotton is a mixture of several

types of *Gossypium neglectum.* A large number of strains of this cotton have been very critically studied with reference to agricultural characters, chiefly the yield and ginning percentage and only the best of them, named *27 W. N.*, has been retained by the Bombay Agricultural Department, for multiplication and distribution. This type has been found by test to be more prolific than the local mixture and has a ginning percentage of over 36, as against an average of not much more than thirty-three for the strains locally grown. It has a bright, white colour and rough feel—important characteristics of Sindhi cotton—for which it is valued by the trade. Hence, it is very popular and the demand for it is increasing very largely every year.

As regards the improvement in the methods of cultivation, it may be mentioned that, the chief work in this line so far, has been the substitution of the "drilling" method in place of the "broadcasting" method of sowing. One of the common features of Sind agriculture is the sowing of all irrigated crops broadcast. This method of sowing rules out any method of clearing the field of weeds, other than hand weeding. The weeding operation may not be so necessary in the case of cereal crops but it is one of the most important operations in cotton cultivation and is, in the ordinary course, carried out, at least, twice during the growing period of the crop.

In recent years, owing to the general rise in wages and the shortage of labour, hand weeding has become so costly as to be even impossible at times.

The advantages of sowing cotton in lines are that it enables the work of hoeing and weeding to be largely done by bullock power instead of by manual labour, thus solving the labour problem and making a saving in money and time. Moreover, the surface of all soils cakes and hardens after irrigation. The bullock hoe not only breaks the crust but also exposes the particles to æration and other beneficial influences—a condition highly beneficial to the soil and the crop. Further, these operations help in the conservation of soil moisture, by reducing evaporation, which is very considerable, when the hardened surface remains unbroken.

It has been seen that, except on uneven lands and on stiff and *kalar* (salt) soils, the sowing of cotton in lines gives excellent results. Moreover, the drilling method actually costs less (sowing and weeding charges taken together) than the broadcasting method; the saving being at least twenty-five per cent.

SANN-HEMP—(*CROTOLARIA JUNCEA*)

As in the Bombay Presidency proper, *sann*-hemp is grown to a very limited extent in Sind. It occupies an area of only about three hundred acres, which is distributed as follows in the different districts :—

Area in 1924-25

District	Acres	Per cent.
Karachi	116	37·1
Nawabshah	101	32·3
Thar Parkar	54	17·2
Larkana	42	13·4
Total, Sind ..	313	100·0

Sann-hemp is grown in small patches for the convenience of the cultivators. The *zamindar* or land holder has usually no share in it.

The seed is sown in July, in a small compartment of a *jowari* or *bajri* field and along the ridges of the compartments. The crop is watered along with, and is reaped soon after, the principal crop.

After it has been reaped, the seed-pods are cut off and the stalks are soaked in water for four or five days, when they are taken out and dried and the fibres stripped off by hand.

From the fibres, the cultivators make ropes, for which they find numerous uses in agriculture.

But although *sann*-hemp is grown, at present, almost exclusively for its fibre, it may really serve three useful purposes.

First, it may be a producer of fibre, which is analogous to, but superior to jute. Then, it may serve as a green manure and so enable land to be recuperated, and lastly, it may serve, to a limited extent, as a very rapidly growing fodder.

To test the general suitability of the crop under Sind conditions and the possibilities of its development, the crop was grown at Sakrand (Central Sind) by the Bombay Agricultural Department in 1926. Curiously enough, it was found to be one of the most vigorously growing crops in the *kharif* season at the Experimental Station (Sakrand).

In the present case, eighty pounds of Gujarat *sann*-hemp seed per acre was drilled, at twelve-inch distance between the rows, about the middle of August 1926. It grew very vigorously from the start and was given a total amount of sixteen inches of water, out of which irrigation contributed thirteen inches and natural rainfall three inches.

It was allowed to ripen and was reaped in the first week of December 1926. It gave one thousand pounds of seed (actual 1,006 lbs.) per acre and two hundred pounds (actual 195 lbs.) of retted fibre. The fibre yield was small but was partly due to the retting being done by inexpert staff.

In the meantime, it has been shown and confirmed in the succeeding season (1927) that the crop flourishes exceedingly well, is not damaged by any enemy except excess of salt in the land, and may have a considerable future.

OTHER FIBRES

There is practically no cultivation in Sind under any fibre crops other than cotton and *sann*-hemp except, perhaps, a very small cultivation under **Ambadi or Brown Hemp**—the extent of area under which, however, is not known—as the crop is not returned separately in the Agricultural Statistics but included under " other fibres ".

CHAPTER X—SUGAR-CANE

(SACCHARUM OFFICINARUM)

In spite of the extensive irrigation of the Province, sugar-cane is not an important crop in Sind—the total annual area not exceeding four thousand acres. The chief cultivation is in the three districts of the south, *viz.*, Karachi, Hyderabad and Thar Parkar which together occupy over eighty-five per cent. of the total area.

The following table shows the share of the different districts in the total area under sugar-cane in Sind.

Area in 1924-25

District	Acres	Per cent.
Karachi	1,350	36·6
Thar Parkar	900	24·4
Hyderabad	888	24·1
Sukkur	331	9·0
Larkana	129	3·5
Nawabshah	74	2·0
Upper Sind Frontier ..	16	0·4
Total, Sind ..	3,688	100·0

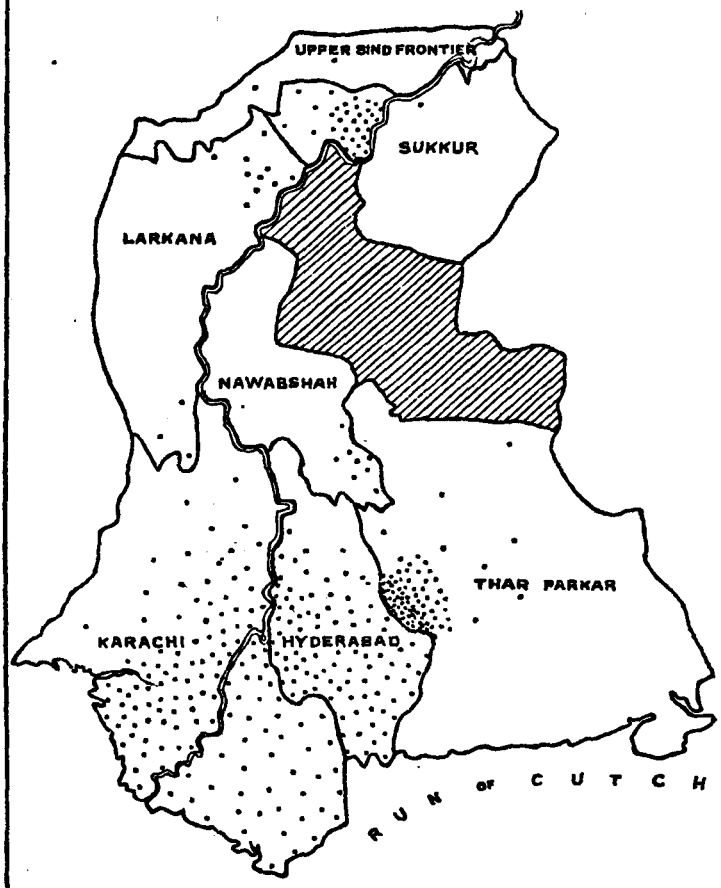
Sugarcane is best laid down in February, as, if planted then, it ripens if well-manured, in November and thus escapes the destructive frosts which not infrequently occur about the end of December and later. But, it is occasionally laid down as late as May and in that case, is not ready before February. The first crop, grown from fresh sets, is known as *neri;* if the plants have been strong, a ratoon crop, called *banth,* is grown from the old roots after the first crop has been cut. The ratoon crop matures in less time than the first.

Land intended for the reception of sugarcane is given a dressing of from ten to thirty tons of cattle dung per acre.

The land is thoroughly ploughed and divided into small compartments, in which the sets, numbering from twenty to thirty thousand per acre, are planted upright. The sets (*bulli*) consist of short lengths of cane, each containing a joint, from which two or three sprouts will grow. Before the final planting, they are kept in soft mud till the sprouts appear. A good flooding is then given to the land, after which the crop is watered once a week. The irrigation is generally by lift, one wheel being capable of irrigating five or six acres. The crop is weeded once a month for the first four months. Sugarcane makes slow growth during the first three months and it is common to grow with it subordinate crops such

SUGARCANE.

Indian States are shown in the map thus ____ ▨



One dot in the above map represents 10 acres.

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as *chavli* or cow pea (Sindhi *Chanura*) or *bajri* for fodder, which are removed before they interfere with the principal crop.

The cane is cut with a sickle and crushed in presses worked by camels or oxen. The old wooden press (*Chichro*) is now being rapidly supplanted by iron machines. The extracted juice, to which a little *chaniho,* or crude carbonate of soda, is added so as to remove the scum easily, is boiled down in large iron pans to the state of a soft solid, in which it is sold as *gur.*

An average crop of sugar-cane yields over four thousand pounds of *gul* per acre. A considerable quantity of cane is sold intact, to be eaten fresh. It may be mentioned here that, the types of cane now grown in Sind are very poor, being the poor reed canes which (except in the neighbourhood of large towns for eating) are the only ones now cultivated in the Province. In the neighbourhood of the larger towns 'Striped Mauritius' cane is usually grown.

CHAPTER XI—DYES

INDIGO—(*INDIGOFERA TINCTORIA*)

In a normal year, indigo occupies an area of about a thousand acres in Sind. Most of this area is to be found in the Nawabshah District. Sukkur, with about a hundred acres only, follows next. Larkana grows to the extent of about twenty-five acres while the cultivation of the crop may be said to be totally absent elsewhere in the Province. The following are the actual figures of area under indigo in 1924-25 :—

District		Acres	Per cent.
Nawabshah	.. ..	1,024	88·7
Sukkur	.. ..	105	9·1
Larkana	.. ..	25	2·2
Total, Sind	..	1,154	100·0

It is, however, grown considerably in the Khairpur State, the area reported in 1927 being 1,200 acres.

A light soil, with a deposit of fresh silt, is considered the best for indigo. As soon as the canals fill in June, the field is irrigated and well ploughed and then divided into small compartments, in which the seed is scattered, whilst the earth is still quite wet. About a hundred pounds of seed are put in per acre. The seed is soaked overnight in water. The field is given a slight watering every second day, until the plant shows about two inches above the ground, after which water is given every fourth day. After the crop is about eighteen inches high, water is given only once a week. The crop is weeded when it is about three inches high and again, when it has reached a height of eighteen inches. Indigo plants are ready for the sickle in about three months. A crop grown from seed is called *neri*. The roots are invariably allowed to remain in the ground for a second crop called *mundhyan* in the following year. This ripens in two and a half months and is the crop from which the seed is always taken. A yield of forty pounds of dye per acre is considered fair.

The dye is extracted from the stems and leaves of the plant, which are soaked in water in pits (*hauz*) constructed of brick and mortar. The reaping is always done in the morning and the produce thrown into the pits at mid-day. After immersion for twelve hours, the stems and leaves are removed and the water is churned for two or three hours. The contents are

then allowed to settle for six hours, during which the dye is precipitated to the bottom of the pit.

The cultivation of indigo in Sind, as elsewhere in India, is now rapidly declining. It had a spurt during the Great War (1914-18), but now seems as if it would very shortly almost entirely disappear.

HENNA (*LAWSONIA ALBA*)

The only other crop falling in the class of 'Dyes' which deserves any mention is, perhaps, henna or *mendi*. This handsome shrub has always been a favourite garden plant in the East from the times of the ancient Egyptians to the present day. In Sind, as elsewhere in India, it is much cultivated as a garden plant and for hedges and is held in particularly high esteem by Mahomedans, both for its fragrant flowers and for its leaves which yield a dye much used as cosmetic.

In Sind, henna is grown in the Hyderabad District in gardens, as a hedge and is also cultivated as an independent crop, though on a very small scale, round about Shikarpur.

On every hundred square feet of soil, two seers of seed are sown in February. The seed germinates in about ten or twelve days. When a foot high, the plants are transplanted and in four months the crop is fit to yield its leaves for dyeing.

Of the total amount of dye produced, a small portion is consumed locally while the remainder is exported to other places in and outside the Province.

CHAPTER XII—DRUGS AND NARCOTICS

TOBACCO—(*NICOTIANA TABACUM*)

Under the class of 'Drugs and Narcotics' tobacco is the only crop grown to any extent in Sind—the area under the other crops coming into the class such as tea, coffee, cinchona, opium, etc. being absent.

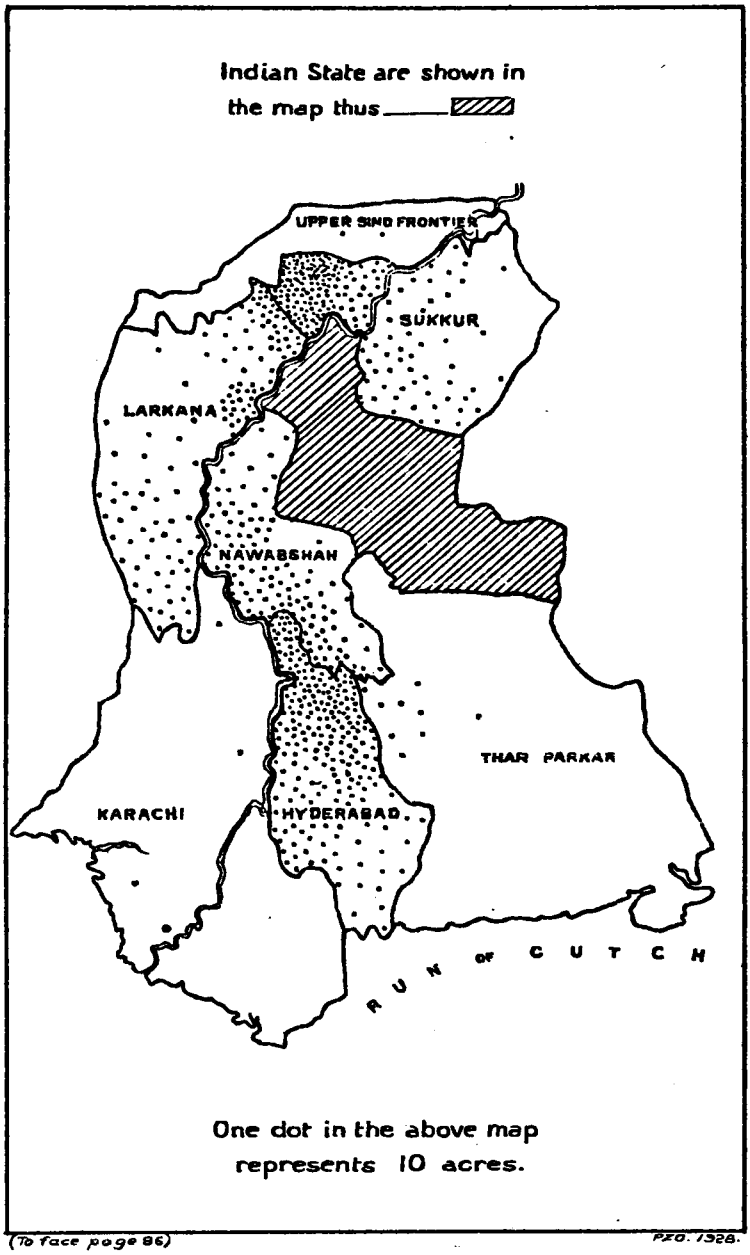
Tobacco occupies, in a normal year, about seven thousand acres and the most important centres of cultivation are the four districts of Hyderabad, Sukkur, Nawabshah and Larkana, the cultivation being either trifling or absent in the other districts.

The following is the actual area reported from the various districts of the Province in 1924-25 :—

District	Acres	Per cent.
Hyderabad	2,274	33·7
Sukkur	2,041	30·3
Larkana	1,283	19·0
Nawabshah	1,013	15·0
Thar Parkar	79	1·2
Karachi	33	0·5
Upper Sind Frontier ..	22	0·3
Total Sind ..	6,745	100·0

Tobacco is always raised from transplanted seedlings. In the south of Sind, the seed is sown in June, on ridges, in a seed-bed, which has been thoroughly ploughed, irrigated and manured. The seed-rate is from four to eight pounds per acre. After a month's growth, the seedlings are removed and planted out singly, on ridges, in a field, well-manured with the droppings of sheep and goats. If possible, the grower gets these animals penned in his field, for some time, but if he cannot arrange this, he gives the land a dressing of about five tons of manure per acre. The crop is watered every day, for the first three days, after which the waterings are gradually reduced to once a week. Reaping takes place about December and is done between dawn and sunrise. The whole plant is cut down at the root and on the following day, the leaves are taken off and spread out in the sun. The drying takes a fortnight or more, during which the leaves are turned over every third or fourth day. When dry, the leaves are collected in a heap which is covered over with palm-leaf matting and weighted. After remaining in this condition for about a fortnight, the leaves are sewn up in bags (*toris*) made of date

TOBACCO.



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fibre, each containing about 160 lbs. The best tobacco is grown in Hala (Hyderabad District). Here (in Hala) an out-turn of 1,400 lbs. per acre is considered fair; elsewhere, the average is from 100 to 200 lbs. lower.

In the north of Sind, tobacco is a spring (*adhawa*) crop, the seed being sown between December and February and the leaves picked from April to June, but the method of cultivation does not differ materially.

There is certainly a large future for tobacco in Sind, when cheap water is available—for the crop is already grown where well water can be had. On the other hand, the cultivation requires a good deal of care and is, at present, in Sind, rather the work of cultivators who make a speciality of the crop.

To gauge the possibility of further development and to test, in general, the suitability of the crop under Sind conditions, a very careful experiment was recently made with the crop by the Bombay Agricultural Department, at the Sakrand Research Station, in Central Sind. The following is an account of the test.

About half an acre of tobacco was grown in 1926, nearly all under local Sind tobacco, but a small area under an improved Gujarat type (*Nadiad No. 6*).

The Sind tobacco grew well in the seed-bed and was transplanted on the sides of ridges between the middle and end of August (1926). After transplanting, it flourished, being watered every ten days, receiving ten such waterings, at two inches of water every irrigation. The total water given, after transplanting, amounted to twenty-three inches, of which irrigation contributed twenty inches and rainfall three inches.

A top dressing of two cwts. of sulphate of ammonia per acre was given in September (1926).

The crop was topped, as usual, and suckers removed regularly. It was cut in the last week of December and cured by the local method. In February 1927, the cured leaf amounted to fifteen hundred pounds per acre, for which rupees thirteen per maund of eighty-four pounds were offered or a value of rupees two hundred and thirty per acre. It was, however, kept till June 1927, when the weight had gone down to 996 lbs. for which rupees seventeen per maund were offered or a value of a little over rupees two hundred per acre.

In the small area devoted to Nadiad tobacco, it was obvious that this was much more delicate than the Sind product and requires much more care in management. The leaves were,

however, large and despite many gaps in the cultivation, it gave one thousand pounds of locally cured tobacco in June 1927. There is clearly a probable future for this tobacco in the Sukkur Barrage area—especially if methods of curing similar to those in use in the *Charotar* (Gujarat) can be introduced.

The experiment has been very instructive in fact and has clearly indicated that tobacco can be very profitably grown in Sind with reasonable care in management.

OTHER DRUGS AND NARCOTICS

Besides tobacco, **bhang or Indian hemp** (*Cannabis sativa*) is grown to a small extent in Sind. The cultivation under the crop is, however, very small, not exceeding seventy or eighty acres annually and that too is exclusively confined to one district—Sukkur. The crop has thus, at the most, only a local importance and deserves no special consideration.

There is no cultivation under **opium, coffee, tea and cinchona** in Sind.

CHAPTER XIII—FRUIT-GROWING IN SIND

The cultivation of fruit is almost a neglected branch of agriculture in Sind. Nevertheless, the Province possesses a number of special advantages for this class of farming. The soil is a deep alluvium. There is very little rain. Pests and diseases are very limited. For these reasons, the grape-vine thrives better in Sind than in almost any other part of India; for, the grape does not suffer from either mildew or anthracnose which devastate the Nasik gardens and the yield of produce is heavy. There are none of the Loranthus parasites which are the curse of mango plantations in the Deccan and of all fruit trees in the Nilgiris. The north of Sind, along the riverain tract, is particularly suited to dates, as, owing to the absence of rain here, the fruit (dates) can be ripened on the trees.

The principal adverse factors are the strong hot winds and the powerful sun. These necessitate shelter but experiments have shown that excellent wind-breaks can be grown in a comparatively short time. For this purpose, the *tali* or *shisham* (*Dalbergia sissoo*) is, perhaps, the best tree.

At the present time, the scope for developing fruit culture is severely limited by the absence of perennial irrigation but several centres, scattered through the Province, have acquired a considerable reputation for fruit. The most important centres of fruit cultivation, at the present time, are (1) Shikarpur (Sukkur), (2) Rohri (Sukkur), (3) Tharushah (Nawabshah) and (4) Hyderabad. In the neighbourhood of Shikarpur, there are upwards of a thousand acres under fruit, of which dates and mangoes occupy the largest area. Then come oranges and pomegranates. Rohri is the most important centre of date culture in Sind. A strip of land, about two and a half miles broad, stretching along the left bank of the Indus and extending to Khaipur Mirs, a distance of fourteen miles, is especially suitable for dates. But the date is cultivated in many other places in North Sind, including Sukkur, Larkana and Kambar Talukas in the Larkana District, in addition to Shikarpur (Sukkur), already mentioned.

At Tharushah and neighbouring villages in the Naushahro Taluka of the Nawabshah District, the most important fruit is the mango, but this place has acquired a special reputation for its oranges, although the area is quite small.

Hyderabad grows a great variety of fruits including figs, grapes, guavas, pomegranates and an inferior variety of apples.

Fruit-growing is, of course, popular with well-to-do men who undertake it for luxury purposes. Such men usually keep their orchards in a bad condition, partly due to ignorance and partly because they are unable to secure good *malis*. They also like to have a diversity of fruit trees and, hence, their gardens become rather non-descript. Fruit-growing, as a business proposition, is carried on at Shikarpur and Tharushah and date culture at Rohri is a highly specialized industry.

The climate of the Province, as we have seen, is remarkably dry and is noted for its rigour during its three characterestic stages, *viz.*, (1) hot wind stage, (2) period of closeness, (3) cold weather. Hot winds begin to blow from the middle of April, lasting till the middle of June; but during the forty days, from the middle of April till the end of May, the heat is very intense. The closeness follows the wind stage and extends, throughout the inundation season, to the end of August. The thermometer attains its extreme height during these two stages. The months of December, January and February make up the third stage and frosts usually occur in February though the severe cold of December and January is also harmful sometimes.

These climatic features make shelter a matter of prime importance in the case of gardens. Each garden is, hence, generally surrounded by a thorn fence, which includes a hedge of tall '*nim*' (*Melia azadirachta*) trees on the inner margin. This tree-hedge possesses several economic advantages, in as much as it serves to break the force of breezes, tends to ameliorate the rigour of hot winds that happen to pass within, and becomes a suitable support to the thorn fence itself, not to mention the tooth brushes that it supplies to the population. A small wooden gate of rough construction forms the entrance to the garden.

Each garden also possesses a well, which has a hut and a shed as necessary adjuncts, the former to accommodate garden servants, fruits awaiting disposal and the well materials, while the latter is for the use of the bullocks. Most of the gardens are only three or four acres in area. One pair of bullocks, therefore, suffices to work the well for half the day, to irrigate the fruit plants during the dry weather excepting the month of May, when scorching hot winds and high temperature necessitate frequent waterings to cope with the large amount of evaporation. More pairs of bullocks are then hired for half the day. The '*haris*' (tenants), having finished their *rabi* crops, offer to engage their pairs of bullocks

most willingly; consequently, no difficulty arises under that head. Those gardens, however, which are of larger size, say about eight or nine acres in area, require two pairs ordinarily and two extra pairs during May. During the *kharif* season, inundation water is usually available in sufficient quantity and, consequently, the fruit trees get a fairly good supply.

The cultivation of fruit trees is gaining ground in the Province and more gardens are springing up every year, as will be seen from the following table :—

Total area under Fruit Trees in Sind

Year	Acres
1907-08	8,093
1912-13	13,454
1922-23	16,959
1925-26	18,529

There is every reason to suppose that the area will further increase and Sind will undoubtedly offer a very promising field to the enterprising fruit-grower, when the perennial canals, associated with the Sukkur Barrage, are constructed.

For the present, the total area under fruit cultivation in the Province is distributed as follows among the different fruit trees :—

Area in 1925-26

	Acres	Per cent.
Mango	10,661	57·5
Date-palm	3,495	18·9
Guava	786	4·2
Oranges and other citrus fruits ..	673	3·7
Pomegranate	538	2·9
Plaintain	366	2·0
Papaw	203	1·1
Grape	87	0·5
Custard apple	77	0·4
Fig	32	0·2
Tamarind	6	....
Jack fruit	6	....
Others	1,599	8·6
Total ..	18,529	100·0

The following notes are intended to indicate briefly the methods of cultivation, the extent of area, etc., under the principal fruit trees.

MANGO—(*MANGIFERA INDICA*)

Mango occupies an area of about ten thousand acres in Sind, out of which, Hyderabad and Larkana claim about two thousand five hundred acres each, Karachi about two thousand acres and Sukkur, Nawabshah and Thar Parkar nearly one thousand acres each. The tree hardly occupies a hundred acres in the Upper Sind Frontier District.

The following is the actual area under mango in 1925-26 in the various districts of the Province :—

District	Acres	Per cent.
Hyderabad	2,789	26·2
Larkana	2,757	25·8
Karachi	1,843	17·3
Sukkur	1,318	12·3
Nawabshah	950	8·9
Thar Parkar	932	8·8
Upper Sind Frontier ..	72	0·7
Total, Sind ..	10,661	100·0

There is a general belief that the seeds of those fruits which reach a complete state of development and ripeness on the parent and fall of their own accord, are true to type and that the seeds obtained out of fruits borne by top-shoots are invariably vigorous and true rather than those that are borne by side-branches. With these theories in view, the people are apathetic about grafting. Such seeds, as are completely ripe and have fallen without any external stimulus, are selected and sown in beds, six inches deep and two feet apart each way, in the month of August or September. The nursery beds are lined out near the wells, usually ten feet square, but very often, these are made very irregularly and of various dimensions, depending more or less on the space available and choice of the *mali* (gardener). The preparation of beds consists in digging the land, six to eight inches deep, with the ordinary *kudal* and mixing about ten seers (twenty pounds) of goat manure in it. Immediately after sowing the seeds, the beds are irrigated, which is repeated every third or fourth day till the seeds have germinated and then the interval is gradually prolonged to ten days. During April and May

(that is within the forty days of heat), the irrigations are given every alternate day, in order to keep pace with the extraordinary evaporation. The seeds germinate within three weeks of sowing and because they are sown sufficiently wide, there appears no need of thinning. In order to protect the young seedlings from frost, which is of no uncommon occurrence, they are sheltered, during cold weather, with thatches or mats woven out of reeds. As soon as spring sets in, the shades are removed. The land is hoed up after three or four waterings and as soon as the weeds have made their appearance.

When the seedlings are about a year old, they are dug out of the nursery beds and conveyed to the field. The field is cleared of all jungle growth and roots, and ploughed three or four times, with the ordinary local plough. Holes are then dug out at desired equal distances. Each seedling is placed in a hole and supported all round with the excavated soil. Then, about eight pounds of goat manure are sprinkled on the surface of the depression and irrigation allowed. Waterings are continued at the interval of four days, till the seedlings have struck roots and are found to be well-established. Then the interval is gradually prolonged to ten days. But during the forty hot days, the irrigations are copiously and frequently given, almost every alternate day.

As a rule, sub-crops are taken for the first five years only and of these, paying vegetable crops are raised during the first two or three years and barley or '*adhawa*' (hot weather) *jowar*, in the last two years. The principal vegetable crops, that are grown in the mango plantation, are chillies, brinjals, *bhendi* (edible hibiscus), onions, garlic, *dodka* or sharp-cornered cucumber (*Laffa acutangula*) and *karli* or bitter gourd (*Momordica charantia*). Barley and '*adahwa*' *jowar* are utilised for the cattle only.

Mango plants begin to bear in the fourth year after transplantation. The flowering season usually occurs after the end of January and the fruits are available from the middle of May to the middle of September.

The yield of fruit depends upon the age of the tree, the year and the variety. The older the plants are, the higher is the yield obtained. Ten year old plants yield from four hundred to five hundred fruits, while those of forty years of age run up to one thousand to fifteen hundred. With regard to the year, it has been observed that the mango produces in abundance every alternate year. The years of low yield are

said to be necessary for the plant for rest and recuperation. As to variety, the ordinary species, bearing small fruits of less flavour and sweetness, yield considerably more than the types such as '*Alphonso*', bearing better flavoured, sweeter and bigger fruits.

The mango plant in Sind is liable to two pests or diseases. They are the '*Mahlo*' and the '*Tat*'. The '*Mahlo*' mango-hopper is an insect pest and is responsible for decreased yield and shedding of unripe fruit. It seems connected with unclean or congested plantations. The '*Tat*' is a malformation of inflorescence which is ascribed to the prevalence of cloudy weather and rains during the flowering stage.

DATE-PALM—(*PHŒNIX SYLVESTRIS*)

The date-palm is one of the most important fruit trees grown in Sind and occupies an area of about three thousand acres, more than three-fourths of which is to be found in the Sukkur District alone. The following table shows the distribution of the fruit tree in the different districts of the Province :—

Area in 1925-26

District	Acres.	Per cent
Sukkur	2,239	83·7
Larkana	306	11·4
Karachi	98	3·7
Hyderabad	21	0·8
Upper Sind Frontier ..	9	0·3
Thar Parkar	2	0·1
Total Sind ..	2,675	100·0

The date-palm is self-sown in Sind. The climatic conditions prevailing in the greater part of the Province, that is to say, that part which is free from sea-breezes, are almost identical with those of the wellknown date-growing tracts of the world. The tree, as is wellknown, requires a dry atmosphere, low humidity, high mean temperature and very little or no rain. The slightest precipitation at the time of flowering spoils pollination, while, during the ripening stage of the fruit, it sets up fermentation in the berries.

Sandy loam is perhaps the best medium for the successful growing of the date-palm but it is not uncommon to find it flourishing in heavy clay and even in salt soils.

The land is first levelled and channels four feet wide are dug about twelve feet apart. Holes are made along one side of the channels twelve to fifteen feet apart. Twenty to

thirty pounds of cattle manure are incorporated in the excavated earth, which is then returned to the pits. Irregular plantations are very common, and testify to the self-sown existence of the palm.

Transplanting of suckers is the most general method of propagation. Round about the palms, several off-shoots spring up and grow as a natural means of replacing the parent. Young off-shoots of from three to five years of age are removed and transplanted. Large leaves of the off-shoots are cut off but the growing bud is well protected. Transplanting takes place in *Phalgun* (April) when the temperature becomes favourable to growth.

For the first three years after the date of transplanting, irrigation is regularly given. During the first quarter, that is, April, May and June, water is applied every alternate day, in order that the seedlings may strike root. From July till the end of the year, weekly irrigation is given. Irrigation during the fruiting season is a necessity but it is carefully avoided during flowering (February-March) as it prevents the proper setting of the fruit.

In specially good soils, young off-shoots begin to yield from the sixth year of their age but ordinarily, the eighth year is considered to be the average year from which an appreciable quantity of fruit should be obtained. The palm is said to live at least two hundred years.

Old leaves and dry fruit stalks are removed every year just a little before flowering, to keep the palms clean and allow more space to the new spathes. Direct manurial or intercultural treatment is not given, nor is it advisable, but the intermediate spaces are ploughed and manured to grow vegetable crops, seedlings of fruits, etc. A yard round each palm, the earth is compressed and a mound raised to make the plant stable enough to stand the high winds which are common.

The date-palm flowers in *Phalgun* (March-April). Male plants produce stout, club-shaped spathes which are enclosed in sheaths. The sheath splits up after about a week, exposing a fruit-stalk, full of slender branches bearing innumerable flowers. These flowers are highly scented and possess a sweet substance (nectar) which attracts bees and other insects which carry over the pollen grains to the female plants in the natural course of events. But this method of pollination is always defective in as much as some female spathes split

much later than the male spathes, in which case the pollen may be lost. The growers, therefore, remove the male flowering spathes just a little before splitting and insert one or two branches in each female spathe when it splits.

After this artificial pollination, the development of the fruit is to be carefully watched. Five distinct stages are recognised corresponding to definite degrees of maturity. The first stage is over when the fruit is about as big as a pea. At this time, thinning is practised in order to enable the remaining fruits to develop. This takes place in May. The second stage is reached when the fruit has developed to about half its normal size. The third stage is attained when the fruit reaches its full size and the colour changes from dark green to various shades of yellow and red. Fruit picked at this stage comes into the market in June but it requires artificial ripening in jars containing a solution of salt, and certain varieties of date are specially suited to this treatment. The fourth stage is reached when translucent spots containing sugar are visible on the surface. At this stage the crop may be picked and marketed without further treatment. The fifth stage represents the final maturation of the fruit which has completed its ripening on the tree. The date at this stage is soft, sweet and fleshy. Much knowledge is required in deciding at what stage to harvest the crop, as some varieties cannot develop up to the fifth stage of maturation.

Full-grown palms bear, on an average, ten bunches. Each bunch yields from ten to forty pounds of dates. The total yield per plant, therefore, ranges between one hundred and four hundred pounds.

In date culture, maximum profits accrue from the quality of the produce. Varieties like '*Assuli*' command much higher prices than do the ordinary varieties.

All parts of the date-palm, except the roots, are usefully employed. The long trunk is used in 'Persian wheels' and other temporary structures. Fans, mattings, brooms and baskets are made by weaving the leaflets. Whole leaves are beaten down to fibre with wooden hammers and twisted into well ropes. The dried fruit stalks serve as brooms, while the shaft of the stalk is split into long stripes which are woven into bird-cages.

GUAVA—(*PSIDIUM GUYAVA*)

Next to mango and date-palm, guava (locally known as '*zetton*' or '*jamphal*') occupies the largest area among the fruit

trees in Sind. The cultivation is general but is more intense in South Sind. The following is the area under the tree in 1925-26 in the different districts of the Province :—

Area in 1925-26

District	Acres	Per cent.
Hyderabad	427	54·3
Karachi	172	21·9
Thar Parkar	106	13·5
Sukkur	59	7·5
Nawabshah	11	1·4
Larkana	10	1·3
Upper Sind Frontier ..	1	0·1
Total, Sind ..	786	100·0

A fully ripe fruit is picked from the tree and crushed to squeeze out the seeds. These are then mixed with dry, rotten but powdered cowdung and sown in a ten feet square nursery bed, without any more delay. Sowing is usually done in the month of March (*Phalgun*) or August (*Shravan*). Germination occurs within about a month. Irrigation is given at intervals of five days. Seedlings are allowed to grow in these beds for full two years. In the meanwhile, the plots are regularly cleaned of weeds and hoed.

The land selected for a guava plantation is irrigated, ploughed twice, levelled and laid out in small plots, measuring from one quarter to half an acre each. Parallel channels or furrows, twelve inches by eighteen inches, are made fifteen feet apart. Along each channel and on one side of it only, circular holes are dug, at a distance of fifteen feet. After the exposure of a week or ten days, the excavated earth is mixed with fifty pounds of cattle manure and returned to the pits.

In the month of March (*Phalgun*), on to the end of April (*Chaitra*), transplanting of guava seedlings is effected. The seedlings are dug out of the nursery bed and planted in the holes. Irrigation follows and is continued at intervals of five to seven days throughout the year.

Side by side with the transplanting of guavas, *karli* or bitter gourd (*Momordica charantia*), *turia* or *dodka*, that is, the sharp-cornered cucumber (*Luffa acutangula*), *bhendi* or edible hibiscus (*Hibiscus esculentus*) seeds are sown along the borders of the channels. Other crops that are sown in the plantation are brinjals, chillies, *chuka* or bladder-dock (*Rumex vesicorius*),

methi or fenugreek, etc. The sub-crops are cultivated during the first three years only, because after that period, the fruit plants cover the ground and begin to yield.

The plants are manured just before the advent of the spring, each year.

The guava tree begins to bear flowers two years after the transplanting, that is to say, in the fifth year of its life and continues on for forty to fifty years, to which age, it is said, it reaches easily unless some unusual cause cuts its life short.

There are two flowering seasons of the guava in Sind, the first commencing from early *Chaitra* (April) and the second from *Shravan Vadya* (about the end of August). The fruit of the former flowering lasts till June-July, while that of the latter, till the middle of January. Of these seasons, the second or the cold weather season is the best from the yield point of view.

Each plant yields, on an average, thirty to forty pounds of fruit, sixty pounds being the maximum yield. An acre of plantation includes about two hundred and fifty plants and ten thousand pounds of fruit may thus be taken an average yield per acre.

There are three varieties of this fruit tree growing in the gardens, *viz.*: (1) *Khasi* (seed-less), (2) *Vanga* (elongate) and (3) *Gedi*. The '*Khasi*' variety is a low yielder as compared to others but the fruit contains very few seeds. The '*Vanga*' variety produces elongated, thick fruits, with innumerable seeds. The '*Gedi*' bears small but many fruits.

Bulbuls, parrots and squirrels damage the fruit. A caterpillar is known to feed upon the fleshy part of the fruit and becomes a serious pest when cloudy weather prevails. But this is a rare occurrence in Sind and consequently the complaint is rare.

The fruit is the only useful marketable product of the plant.

ORANGE AND OTHER CITRUS FRUITS

Oranges and other citrus fruits occupy an area of about seven hundred acres in the Province. The areas under the different fruit trees falling under this class, such as lime, sweet lime, orange, etc., are often indiscriminately mixed together and hence the figures need to be accepted with caution.

The following are the figures actually reported in 1925-26 :—

Area in acres

District	Lime	Sweet lime	Orange	Citron
Karachi	21	..	5	2
Hyderabad	88	..	13	12
Thar Parkar	49	..	17	3
Nawabshah	82	2	50	1
Larkana	40	3	1	..
Sukkur	184	72	7	2
Upper Sind Frontier	14	4	1	..
Total, Sind ..	478	81	94	20

By far the largest number of seedlings are raised from the *musambi* (sweet lime) stalks, because of the prevailing belief among the growers that the fruit of such a plant is sweeter in taste and better flavoured than that of the plant raised from any other stock.

The stalks of *musambi* are raised mostly by layering and rarely by cuttings. During February and March, the lower shoots of *musambi* plants are bent down, buried in the soil and weighted to keep them in position. The skin of the branch is scratched a little to stimulate root formation. Irrigation is then allowed, as usual, at the interval of four to five days. The branches strike root in about a month, when the connection with the parent is cut off. Stocks are generally allowed to progress and are even budded on under the parent. Some growers, however, transplant the stocks to nursery beds, measuring ten feet by ten feet, and plant them at a distance of one foot each way. The beds are prepared by digging the ground, about eight to twelve inches deep and manuring, at the rate of thirty pounds of goat manure per bed.

When transplanting to the nursery bed is practised, it is usually done in the month of September when the budding operation is also effected. The growers have learnt by experience that March buds usually succumb to the following hot winds of April and May, while September buds are well advanced in the cold weather to resist their effect. Frost also kills some buds but, as a rule, they are protected sufficiently against it.

The budding is made in this way :—An incision is made in the form of an inverted T (T) and the skin is loosened, on

either sides, to accommodate the bud. The bud of a twelve-month old shoot is selected and carefully cut out with a sharp knife, to be inserted in the slit. The part is then securely tied with twine and the leaves or buds growing in the neighbourhood of the wound are removed, while the top is also cut down to about two or three inches above it.

Irrigation is given regularly at intervals of three or four days during the cold weather and every alternate day during the hot weather.

Land selected for an orange plantation is ploughed and levelled during the inundation season and buds are raised all round. Square depressions, two feet by two feet, are then made in rows, twelve feet apart, from centre to centre, each way. These depressions are manured with goat manure and are made eight to twelve inches deep.

Three year old seedlings are then located in these depressions, in the month of September. Irrigation immediately follows and is continued at intervals of four to seven days according to the season.

Eight pounds of goat manure are applied to each plant in the month of October, while the hoeings and weedings are repeated weekly or fortnightly in accordance with the need of the plants.

As a rule, sub-cropping in orange plantations is deprecated, principally on the ground that the cultivation of such crops retards the maturity of orange seedlings, though, in rare cases, some vegetables are grown.

The plants begin to bear when they are about six or seven years old. The fruiting season extends from November to January. The first fruiting is generally light, averaging about twenty fruits per plant. But from the sixth to the twentieth year after transplantation, the yield averages between three and four hundred fruits per plant.

Generally, orange or sweet lime plantations last up to twenty years, after which gradual deterioration sets in and the yield falls, though, under exceptionally favourable circumstances, such as, rich soil, liberal treatment and amenities of climate, the plants may continue vigorous even up to forty years.

Though severe winds in April and May often cause shedding of unripe fruits, the orange tree is generally free from any serious crop disease or pest in Sind.

POMEGRANATE, ANAR—(*PUNICA GRANATUM*)

Pomegranates occupy an area of about six hundred acres in Sind, which is distributed as follows in the various districts of the Province :—

District	Acres	Per cent.
Sukkur	234	38·6
Hyderabad	193	31·9
Karachi	66	10·9
Thar Parkar	62	10·2
Nawabshah	28	4·6
Larkana	13	2·1
Upper Sind Frontier ..	10	1·7
Total, Sind ..	606	100·0

With the advent of spring, mature branches of the *anar* plant are pruned out and cut in pieces, nine to twelve inches long, with a sharp hatchet. These pieces or cuttings are buried two-thirds deep in the soil of the nursery beds. The tops of the cuttings are covered with fresh cowdung to save them from exposure and drying. The beds are irrigated at intervals of three to four days, till the cuttings have sprouted, which they usually do in about a month. The cuttings stand in the nursery bed for full two years, during which period they receive hoeings once a month regularly. They are planted in rows nine to twelve inches apart.

Eighteen months after making and planting the cuttings, that is, during the second following inundation season, the land selected for *anar* plantation is irrigated, ploughed twice, levelled and laid out in small plots, measuring from one quarter to half an acre each. Parallel channels or furrows, twelve inches by eighteen inches, are made twelve feet apart. Along each channel and on one side of it only, circular holes are dug, at a distance of twelve feet. After the exposure of a week or ten days, the excavated earth is mixed with fifty pounds of cattle manure and returned to the pits.

When all the field operations have satisfactorily been done, the grower awaits the approach of the *Mahashivaratra* (about the middle of March) festival, which marks the beginning of the transplanting season. The plants to be used are carefully lifted from the nursery beds and carried to the field where planting is simultaneously done.

Irrigation, during the first few months after the transplantation, is given at short intervals, about twice a week, but when the plantation is fairly established, water is applied

once a week, throughout the year. In case of white ants proving a serious pest, the interval is shortened to suppress the attack.

Side by side with the transplanting of pomegranates, *karlis* (bitter gourds), *dodka* or *turi* (sharp cornered cucumbers), *bhendi* (edible habiscus), brinjals, chillies, *methi* (fenugreek), etc., etc., are sown along the borders of the channels. The sub-crops are cultivated during the first three years only, because after that period the fruit plants cover the ground and begin to yield.

For the first three years, the soil round the plants is stirred and weeds removed twice a month. The channels are also cleaned in order to grow the sub-crops. But after that period, the weedings cease altogether and the growth of natural grasses is encouraged, as these provide an excellent green feed for cattle and, consequently, are readily sold. Pruning of dead branches on the top and fresh growth at the roots of full-grown plants is effected in *Kartika* (November).

Manure is applied once in a year (February) when about fifteen pounds is applied to each plant. Before applying manure, the soil round the roots is dug out and replaced by fresh canal earth.

Productive flowers appear two years after transplanting or in the fifth year of the life of the plant. Some flowering, however, occurs from the second year of its life when it is still in the nursery, but at this stage, the flowers are usually picked out. There are two main flowering seasons, the first commencing from early *Phalgun* (March-April) and the second from *Bhadrapad* (September-October). The fruit of the former, lasts till the *Dasra* (October) festival and that of the latter till *Margashirsha* (January). Of the flowering seasons, the *Phalgun* flowering is always the best.

From five years of age on to about fifty years, maximum yields are obtained. After fifty years, the yield is said to decline. The average yield amounts to thirty pounds per plant, the maximum being about a maund (eighty pounds) of fresh fruit. The average number of *anars* borne by each plant is seventy, the range being from forty to one hundred, each of which weighs from one-half to three quarters of a pound. An acre of *anar* plantation consists of about two hundred and fifty plants.

Another product of the trees is the quantity of fallen flowers obtained from the *Phalgun* (March-April) flowering. These

are dried and gathered and find a ready sale. Ten to twelve maunds of this stuff are obtained per acre.

The third product consists of the rotten fruits which have been damaged by birds or insects. Seeds of such fruits are dried and sold as *Khât* (sour substance used in curries), while the rind goes to the dye-dealers to yield a yellow dye.

The pomegranate tree is of considerable local importance, owing to the uses that a good many parts of it are put to. Thus, the fresh fruit is enjoyed on the table. During malaria and seasonal fevers, it is recommended as a cooling beverage to ameliorate the action of the bile. Syrup *anar* is commonly used as a febrifuge. The rind and flowers are dried and used by dyers in wool colouring. Unripe flowers are dried and pounded to make a snuff which is considered to be the best astringent in nasal hemorrhage while internally it is very effective during infantile diarrhœa and dysentery. The green leaves are made into a paste and applied on the eyes during conjunctivities. The bark of the roots is also used in several medicinal preparations.

PLANTAINS—(*MUSA PARADISIACA*)

This is the poor man's fruit and is an exception to the rule that orchards are only found near large towns. Dense groves of plantain trees may be seen near many remote villages. Sind plantains are, however, generally poor but Bombay plantains, though not the best, are grown in Karachi and large quantities are imported.

From four hundred to five hundred acres are put under plantains annually in Sind. The following is the distribution of the area in different districts of the Province :—

Area in 1924-25

District	Acres	Per cent.
Karachi	151	36·8
Sukkur	84	20·5
Thar Parkar	76	18·6
Hyderabad	71	17·0
Nawabshah	18	4·5
Upper Sind Frontier ..	6	1·4
Larkana	5	1·2
Total, Sind ..	411	100·0

Plantains are propagated by separating the shoots which spring up around the parent stem, after it has fruited. No further trouble is taken with them. They must have abundant water and are therefore usually planted near an

irrigation channel or well but the soil is rarely manured. The transplanted shoots produce fruit in the second year and at any season.

PAPAYA—(*CARICA PAPAYA*)

The only systematic cultivation of *papaya* is done in the Karachi District which alone reports an area of about two hundred acres annually under the fruit tree.

Papaya yields a quicker return than any other orchard tree, the fruit being ready to pluck eight months after the seed is sown. But the trees are short lived.

Seed is sown at any time except the cold season and, after a short time in the seed bed, the young plants are transferred to well manured land. They require liberal watering and much manure.

GRAPES—(*VITIS VINIFERA*)

Grapes of many varieties and excellent quality grow at Karachi as well as inland. They occupy an area of about one hundred acres which is distributed among the different districts as shown in the following table :—

Area in 1924-25

District	Acres	Per cent.
Sukkur	42	39·7
Karachi	32	30·2
Hyderabad	13	12·3
Thar Parkar	12	11·3
Nawabshah	5	4·7
Larkana	1	0·9
Upper Sind Frontier ..	1	0·9
Total, Sind ..	106	100·0

Grape vines are raised from large cuttings put down in the spring and begin to bear fruit in the third season. In February or March, they are severely pruned and the roots are exposed after which the ground is richly manured with dung of goats and cows or blood and offal and the entrails of fish.

The fruit ripens in June or July and is done before the Quetta grapes are ready to compete. The Karachi season is a little earlier than that of Hyderabad.

The grape most commonly grown is the *Kismis* or seedless *Sultana* but the large '*Kandahar*' grape also grows well and several fine varieties have been introduced.

FIGS—(*FICUS CARICA*)

The cultivation of fig is practised, only on a small scale, in the Province, mostly in the three southern districts of Karachi, Hyderabad and Thar Parkar and to a small extent in Sukkur (chiefly near Shikarpur). The annual area put under the fruit tree hardly exceeds forty acres.

The following are the actual figures of acreage in 1924-25 :—

District	Acres	Per cent.
Hyderabad	15	41·6
Thar Parkar	8	22·2
Karachi	6	16·7
Sukkur	6	16·7
Nawabshah	1	2·8
Total, Sind ..	36	100·0

Figs are grown from cuttings which are put down about March or August and begin to bear in two years.

The trees are regularly manured with goat or cowdung and also pruned in February or March when their roots are also exposed for a week or two.

The fruit ripens in July or August before which it is customary to sprinkle or wash the foliage from the dust which would smother it.

CRAB APPLE, SOOF—(*PYRUS MALUS*)

The crab apple is a type of the well-known *sab*, *soof* or *safarchand* variety, very largely imported from Kashmir State. It is neither so big nor so sweet or flavoured as foreign types, nevertheless, it is a useful fruit and is in considerable demand.

Mature plants produce off-shoots every year in March (*Phalgun*), when the new growth makes its appearance. These are dug out and planted in beds nine inches apart, during the month of August (*Shravan*). These beds are then irrigated every alternate day till the young plants have struck root, after which the interval is gradually prolonged to five days. Nursery beds are located in the shady avenues, usually in plantain plantations, in order to protect the seedlings from the hot winds, and the western sun. The plants are allowed to grow in the nursery beds for about eight months, being transferred to the field in the following March. Transplanting in the month of August is equally effective.

Having completed the ploughing and levelling of the land, plots are laid out, half an acre in area, and channels, twelve to eighteen inches wide, are made fifteen feet apart.

Along each channel, about eighteen inches from one side of it, round holes, eighteen inches by twelve inches, are excavated, at a distance of fifteen feet from hole to hole. Twenty pounds of horse dung are added to the earth which is then returned to the pits. Grown up plants stand about twenty-five feet high from the ground level and occupy a considerable space; consequently, the distance of fifteen feet each way is almost covered.

The transplanting is usually done about the middle of March (*Mahashivratra*). The young plants are carefully lifted from the nursery bed and placed in the holes made ready for them. Irrigation immediately follows.

The plants are irrigated, at intervals of five or six days, throughout the year during their life time, except during the fruiting season, when they are watered every alternate day.

Hot weather vegetables are usually grown for the first three years only after which, the fruit trees attain maturity and begin to yield.

The land is kept clean and the weeds are removed almost every month. No hoeing is done near the roots, nor is it considered advisable to do so, in asmuch as the plant possesses shallow roots which would not stand the injury caused by hoeing them. On the contrary, the soil is pressed down at the bottom of the plants to make them firm enough to stand high winds. The plants are manured in February each year.

The first flowering appears three years after transplanting or in the fifth year of the life of the tree. The fruiting season of the *soof* lasts only for a couple of months, that is to say, during *Vaishakha* and *Jyeshtha* (May and June). Ripe fruits are round, with depressions at both ends, yellowish green, turning brownish red on over-ripening.

The average yield of ripe fruit comes to about thirty pounds per plant. An acre of plantation consists of about two hundred and fifty plants. The fruit tree appears to have a life of about twenty years.

The tree is generally free from insect pests and diseases. Birds have to be carefully driven away. Frost has a deleterious effect on the flowers, while rain (which nevertheless is of a rare occurrence) damages the flowers as well as the fruit.

The fruit is the only part of the plant that is useful in home economy. Pickles are made by boiling well-developed berries for half an hour and putting them in sugar syrup. This kind

of pickle is known as '*Murabo.*' As a vegetable, the fruit is cooked in curries. The wood, leaves and roots are of no economic significance.

BER—(*ZIZIPHUS JUJUBA*)

The *ber* plant is naturally very hardy, a heavy yielder and long lived. It withstands excess of moisture with as much ease as it bears drought; it tolerates bad treatment and is profuse in yield. It is not subject to any serious insect or fungus disease, nor does it succumb to frost or wind.

Any "flow" area which includes a well for hot-weather irrigation, is chosen for a '*ber*' plantation. The plant does well on sandy loam, deep, well-drained soil, though it has been found to grow quite well even in *kalar* (alkali) soils.

There are three main varieties of '*ber*' which are commonly grown, *viz.*: (1) wild *ber*, (2) *soofi mithi* (sweet budded) and (3) *soofi khâti* (sour budded). The wild variety includes innumerable sub-varieties all of which bear small, almost tasteless berries and possess myriads of thorns. The sub-varieties grow anywhere unattended and yield abundant fruit to the poorer classes and way-farers. The two *soofi* varieties are raised in gardens, or in the neighbourhood of wells, by budding on the wild varieties.

Nothing is done with regard to levelling the soil and no ploughing is given to the intended area. Small channels, one and a half feet wide, are lined out, twenty to thirty feet apart. Within these channels, depressions, two and a half feet square, are made, which are of the same depth as the channel itself. In the centre of each depression, a hole is dug, about eight to ten inches in diameter, in which the stock fits in almost exactly.

Underneath a wild *ber* tree, large number of seedlings spring up annually. Such seedlings as are about half an inch thick, are dug out and planted in holes prepared for them, usually during February and March or June and July. After the transplantation, goat manure, to the extent of ten pounds per plant, is spread on the surface of the depression and irrigation given. Waterings are given at intervals of seven to ten days.

By the end of August or in early September, budding operations are performed on the transplanted seedlings. Twelve month old branches of a '*soofi*' variety are cut and conveyed to the field and kept moist. The seedlings are then carefully deprived of all growing buds and topped. An incision, in the form of an inverted T (T), is then made on each stock, and

the bud, cut out of the *soofi* branch, is inserted in it. The wounded part is then securely tied round, with twine. The bud germinates within about a month's time.

Ber plants begin to put out new growth by the end of August or early September. A month previous to this, the irrigation is stopped, the plants well manured with about twenty-five pounds of goat manure and four pounds of common salt and irrigation started. This (irrigation) is then continued on, throughout the bearing season, at intervals of seven to ten days.

The '*ber*' begins to bear three years after budding, if it is well attended to; otherwise, after four years. Yielding capacity gradually increases and after ten years, maximum yields are obtained.

Except a mild attack of fly maggot, the plant is generally free from disease.

PHALSA OR PHARWAN—(*GREWIA ASIATICA*)

Unlike other fruit trees, the *pharwan* is a small but very productive perennial shrub. Its stump is hardly four feet high, but when the new shoots are borne, it occupies a good deal of space.

Ripe berries, collected during the month of May, are mixed with fresh, moist cowdung and kept in a jar for two days. In the meantime, nursery beds are pepared near the well, as usual. Small ridges, nine to twelve inches apart, are lined out in the nursery beds. On the third day, the contents of the jar are taken out and sprinkled on the ridges. After slightly dusting the ridges to cover the seeds, the furrows are watered carefully so as not to submerge the ridges entirely. Irrigation is applied every alternate day. The seedlings make their appearance above the ground in about ten days' time. They are allowed to grow in the beds for full three years and are transplanted in the fourth spring. At the time of transplantation, the subterranean portion of the seedlings resembles a country carrot (*gajar*)—a thickened elongated mass, tapering towards the tip, while the portion above the ground shows a similarity to the parent.

The land selected for plantation is irrigated, ploughed twice, levelled and laid out in small plots. Small shallow channels are lined out, nine to twelve feet apart, along each of which, holes, four to five feet apart, are excavated.

The transplanting operation is usually performed in the month of *Phalgun* (March-April) and rarely in June. The

seedlings are carefully lifted from the nursery beds and planted in holes prepared for them. Irrigation is given at the interval of three days during the summer months and of six days afterwards.

One year after transplanting the seedlings or in the fifth year of their life, flowers appear in small bunches. These flowers, on fertilization, bear small, white berries which turn red, finally becoming black on complete ripening. The fruit is picked during the hottest season, *viz.* : April and May and the fruiting lasts till the end of June.

Each plant yields from twenty to twenty-five pounds of ripe berries, on the average. An acre of *phalsa* plantation contains about 650 plants.

The berries provide a useful fruit to serve on the table during the hot weather, and as the fruit ripens during the hot weather, its cooling properties are highly appreciated. Extract and syrup are other preparations made out of the fruit. Pickles are also very largely produced from it.

The leaves are dried and stitched together to make leaf plates which are very useful and important articles in the domestic economy of the people. Round pots are also stitched of the leaves and are used by confectioners and hawkers in wrapping sweets, etc. The long branches are employed in thatchings and *kacha* roofs.

No fungus or insect disease is known to occur except white ants, which will always be found infesting the plants and sometimes eating them out entirely. Shade of trees is harmful to the healthy growth of the plant. Parrots and squirrels are important pests which can only be kept down by ceaseless watching.

PEACH—(*PRUNUS PERSICA*)

Peaches are found to fail on the coast but grow fairly successfully in gardens in the interior of the Province.

Peaches are raised from seed sown in the spring and afterwards transplanted. The plants are manured in spring and autumn, with goat's dung, if procurable ; otherwise, with cattle manure. They are not pruned but their roots are exposed before manuring. The leaves from these trees fall in the winter.

The fruit ripens in July, earlier than peaches can be obtained from Quetta and, hence, is in demand, though not of very high quality.

MULBERRY—(*MORUS INDICA*)

Mulberries are of two kinds, the black or garden variety, the fruit of which is sold in the Karachi bazar and the white mulberry, which grows all over Baluchistan and Upper Sind and attains a height of thirty or forty feet. The long, thin, greenish fruit of the latter is dried and sold in all the bazars. It was held in great esteem by Baluchi warriors who carried it in their pouches and swallowed a mouthful, when entering into action, to give them stomach for the fight.

MELONS

Both kinds of melons, namely, the musk-melon (*Cucumis melo*) called in Sindhi *gidro*, but commonly known as *kharbuza* and the water-melon (*Citrullis vulgaris*) called in Sindhi *hindano* or *chhanho*, but commonly known as *tarbuza*, are much cultivated where sand with an under current of water can be found, as in river beds. These two together occupy about fifteen thousand acres in Sind. The following are the actual figures of area in 1924-25 :—

District	Musk Melon Acres	Water Melon Acres
Karachi	1,573	382
Hyderabad	2,152	493
Thar Parkar	40	4
Nawabshah	197	17
Larkana	1,395	849
Sukkur	1,656	2,273
Upper Sind Frontier	1,037	1,240
Total, Sind ..	8,050	5,258

So soon as the sand banks are exposed by the falling of the river, operations commence, by enclosing small plots with grass fences, in order to protect them from the inroad of the drifting sand. Large holes are dug at regular intervals throughout the plot, into which the requisite amount of manure is distributed. The melons are sown over the manure in the holes, which act therefore in the same manner as forcing beds. Where the river deposit is of richer quality and contains a mixture of organic matter a much less amount of manure is required and in a few cases manure is altogether dispensed with. The melon beds commence fruiting in April and continue yielding until they are overwhelmed by the rise of the river in June.

Jacobabad is famous for the *kharbuza* (musk-melon) while the best water-melons are to be found at Garhi Yasin in the Sukkur District.

CHAPTER XIV—VEGETABLES

The common European vegetables such as, **cabbage, cauliflower, turnip, green peas, French beans, tomatoes, beet-root, celery,** etc., are very successfully grown at Karachi, Hyderabad and, in short, wherever there is a demand for them.

Others, which are used by Indians as well as Europeans, are more widely cultivated, such as the **onion** (*basar*), **garlic** (*thum*), **radish** (*muri*), **carrot** (*pitai gajar*), **sweet patato** (*Lahori gajar*), **spinach** (*palak*), **brinjal or egg plant** (*wangan*), **bhendi** (edible hibiscus) and **potato.**

We have the figures of area for some of the above vegetables and those that are so available are noted in the following table. The figures for onion and potato are noted under the respective heads :—

Area in 1924-25

District	Sweet Potato	Carrot	Radish	Cabbage	Brinjal	Tomato	Fenu greek	Bhendi
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Karachi ..	277	287	89	298	603	30	93	92
Hyderabad ..	1,092	143	66	6	111	1	146	34
Thar Parkar ..	15	77	62	4	25	..	3	3
Nawabshah ..	1	31	10	1	14	..	37	2
Larkana ..	..	113	34	15	54	..	21	10
Sukkur ..	..	123	16	26	70	..	75	38
Upper Sind Frontier ..	..	72	31	15	8	..	8	7
Total, Sind ..	1,385	846	308	365	885	31	383	186

Of the vegetables cultivated in Sind, onions and potatoes deserve a special mention as they are grown, on a fairly extensive scale, in the Province and occupy the largest areas among vegetables.

ONION—(*ALLIUM CEPA*)

Onions occupy by far the largest area among vegetables grown in Sind. The most important centre of cultivation is the Hyderabad District which alone occupies more than two-thirds the total area under the crop. The cultivation of onions is also important in Sukkur. In the other districts, the cultivation, though small, is yet general.

The following table shows the distribution of area under onions in the different districts of Sind :—

Area in 1924-25

District	Acres	Per cent.
Hyderabad	6,994	68·8
Sukkur	1,640	16·1
Larkana	511	5·0
Karachi	478	4·7
Nawabshah	236	2·3
Thar Parkar	175	1·7
Upper Sind Frontier	137	1·4
Total, Sind ..	10,171	100·0

Onions are really a garden crop grown in the *rabi* season, requiring a fairly large amount of water. Given this (sufficient water) and proper care, the crop is likely to flourish exceedingly in most parts of Sind.

The details of a very recent experiment with onions are given below as they indicate both the mode of cultivation and the returns from the crop.

Onions were planted at Sakrand on land, manured with fifteen cart loads of farm yard manure per acre, from seed beds, about the middle of January 1927 into dry land which was immediately watered with four inches of water. The total water added between the planting and May 30th when the crop was reaped, was twenty-four inches.

The crop of onions obtained was, on the average, sixteen thousand pounds (actual 15,960 lbs.) of onions per acre; as sold ten days after taking out of the ground.

The greater part of the crop was sold at rupee one per maund of eighty-four pounds and the rest at twelve annas per maund, bringing in rupees one hundred and sixty-five per acre.

There was no difficulty with the crop whatever. The above experiment clearly indicates that onions are both a suitable and a profitable crop to grow in a large part of Sind.

POTATO—(*SOLANUM TUBEROSUM*)

Potatoes occupy the second largest area among the vegetables cultivated in Sind. Unlike onions, however, the cultivation of potatoes is not general but is, at present, confined to two districts, Karachi and Sukkur, the area being very small in the other districts of the Province.

The following table indicates the distribution of the crop in the different districts of Sind :—

Area in 1924-25

District	Acres	Per cent.
Karachi	1,925	55·0
Sukkur	1,562	44·6
Upper Sind Frontier	12	0·4
Total, Sind ..	3,499	100·0

The best potato soil is a sandy loam having as fine a texture as possible. The soil must not be saline nor must it contain too much iron. Soils containing *kankar* or nodules of carbonate of lime are also considered unsuited for potatoes. As artificial irrigation is indispensable in the cultivation of potatoes, canal or some other form of reservoir for water must be close by.

Generally, the smallest potatoes are used for seeds but middle sized tubers are admitted to be better. As a matter of fact, much care is taken by the cultivators in the preservation, though little or none, in the selection of seed.

Potatoes are sometimes put in as early as the middle of September but the more general time for planting is October. The object to be kept in view in preparing lands for potatoes it to pulverise the soil thoroughly and to cultivate as deeply as possible. It is also necessary to eradicate the weeds completely. This is effected by the repeated use of the plough. When land has been well prepared it is levelled as perfectly as possible and is then divided into a number of plots to facilitate irrigation. The potatoes are planted in the prepared field at a distance of about eight to twelve inches in the rows. The seeds must be put in deep enough to save them from the scorching sun. The plants will come overground in a week or more after planting, according to the variety of the seed. Watering is given once in seven to ten days at regular intervals or more frequently according to the conditions of soil and temperature.

The manures applied to potatoes are well-rotten dung, mustard cake and ashes. Dung is used only in a well rotten state and that a long time before potatoes are put in, so that, it may be well mixed with the soil. Green manuring with indigo is also resorted to, in a few places, by the best cultivators.

Except when the potatoes are intended for the early market, the cultivators do not lift them till the plants die and dry up.

Potatoes are generally ready for harvest about a little over three months after planting.

After the potatoes have been raised they are sorted, the largest and the middle sized ones are sold, and the smallest are kept for seed and household use.

The crop was tried at the Sakrand Research Station, by the Bombay Agricultural Department, very recently (in 1926), when two types of potato seed, *viz.*, (1) the Early Italian Potatoes and (2) the Scottish '*Pholo*' Potatoes were planted in the last week of November and the first week of December respectively. In each case, the crop was ready for harvest in about a little over three months. This test, though only a preliminary one, has clearly shown that potatoes can be successfully grown in Central Sind provided they are guarded against frost to which the crop is very sensitive.

OTHER VEGETABLES

Over and above the vegetables mentioned so far, a number of gourds and other vegetables are grown in Sind. Among gourds, the following are much esteemed as vegetables :—

(1) **Common cucumber, kakri** (*Cucumis sativus*).
(2) **Turi or Dodka, Sharp-cornered cucumber** (*Luffa acutangula*).
(3) **Karelo, Bitter Gourd** (*Momordica charantia*).
(4) **Meho or Dilpasant** (*Citrullus vulgaris*).
(5) **Kadu or kohla, Pumpkin** (*Cucurbita pepo*).

The following country vegetables are also grown in the Province, though they are not so well known to Europeans :—

(1) **Mariro, (Tambda math)** (*Amaranthus gangeticus*).
(2) **Lunak, Purslane** (*Portulaca oleracia* and *tuberosa*).
(3) **Methi, Fenugreek** (*Trigonella fœnumgræcum*).
(4) **Singuin,** the pods of the **horse radish** tree (*Moringa pterygosperma*).

The above list is, however, by no means, complete—only the more important being noted.

CHAPTER XV—CONDIMENTS AND SPICES

The principal condiments and spices produced in the Province are :—

(1) Chillies, *Garho Mirch* (*Capsicum frutescens or minimum*),
(2) Coriander, *Dhana* (*Coriandrum sativum*),
(3) Fennel, *Saunf* (*Feniculum vulgare*), and
(4) Mustard, *Ahur* (*Brassica nigra*).

Of these, the last, mustard, has already been noted under 'Rapeseed and *Jambho*' in Chapter VIII—Oilseeds.

CHILLIES, MIRCH—(*CAPSICUM FRUTESCENS*)

Chillies are grown to the extent of over one thousand acres and the area is distributed as follows :—

Area in 1924-25

District	Acres	Per cent.
Sukkur	431	34·9
Karachi	374	30·4
Hyderabad	309	25·1
Thar Parkar	112	9·1
Upper Sind Frontier	4	0·3
Nawabshah	2	0·2
Total, Sind ..	1,232	100·0

It will be seen from the above that the crop is hardly grown on any commercial scale, as is the case, at least in some districts, in the Bombay Presidency proper, but is grown almost entirely for local use.

CORIANDER, DHANA—(*CORIANDRUM SATIVUM*)

Coriander (*dhana*) occupies more than twice the area under chillies. The area is distributed as follows :—

Area in 1924-25

District	Acres	Per cent.
Larkana	1,139	43·8
Sukkur	494	19·0
Karachi	387	14·9
Upper Sind Frontier	313	12·0
Hyderabad	191	7·3
Thar Parkar	68	2·6
Nawabshah	9	0·4
Total, Sind ..	2,601	100·0

Coriander will not grow in poor or salt land. It is sometimes grown as a mixed crop with gram. Sometimes, it is taken as a *dubari* or second crop in rice beds after the rice is

harvested. In this case, the seed is sown broadcast under one ploughing and the seed rate is about twelve pounds per acre. If well grown, the crop brings in more than a hundred rupees per acre.

The leaves of coriander are eaten and cooked in curry and the seed (fruit) forms one of the most greatly used condiments in Sind.

FENNEL, SAUNF—(*FENICULUM VULGARE*)

Fennel occupies an area of about one hundred and fifty acres which is almost exclusively confined to the two districts of Sukkur (one hundred acres) and Larkana (fifty acres).

The seed is used as a spice and also as a medicine. The crop has hardly any economic significance to deserve a special treatment.

CHAPTER XVI—FODDER CROPS

A large part of Sind consists of pastoral, rather than agricultural, country abounding in trees and shrubs which give abundant fodder to animals and especially to camels and goats. While in most pastoral areas, it is the annual and perennial grasses which form the bulk of the food of the live stock, in Sind, these trees are the mainstay of the animal population. True, there are grasses, and in the land which comes under water during the inundation season, these are abundant, the best known being *chhabar* (*Eleusine flagellifera* and *ægyptiaca*), *hariali* or *chhibhar* (*Cynodon dactylon*) and *karsih* (*Paspalum sanguinale*). But, after all, the mainstay consists of the fodder trees.

Of such trees, there are many, and it is curious for a visitor to Sind to see a large animal population in an area where the herbaceous vegetation is very small. But in such areas, there are generally large numbers of *babul* trees (*Acacia arabica*), or *kandi* (*Prosopis spicigera*) or *khabhar* (*Salvadora sp.*), and many others, each of which is beloved by one or other form of livestock. The second of these, (*kandi*), is usually so closely cropped by animals that it has little chance of growing into a regular tree. There is also the *timar* or mangrove (*Avicenna tomentosa*) on the coast of the delta, which provides unlimited fodder for the animals in this region. Among unusual forms of herbaceous fodder, might be mentioned the various ground plants of the goosefoot order, known to Sindhis as '*Lani*' which grow widely on salt soil and which are greedily devoured by camels.

Crops grown specifically for fodder are also not unusual in Sind, besides those like *jowar*, *bajri* and rice in which the fodder forms a very important bye-product. These specific fodder crops are chiefly maize and barley, *jowar* in the hot weather, lucerne, berseem, guinea grass and *guvar* or field vetch.

The following are very short notes on each of the specific fodder crops mentioned above :—

MAIZE—(*ZEA MAIZE*)

Maize, as a fodder crop, is grown generally in Sind in the *adhawa*, that is, the hot-weather season, though, the extent to which it is so grown is not known.

The method of cultivation followed is something like this : The land is first well prepared and, if possible, frequently harrowed before sowing the maize. Immediately after the seed is sown, beds of suitable size, depending on the levels in

the field, are made for irrigating the crop. Interculture is valuable as it tends to form a good soil mulch and so reduce surface evaporation.

Maize will grow in almost any kind of soil, provided that, there is good drainage, and, hence, that the land is not water-logged. The ideal land is, however, a light loam of considerable depth.

Maize grows very rapidly and has one great advantage over all the *jowars*, namely, that it can be fed to stock at any period of its growth. This being the case, the crop, when grown for fodder, can be cut and used at any stage that is most convenient, though, the maximum yield and digestibility together is obtained, if it is cut when the grain is in the dough stage whether intended for direct feeding, for making into hay or for making silage. The crop is usually ready to cut about two months after sowing.

BARLEY—(*HORDEUM VULGARE*)

Barley has, of late years, attracted considerable attention owing to its cheapness and value as a fodder. It has long been employed in the Punjab and also in Sind, for this purpose, the crop being cut, two or even three times, when quite young, without marked injury to the final yield of grain.

In the report on the Experimental Farm of Hyderabad in Sind, it is recorded that, experiments were tried to determine the pecuniary benefit of growing it purely as a fodder, with the result that the balance was very much in favour of this method even in a year when fodder was very cheap. The yield of grain and straw per acre obtained in the above experiments was as follows :—

Description	Grain	Straw
	lbs.	lbs.
(1) Cut before ripening	..	22,000
(2) Cut in grain, green	..	15,000
(3) Cut ripe	2,000	4,000
(4) Cut ripe	3,000	4,500

The straw of even ripe barley is a fairly good fodder when cut up as '*bhusa*' but is inferior to that of wheat.

HOT-WEATHER JOWAR—(*ANDROPOGON SORGHUM*)

The area under *jowar*, grown in the hot weather for fodder, varies considerably from year to year, according to the nature of the season and it is, hence, difficult to say what area the crop occupies, on an average, though the statistics of area available

with us show that the range lies between about fifty acres and four hundred acres. The following are, for instance, the figures of acreage in two recent years, *viz*: 1923-24 and 1924-25 :—

District	Acres	
	1923-24	1924-25
Karachi	88	..
Hyderabad	222	16
Thar Parkar	..	..
Nawabshah	..	..
Larkana	108	20
Sukkur	..	..
Upper Sind Frontier	..	1
Total, Sind ..	418	37

Experiments with the crop, made so far, show that *jowar* grows excellently as a fodder crop in Sind and, if plenty of water is available, gives enormous returns.

The method of cultivation followed is as follows :—

Owing to the uncertainty as to the time when the inundation canals will run, the land is ploughed during the cold weather and early months of the year, when quite dry, and held ready for seeding. When the water is expected, the seed is put into this dry ground and the water, on arrival, is run on to it.

The crop found to be most suitable for Sind conditions is a variety very similar to *nilwa* or as it is termed in Sind, the '*Sind Red.*' Sixty pounds of seed per acre are probably the most suitable quantity.

The crop is ready for cutting for fodder, in about less than three months, the best time to cut being when the seed is in the milky stage.

On good land, free from salt (*kalar*), the presence of which is perhaps the greatest difficulty in agriculture in Sind, enormous yields can be obtained. An outturn of eighty thousand pounds per acre of green fodder may be expected on the best lands and an average of fifty thousand pounds per acre should be generally obtained. This average is at least equal to twenty thousand pounds per acre of dry *jowar* fodder, or from nine to ten tons.

LUCERNE—(*MEDICAGO SATIVA*)

Lucerne occupies an area of about two and a half thousand acres in Sind, almost the whole of which is to be found in the south of the Province. The most important centre of cultivation is the Karachi District which alone occupies about

two-thirds of the total area under the crop. The following are the actual figures of area in the different districts of Sind :—

Area in 1924-25

District	Acres	Per cent.
Karachi	1,604	60·3
Thar Parkar	636	23·9
Nawabshah	333	12·5
Hyderabad	86	3·2
Larkana	2	0·1
Total, Sind ..	2,661	100·0

From the above, it will be clearly seen that, lucerne has practically no place in the North of the Province as it does not thrive under the extremes of heat and cold experienced there. In fact, as Mr. Henderson, after a number of trials at Mirpurkhas, remarks "the limit (of the area put under lucerne in Sind) appears to be reached. For, it does not grow well or yield well. The hot weather seems to be too much for it. It only lasts a short time and is not able to maintain itself against weeds." Especially in North Sind, where the extremes of temperature are more marked than in South Sind, lucerne does not seem to have a future.

Lucerne will flourish on practically any soil provided it is not water-logged, or highly charged with salts and provided water is available in sufficient abundance. The crop, however, does especially well on a deep, loose soil. It is absolutely essential that the land should be thoroughly cleared of weeds before lucerne is put in.

The seed is broadcasted in beds about ten feet square, surrounded by small *bunds*—each forming an irrigation check, flooded at each application of irrigation water. The size of the beds, however, varies considerably with the level and the shape of the fields. The seed is lightly covered with soil by means of a wooden rake. The frequency and the amount of watering vary with climatic conditions and the character of the soil. It is quite essential that the crop should be carefully weeded.

Under favourable conditions, lucerne is ready for the sickle in about two months after planting. The right stage for cutting is considered to be reached when about one quarter of the plants are in bloom. Immediately on being cut, growth begins again and crops are obtained from the same plants many times.

A good crop of lucerne should yield, on an average, between thirty and forty thousand pounds of green fodder per acre.

BERSEEM OR EGYPTIAN CLOVER—(*TRIFOLIUM ALEXANDRINUM*)

Berseem, well-known as the chief fodder crop of Egypt and one of the mainstays of agriculture in that country, was introduced into Sind at Mirpurkhas in 1904, and its cultivation from this time has gradually spread in the Province, though the extent to which it has spread cannot be stated—the area under the crop being not separately recorded in Agricultural Statistics but being included under "other fodder crops."

Berseem does best on a deep loamy soil. The best date for sowing the crop is about the middle of October, as, if sown at this time, the crop is sufficiently advanced to stand the effects of frost in December-January.

The land intended for berseem is first well-prepared by ploughing, cross-ploughing and clod crushing and left exposed for about a month after the preceding crop, before the seed is sown. The seed should be steeped for twenty-four hours, before it is broadcasted over the field, on which irrigation water is standing some three inches deep. The seed rate is forty pounds per acre.

Frequent light irrigation is necessary when the tiny plants are taking root and afterwards irrigation is required once a week to once in twelve days, depending upon the soil and the temperature.

When sown in October, berseem yields five or six good cuttings between that time and the following May and from fifty to seventy thousand pounds of green fodder per acre may be taken as an average yield. Berseem thus surpasses almost all other green fodders in point of outturn in the *rabi* season.

The utilisation of the berseem crop may be carried out in several ways. In the first place, stock may be tethered in berseem after the Egyptian fashion and this method has been regularly adopted at the Government Farms in Sind. It is most likely, however, that the chief use of berseem here, as in Egypt, will be for feeding green in the stable. For this, it seems admirably adapted and has already achieved a demand in Sind markets. Another use to which berseem may be put is for the fertilising effect which it produces upon the soil. Being a leguminous plant, it gathers and fixes the free nitrogen of the air in its roots, which becomes available as manure, for

the succeeding crops and many instances of this beneficial effect upon future crops have been recorded. Berseem is also the most resistant *rabi* crop to *kalar* (alkaline salts) in the soil and on such soils, it will often yield well where other crops fail to become established.

GUINEA GRASS—(*PANICUM TUMENTORUM*)

Guinea grass is grown in many parts of Sind, though its area is not separately measured or recorded.

Guinea grass will grow in almost any soil, provided it is not water-logged. It does best, perhaps, on medium loam which can be irrigated to advantage or on light, deep, sandy soil.

The soil should be friable, down to a considerable depth and this condition can be obtained by two ploughings, three or four harrowings and clod crushing, if necessary. Thirty cart loads of farm yard manure per acre should be worked into the soil, during the tillage.

The grass is propagated by seed or by division of the tussocks. The latter method is almost invariably used and five or six root-bearing stems should be planted in one place.

The field should be flooded with irrigation water, immediately after planting. After a plantation has been established, guinea grass can hardly get too much water or manure. The richer the land, the more succulent and tender will the fodder be. Guinea grass responds very quickly to well-selected manures, and if it can be grown under sewage or sewage effluent, very high, and sometimes extraordinary, yields may be obtained. Thus, at Karachi, under raw sewage, eight cuttings have been secured per annum, with twenty-five to thirty thousand pounds of green fodder per cutting or over two lakhs of pounds per annum. On the other hand, without manure, its yield rapidly declines.

Guinea grass is very apt to become over-run with weeds and, hence, fairly frequent weeding is necessary.

Though the grass is perennial, the plantation is not and if not dug up and replanted frequently, its yield will rapidly decline, and it is usually necessary to re-establish it after three years.

The first cutting of guinea grass can be obtained in three months after planting the sets, when it is about three or four feet high. Subsequent crops should be cut at a height of two to three feet, as the oftener it is cut the finer will be the fodder, and the larger the outturn.

The yield of guinea grass obtainable seems to vary very much but the highest on record seems to have been obtained under sewage at Karachi as already stated, namely, two lakhs of pounds of green fodder per annum. Under ordinary circumstances, however, it yields between thirty and forty thousand pounds of green fodder per acre as a maximum and the yield of a plantation, even when renewed frequently, tends to fall to half this amount.

Guinea grass makes an exceedingly fine fodder for all descriptions of farm animals.

GUVAR, FIELD VETCH—(*CYAMOPSIS PSORALIOIDES*)

Guvar possesses certain special advantages as a fodder crop. For instance, it is very drought resistant and, hence, will give a good crop, with very little water in irrigated tracts. It is particularly suitable for light, sandy soils. Being an upright growing plant, it has a number of advantages over some other twining, creeping, climbing pulses. The fodder produced by *guvar* is also relished by animals. Its disadvantages are that it grows comparatively slowly and will not grow well on deep, black soil.

Many experiments with *guvar*, as a fodder crop, have been made in Sind, where it shows considerable promise for growth in the *kharif* season. At Mirpurkhas, planted in June and cut for the first time in August, it has all along given ten to sixteen thousand pounds per acre of excellent green fodder, much relished by cattle.

It is for these reasons that the crop is cultivated on a fairly extensive scale in Sind as will be seen from the figures of area in the various districts in the Province.

Area in 1925-26

District	Acres	Per cent.
Nawabshah	17,399	53·0
Thar Parkar	10,000	30·4
Hyderabad	2,342	7.1
Karachi	1,748	5·3
Upper Sind Frontier..	1,269	3·9
Larkana	78	0·2
Sukkur	32	0·1
Total, Sind ..	32,868	100·0

In fact, in *guvar* we have a crop essentially suited to sandy or alluvial soils and under these conditions it can be grown with success in many parts of Sind.

The land must be prepared into a fairly fine tilth and the seed drilled in rows, at a distance of from twelve to eighteen inches apart. Ten pounds of seed per acre are required. *Guvar* is particularly suitable for growing in the *kharif* season being sown in June and cut when in flower or when the pods are beginning to form. It will usually be ready at the end of August, if planted early in June. If seed is wanted, it will have to be left till October.

As already noted, *guvar* gives, on an average, from ten to sixteen thousand pounds of green fodder per acre and all our local experiments agree that green *guvar* is an excellent fodder and is relished by all our agricultural animals.

STATISTICAL TABLES SHOWING AREA UNDER CROPS, ETC., IN SIND IN 1924-25

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Table I—Share of each Crop in the Gross Cropped Area in each District in Sind

No.	Crop	Karachi	Hyderabad	Thar Parkar	Nawabshah	Larkana	Sukkur	Upper Sind Frontier	Sind Province
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Rice	55	39	6	6	40	12	16	24
2	Wheat ..	5	7	4	8	12	32	14	11
3	Barley ..	2	..	..	..	..	..	..	..
4	Jowari ..	10	2	1	19	13	25	18	12
5	Bajri	3	23	65	22	..	3	14	21
6	Gram ..	..	..	..	2	4	12	19	5
7	Mug	3	..	..	..	..	..	..	..
8	Udid	2	..	..	..	..	..	..	..
9	Lang	1	1	..	4	19	6	6	6
10	Cotton ..	..	12	19	24	..	..	..	8
11	Sesame ..	1	1	..	1	2	..	2	..
12	Rape and Mustard (including Jambho).	8	9	1	8	10	6	10	8
13	Others ..	10	6	4	6	..	4	1	5
	Total ..	100	100	100	100	100	100	100	100

Table II—Share of each District in the Total Area under each Principal Crop in Sind

No.	Crop	Karachi	Hyderabad	Thar Parkar	Nawabshah	Larkana	Sukkur	Upper Sind Frontier	Sind Province
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent	Per cent.
1	Rice	20·0	21·8	5·1	3·0	34·3	6·6	9·2	100
2	Wheat ..	8·8	9·3	6·4	8·0	22·7	33·3	16·5	100
3	Barley ..	60·1	10·0	0·8	7·1	18·6	2·5	0·9	100
4	Jowari ..	8·3	1·8	2·4	18·5	23·6	25·2	20·2	100
5	Bajri	1·5	15·2	61·3	11·8	0·1	2·0	8·1	100
6	Gram ..	0·4	0·1	0·3	5·6	15·4	29·6	48·6	100
7	Mug	71·9	1·6	7·6	0·8	1·6	8·2	8·3	100
8	Udid	98·5	..	2·1	0·4	1·1	1·1	1·8	100
9	Lang	2·5	2·1	0·1	8·8	61·9	11·1	13·5	100
10	Cotton ..	0·3	20·6	45·5	33·0	0·2	0·4	0·1	100
11	Sesame ..	16·1	11·1	15·9	23·5	7·0	10·4	16·0	100
12	Rape and Mustard (including Jambho).	9·9	17·6	0·3	12·1	36·1	7·6	17·0	100

*Table III—Area under Principal Crops in each District * of Sind in 1924-25*

No.	Crop	Karachi	Hyderabad	Thar Parkar	Nawabshah	Larkana †	Sukkur	Upper Sind Frontier	Total Sind
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	46,400	10,023	13,460	103,931	89,359	141,976	113,947	519,096
2	Bajri	14,906	156,127	630,239	121,378	1,676	20,852	83,731	1,028,909
3	Rice	242,425	260,043	54,826	32,507	416,766	65,982	96,868	1,169,417
4	Wheat	20,575	50,059	34,691	43,390	91,504	180,052	89,253	509,524
5	Barley	9,707	1,625	131	1,149	2,368	399	147	15,526
6	Maize	1,832	259	444	79	....	1	10	2,625
7	Ragi	327	5	4	....	....	5	....	341
8	Vari	34	87	968	646	82	....	....	1,817
9	Rala	....	....	1	1	521	1,017	2,484	4,024
10	Other Cereals	....	....	....	....	....	1,742	2,426	4,168
11	Total, Cereals ..	336,206	478,228	734,764	303,081	602,276	412,026	388,866	3,255,447
12	Tur	....	....	89	....	....	....	....	89
13	Gram	1,038	309	657	13,344	30,695	71,063	116,487	233,588
14	Mug	14,602	329	1,536	152	319	1,662	1,715	20,315
15	Udid	7,601	3	172	31	85	92	142	8,126
16	Math	1,066	1	....	....	....	147	333	1,547
17	Chavli	25	143	94	4	170	78	90	604
18	Masur	....	....	12	....	....	....	....	12
19	Vatana	56	....	....	....	....	4	....	60
20	Lang	7,280	6,184	176	25,695	170,523	32,318	39,330	281,506
21	Guvar	801	....	....	....	....	1	....	802
22	Other Pulses	....	....	920	6	....	....	1,167	2,093
23	Total, Pulses ..	32,464	6,969	3,656	39,232	201,792	105,365	159,064	448,542
24	Tobacco	33	2,274	79	1,013	968	2,041	22	6,430
25	Other Drugs and Narcotics ..	....	....	....	....	61	21	..	82
26	Total, Drugs and Narcotics ..	33	2,274	79	1,013	1,029	2,062	22	6,512

27	Chillies	374	309	112	2	....	431	4	1,232
28	Fennel	1	1	1	....	84	98	....	185
29	Turmeric	....	....	....	....	....	1	....	1
30	Dilseed	17	1	4	2	3	....	....	27
31	Coriander	387	191	68	9	1,205	494	313	2,757
32	Cumin	22	....	....	....	116	31	....	169
33	Mustard	2,441	199	1	1,435	....	116	647	4,839
34	Garlic	31	47	16	6	36	207	5	348
35	Other Condiments	....	....	....	1	....	49	8	58
36	Total, Condiments ..	3,273	748	202	1,455	1,534	1,427	977	9,616
37	Sugarcane	1,350	888	900	74	128	331	16	3,687
38	Linseed	....	....	....	247	....	....	1	248
39	Sesamum	5,423	3,758	5,366	7,943	2,496	3,524	5,392	33,902
40	Castorseed	79	....	1,185	....	....	....	....	1,264
41	Rapeseed	32,398	3,175	1,144	40,990	30,655	4,156	26,318	138,831
42	Jambho	....	56,238	....	....	41,145	22,383	32,566	152,332
43	Cocoanut	31	....	....	....	3,101	....	....	3,132
44	Safflower	....	....	6,533	....	....	....	....	6,533
45	Other Oilseeds	....	1	720	....	....	8	....	729
46	Total, Oilseeds ..	37,926	63,172	14,948	49,180	77,397	30,071	64,277	336,971
47	Dyes	....	5	....	1,026	427	338	....	1,796
48	Cotton	1,035	81,944	181,803	131,810	451	1,665	363	399,071
49	Bombay Hemp	116	248	56	101	40	....	8	569
50	Other Fibres	1	....	....	....	....	5	....	6
51	Total, Fibres ..	1,152	82,192	181,859	131,911	491	1,670	371	399,646
52	Vegetables, Green Fodder and Fruits ..	11,848	11,741	28,872	17,698	9,773	14,538	3,472	97,942
53	Grass and Babul	17,224	25,604	1,876	9,097	1,225	797	79	55,902
54	Miscellaneous Crops	7	10	....	....	25	32	....	84
	Gross area cropped ..	441,483	671,831	967,156	553,767	896,097	568,657	617,203	4,716,194

* For details of Taluka areas see Tables V to XI further on.

† Area for 1923-24.

*Table IV—Area under Vegetables, Green Fodder and Fruits in each District * of Sind in 1924-25.*

No.	Crop	Karachi	Hyderabad	Thar Parkar	Nawabshah	Larkana†	Sukkur	Upper Sind Frontier	Total, Sind
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
	A.—Vegetables (Roots and Tubers)								
1	Onion	478	694	175	236	537	1,640	137	3,897
2	Sweet Potato	277	1,092	15	1	....	....	....	1,385
3	Potato	1,925	....	....	....	....	1,562	12	3,499
4	Radish	89	66	62	10	48	16	31	322
5	Carrot	287	143	77	31	178	123	72	911
6	Others	156	8	....	224	378	475	66	1,307
	Total ..	3,212	2,003	329	502	1,141	3,816	318	11,321
	B.—Green Vegetables								
7	Cabbage	293	6	4	1	26	26	15	376
8	Edible Hibiscus	92	34	3	2	9	38	7	185
9	Brinjal	603	111	25	14	43	70	8	874
10	Tomato	30	1	....	....	....	....	....	31
11	Fenugreek	93	146	3	37	24	75	8	386
12	Musk Melon	1,573	2,152	40	197	1,924	1,656	1,037	8,579
13	Water Melon	382	493	4	17	772	2,273	1,240	5,181
14	Others	324	132	38	101	1,259	568	189	2,611
	Total ..	3,395	3,075	117	369	4,057	4,706	2,504	18,223

	C.—Green Fodder								
16	Lucerne	1,604	96	636	333	....	....	....	2,669
17	Hot-weather Jowar	....	16	....	....	108	....	1	125
18	Field Vetch	....	1,955	25,984	14,771	38	29	419	43,196
19	Others	833	949	323	464	1,479	1,553	97	5,698
	Total ..	2,437	3,016	26,943	15,568	1,625	1,582	517	51,688
	D.—Fruit Trees								
21	Plantain	151	71	76	18	6	84	6	412
22	Mango	1,850	2,486	941	968	2,482	974	73	9,769
23	Lime	12	68	49	89	46	172	15	451
24	Sweet Lime	....	3	....	5	5	67	4	84
25	Orange	4	6	28	48	5	9	2	102
25	Pomegranate	66	193	62	26	11	234	10	602
26	Guava	184	313	118	16	14	58	1	704
27	Date Palm	193	21	5	....	319	2,279	7	2,824
28	Fig	6	15	8	1	1	6	....	37
29	Papaya	222	....	....	....	....	....	....	222
30	Grapes	32	13	12	5	2	42	1	107
31	Others	114	458	194	88	59	509	14	1,426
	Total ..	2,834	3,647	1,483	1,259	2,950	4,434	133	16,740
	Total, Orchard and Garden Produce ..	11,878	11,741	28,872	17,698	9,773	14,538	3,472	97,972

* For details of Taluka areas see Tables XII to XVIII further on.

† Area in 1923-24.

Table V—Area under Principal Crops in each Taluka of the Karachi District in 1924-25

No.	Crop	Karachi	Mirpur-sakro	Ghorabari	Shah-bunder	Jati	Sujawal	Mirpur Bathoro	Tatta	Kohistan	Kotri	Manj-hand	Total, Karachi District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	2,218	186	..	9	18	11	40	10,234	5,882	16,492	11,310	46,400
2	Bajri	870	1,895	53	1,169	556	222	2,652	2,883	..	4,850	756	14,906
3	Rice	..	26,502	43,601	39,082	34,593	36,448	44,482	15,615	..	2,102	..	242,425
4	Wheat	673	9	18	5	63	98	391	1,528	898	12,913	3,979	20,575
5	Barley	11	1,003	779	58	945	1,173	692	3,195	..	1,851	..	9,707
6	Maize	1,363	126	15	3	213	86	16	10	..	..	..	1,832
7	Ragi	89	78	..	33	62	8	..	56	..	1	..	327
8	Vari	11	1	..	..	6	9	4	..	..	..	3	34
9	Other Cereals	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Cereals ..	4,735	29,800	44,466	40,359	36,456	38,055	48,277	33,521	6,780	37,709	16,048	336,206
10	Gram	..	49	6	..	..	39	12	4	..	606	317	1,033
11	Mug	350	5,227	1,936	1,051	492	1,744	485	870	385	2,061	1	14,602
12	Udid	..	892	5,229	941	33	18	17	471	..	..	..	7,601
13	Math	..	163	214	167	6	4	16	495	..	..	1	1,066
14	Chavli	1	4	..	..	2	..	18	..	..	..	..	25
15	Vatana	56	..	..	..	..	..	..	..	..	..	..	56
16	Lang	1	1,248	583	341	11	81	530	1,267	..	1,810	1,408	7,230
17	Guvar	778	..	..	..	1	..	1	21	..	..	..	801
18	Other Pulses	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Pulses ..	1,186	7,583	7,968	2,500	545	1,886	1,079	3,128	385	4,477	1,727	32,464
19	Tobacco	..	..	..	20	8	..	3	..	..	..	..	33
20	Other Drugs and Narcotics .	..	..	..	..	..	..	..	..	..	..	..	..

	Total, Drugs and Narcotics ..	..	..	..	20	8	..	3	..	..	2	..	33
21	Chillies	212	8	1	1	89	3	29	29	..	2	..	374
22	Fennel	..	..	..	..	..	..	..	..	1	..	..	1
23	Dilseed	..	..	..	..	17	..	..	..	..	..	..	17
24	Coriander	16	3	34	85	67	117	47	15	..	..	3	387
25	Cumin	..	..	..	..	..	..	..	..	22	..	..	22
26	Mustard	..	..	566	309	579	111	8	201	..	664	3	2,441
27	Garlic	..	..	..	4	23	..	1	..	..	3	..	31
28	Other Condiments ..	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Condiments ..	228	11	601	399	775	231	85	245	23	669	6	3,273
29	Sugarcane	37	576	56	40	271	15	142	197	..	13	3	1,350
30	Sesamum	325	647	43	17	25	31	92	1,462	905	1,450	426	5,423
31	Castorseed	75	4	..	..	..	..	..	..	..	..	..	79
32	Rapeseed	342	687	221	163	5,811	5,821	8,618	1,575	467	3,222	5,466	32,393
33	Cocoanut	13	1	11	4	2	..	..	..	..	..	..	31
34	Other Oilseeds	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Oil-seeds ..	755	1,339	375	184	5,838	5,852	8,710	3,037	1,372	4,672	5,892	37,926
35	Dyes	..	..	..	..	..	..	..	..	..	..	..	..
36	Cotton	4	1	..	..	1	2	28	..	11	536	452	1,035
37	Bombay Hemp ..	..	13	25	4	31	7	23	2	..	8	3	116
38	Other Fibres	..	..	..	..	1	..	..	..	..	..	..	1
	Total, Fibres ..	4	14	25	4	33	9	51	2	11	544	455	1,152
39	Vegetables, Green Fodder and Fruits ..	7,810	439	198	146	441	324	549	702	14	1,005	220	11,848
40	Grass and *Babul* ..	16,866	..	..	..	5	1	12	..	..	85	255	17,224
41	Miscellaneous Crops ..	..	..	..	..	3	..	..	4	..	..	..	7
	Gross Area Cropped ..	31,621	39,762	53,589	43,652	44,375	46,373	58,908	40,836	8,585	49,176	24,606	441,483

Table VI—Area under Principal Crops in each Taluka of the Hyderabad District in 1924-25

No.	Crop	Hyderabad	Hala	Tando Alahyar	Dero Mohbat	Tando Bago	Badin	Guni	Total, Hyderabad District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	4,044	2,363	857	287	612	634	1,226	10,023
2	Bajri	33,787	40,094	33,431	21,819	5,748	551	20,697	156,127
3	Rice	3,286	762	220	15,061	61,895	95,761	83,058	260,043
4	Wheat	5,174	3,387	177	4,971	22,280	11,987	2,083	50,059
5	Barley	90	1	....	4	266	1,222	42	1,625
6	Maize	137	....	34	14	39	35	....	259
7	Ragi	....	....	....	3	....	2	....	5
8	Vari	17	....	7	34	2	16	11	87
9	Other Cereals	....	....	....	....	....	....	....	....
	Total, Cereals ..	46,535	46,607	34,726	42,193	90,842	110,208	107,117	478,228
10	Gram	69	193	8	....	3	1	35	309
11	Mug	10	62	5	56	13	90	93	329
12	Udid	3	....	....	....	....	....	....	3
13	Math	....	1	....	....	....	....	....	1
14	Chavli	....	....	4	....	87	51	1	143
15	Lang	1,911	2,103	15	276	115	237	1,527	6,184
16	Other Pulses	....	....	....	....	....	.....	....	....
	Total, Pulses ..	1,993	2,359	32	332	218	379	1,656	6,969
17	Tobacco	238	641	589	286	153	2	365	2,274
18	Other Drugs and Narcotics	....	....	....	..	....	....	....	....
	Total, Drugs and Narcotics ..	238	641	589	286	153	2	365	2,274

19	Chillies	62	31	27	26	131	[illegible]	18	309
20	Fennel	....	1	....	....	....	....	....	1
21	Dilseed	....	....	....	....	....	....	1	1
22	Coriander	2	39	....	....	7	129	14	191
23	Mustard	....	....	....	....	....	199	....	199
24	Garlic	19	14	1	....	5	4	4	47
25	Other Condiments	....	....	....	....	....	....	....	....
	Total, Condiments ..	83	85	28	26	143	346	37	748
26	Sugarcane	20	8	....	76	254	308	222	888
27	Sesame	338	296	1,096	1,000	108	6	914	3,758
28	Rapeseed	377	460	12	67	33	1,377	849	3,175
29	Jambho	2,972	6,128	2,443	7,116	10,596	16,926	10,057	56,238
30	Other Oil-seeds	....	....	....	....	1	....	....	1
	Total, Oil-seeds ..	3,687	6,884	3,551	8,183	10,738	18,309	11,820	63,172
31	Morinda	....	....	....	....	....	....	5	5
32	Cotton	20,103	27,608	17,915	7,679	3,216	87	5,336	81,944
33	Hemp	68	51	67	43	3	4	12	248
34	Other Fibres	....	....	....	....	....	....	....	....
	Total, Fibres ..	20,171	27,659	17,982	7,722	3,219	91	5,348	82,192
35	Vegetables, Green Fodder and Fruits	4,395	2,500	1,322	857	698	800	1,169	11,741
36	Grass and Babul	4,279	12,649	1,050	1,013	1,776	2,220	2,617	25,604
37	Miscellaneous Crops	....	10	....	....	....	....	....	10
	Gross Area Cropped ..	81,401	99,402	59,280	60,688	108,041	132,663	130,356	671,831

Table VII—Area under Principal Crops in each Taluka of the Thar Parkar District in 1924-25

No.	Crop	Mirpurkhas	Digri	Jamesabad	Samaro (Pithoro)	Umarkot	Khipro	Sanghar	Diplo	Mithi	Nagar Parkar	Chhachro	Total, Thar Parkar District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	441	2,145	1,093	132	102	131	572	1,503	75	7,266	..	13,460
2	Bajri	17,942	20,081	12,677	11,992	41,303	22,136	12,914	26,399	104,678	170,916	189,201	630,239
3	Rice	79	..	..	18,266	17,759	10,554	8,168	..	..	..	...	54,826
4	Wheat	2,486	11,107	7,232	3,942	3,147	1,947	3,949	255	141	485	...	34,691
5	Barley	6	27	26	1	6	30	11	24	..	..	..	131
6	Maize	39	227	171	4	..	2	..	1	..	..	..	444
7	Ragi	..	4	..	..	..	..	..	..	..	..	..	4
8	Vari	163	281	321	28	5	71	99	..	..	..	..	968
9	Rala	..	1	..	..	..	..	..	..	..	..	..	1
10	Other Cereals	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Cereals ..	21,156	33,873	21,520	34,365	62,322	64,871	25,713	28,182	104,894	178,667	189,201	734,764
11	Tur	9	33	34	8	1	..	4	..	..	..	..	89
12	Gram	28	85	60	58	1	18	407	..	..	..	..	657
13	Mug	43	68	13	38	23	89	3	22	191	746	300	1,536
14	Udid	23	96	52	1	..	..	..	..	..	..	..	172
15	Chavli	1	1	..	2	1	3	84	1	1	..	..	94
16	Masur	..	12	..	..	..	..	..	..	..	..	..	12
17	Lang	12	1	1	144	..	15	3	..	..	..	..	176
18	Other Pulses	..	40	13	..	..	..	..	1	24	636	206	920
	Total, Pulses ..	116	336	173	251	26	125	501	24	216	1,382	506	3,656

19	Tobacco	32	27	5	14	1	..	..	..	..	..	..	79
20	Other Drugs and Narcotics .	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Drugs and Narcotics .	32	27	5	14	1	..	..	..	..	..	..	79
21	Chillies	11	33	13	25	15	2	3	..	..	10	..	112
22	Fennel	..	..	..	..	..	..	1	..	..	..	..	1
23	Dilseed	..	1	..	..	1	..	2	..	..	..	..	4
24	Coriander	1	2	2	5	4	32	14	8	..	..	..	68
25	Mustard	..	1	..	..	..	..	..	..	..	..	..	1
26	Garlic	..	3	1	1	8	2	1	..	..	..	..	16
27	Other Condiments ..	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Condiments ..	12	40	16	31	28	36	21	8	..	10	..	202
28	Sugarcane	14	459	318	5	71	30	3	..	..	..	..	900
29	Sesamum	51	105	56	21	213	38	17	10	585	1,270	3,000	5,366
30	Castorseed	..	..	..	..	..	..	..	13	91	1,081	..	1,185
31	Safflower	514	1,098	435	403	1,481	841	883	878	..	..	..	6,533
32	Rapeseed	26	698	353	..	..	36	27	4	..	..	..	1,144
33	Other Oil-seeds.. ..	62	184	295	40	..	..	139	..	..	..	..	720
	Total, Oil-seeds ..	653	2,085	1,139	464	1,694	915	1,066	905	676	2,351	3,000	14,948
34	Cotton	33,491	30,318	26,198	25,752	15,625	26,477	23,867	..	..	75	...	181,803
35	San Hemp	6	25	13	4	1	5	2	..	..	..	..	56
36	Ambadi	..	..	..	..	..	..	..	..	..	..	..	..
37	Other Fibres	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Fibres ..	33,497	30,343	26,211	25,756	15,626	26,482	23,869	..	..	75	..	181,859
38	Vegetables, Green Fodder and Fruits	1,110	1,097	774	144	1,625	208	134	873	3,482	6,681	12,744	28,872
39	Grass and Babul ..	811	421	416	3	86	65	74	..	..	..	..	1,876
40	Miscellaneous Crops ..	..	..	..	..	..	..	..	..	..	..	..	..
	Gross Area Cropped .	57,401	68,681	50,572	61,033	81,479	62,732	51,381	29,992	109,268	189,166	205,451	967,156

Table VIII—Area under Principal Crops in each Taluka of the Nawabshah District in 1924-25

No.	Crop	Nawabshah	Sinjhoro	Shahdadpur	Sakrand	Moro	Nausharo	Kandiaro	Total, Nawabshah District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	16,650	2,239	3,962	10,816	18,861	30,932	20,471	103,931
2	Bajri	19,278	23,246	43,798	15,486	4,798	8,674	6,098	121,378
3	Rice	428	619	11,781	10,693	3,241	4,712	1,033	32,507
4	Wheat	188	1,865	582	6,624	11,603	8,017	14,511	43,390
5	Barley	2	10	1	137	563	342	94	1,149
6	Maize	3	76	....	....	....	....	....	79
7	Rala	1	....	....	....	....	....	....	1
8	Vari	57	345	21	15	15	114	79	646
9	Other Cereals	....	....	....	....	....	....	....	....
	Total, Cereals ..	36,607	28,400	60,145	43,771	39,081	52,791	42,286	303,081
10	Gram	575	149	5,408	2,260	4,003	364	585	13,344
11	Mug	64	15	35	10	4	16	8	152
12	Udid	....	11	....	....	....	....	20	31
13	Chavli	4	....	....	....	....	....	....	4
14	Lang	54	65	551	3,413	12,516	2,415	6,681	25,695
15	Other Pulses	....	6	....	....	....	....	....	6
	Total, Pulses ..	697	246	5,994	5,683	16,523	2,795	7,294	39,232
16	Tobacco	2	29	236	351	158	81	156	1,013
17	Other Drugs and Narcotics	....	....	....	....	....	....	....	....
	Total, Drugs and Narcotics ..	2	29	236	351	158	81	156	1,013

18	Chillies	....	2	....	....	....	....	....	2
19	Dilseed	....	1	....	....	....	....	1	2
20	Coriander	....	....	3	4	2	....	....	9
21	Mustard	....	1	....	....	1,434	....	....	1,435
22	Garlic	....	2	1	....	....	2	1	6
23	Other Condiments	....	....	....	....	....	1	....	1
	Total, Condiments ..	....	6	4	4	1,436	3	2	1,455
24	Sugarcane	....	61	....	1	1	8	3	74
25	Sesamum	3,713	135	521	1,370	1,722	432	50	7,943
26	Linseed	61	183	3	....	....	....	....	247
27	Rapeseed	4,993	491	1,793	13,171	15,739	1,530	3,273	40,990
28	Other Oil-seeds	....	....	....	....	....	....	....	....
	Total, Oil-seeds ..	8,767	809	2,317	14,541	17,461	1,962	3,323	49,180
29	Indigo	223	1	....	99	533	168	....	1,024
30	Morinda	....	....	....	....	1	1	....	2
31	Other Dyes	....	....	....	....	....	....	....	....
	Total, Dyes ..	223	1	....	99	534	169	....	1,026
32	Cotton	37,311	38,735	34,534	6,484	4,014	9,271	1,461	131,810
33	Bombay Hemp	28	13	12	9	11	20	8	101
34	Other Fibres..	....	....	....	....	....	....	....	....
	Total, Fibres ..	37,339	38,748	34,546	6,493	4,025	9,291	1,469	131,911
35	Vegetables, Green Fodder and Fruits	10,001	1,763	1,046	394	832	3,140	522	17,698
36	Grass and Babul	490	863	5,694	985	226	604	235	9,097
37	Miscellaneous Crops	....	....	....	....	....	....	....	....
	Gross Area Cropped ..	94,126	70,926	109,982	72,322	80,277	70,844	55,290	553,767

Table IX—Area under Principal Crops in each Taluka of the Larkana District in 1924-25

No.	Crop	Larkana	Rato-Dero	Miro-Khan	Kambar	Warah	Labdara	Mehar	Kakar	Dadu	Johi	Sehwan	Total, Larkana District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	2,470	5,049	3,614	1,118	4,548	5,305	11,192	9,725	12,369	27,965	6,004	89,359
2	Bajri	21	119	15	10	39	727	159	61	271	188	66	1,676
3	Rice	57,832	35,111	46,882	74,222	65,791	33,658	42,857	31,147	12,334	11,929	5,003	416,766
4	Wheat	8,353	7,969	10,195	5,135	2,536	14,962	6,884	3,116	11,338	9,587	11,429	91,504
5	Barley	9	8	..	2	6	72	143	144	1,337	145	502	2,368
6	Rala	33	18	209	17	173	40	3	4	24	..	..	521
7	Vari	..	..	..	..	..	..	..	..	10	71	1	82
8	Other Cereals	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Cereals ..	68,718	48,274	60,915	80,504	73,093	54,764	61,238	44,197	37,683	49,885	23,005	602,276
9	Gram	5,203	6,095	3,691	4,030	1,441	1,291	1,805	2,823	2,825	192	1,299	30,695
10	Mug	24	36	15	..	4	39	17	34	113	37	..	319
11	Udid	57	2	1	..	3	22	..	..	..	..	..	85
12	Chavli	115	4	6	3	1	9	31	1	..	..	..	170
13	Lang	28,343	13,787	14,102	29,395	19,944	19,170	17,937	11,254	10,892	1,851	3,848	170,523
14	Other Pulses	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Pulses ..	33,742	19,924	17,815	33,428	21,393	20,531	19,790	14,112	13,830	2,080	5,147	201,792
15	Tobacco	16	307	5	1	1	220	9	49	13	194	153	968
16	Bhang	..	..	..	..	..	..	..	..	..	..	61	61
17	Other Drugs and Narcotics ..	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Drugs and Narcotics ..	16	307	5	1	1	220	9	49	13	194	214	1,029

18	Fennel	1	3	..	1	..	1	..	4	1	1	72	84
19	Dilseed	..	..	1	..	..	1	1	..	..	[illegible]	..	3
20	Coriander	31	247	351	212	52	36	38	77	14	68	169	1,295
21	Cumin	..	..	..	..	..	..	..	..	..	20	96	116
22	Garlic	12	4	1	..	..	2	..	3	1	..	13	36
23	Other Condiments ..	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Condiments ..	44	254	353	213	52	40	39	84	16	89	350	1,534
24	Sugarcane	66	7	10	4	9	2	..	14	..	..	16	128
25	Sesame	3	338	110	3	180	33	34	34	102	1,097	62	2,496
26	Rapeseed	4,775	597	1,228	7,102	4,147	1,631	2,015	5,239	2,255	1,106	560	30,655
27.	Jambho	2,671	2,097	4,074	3,921	3,526	3,247	2,517	2,357	2,502	10,352	3,881	41,145
28	Cocoanut	105	7	..	..	..	..	..	..	186	1,536	1,267	3,101
	Other Oil-seeds	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Oil-seeds ..	7,554	3,539	5,412	11,026	7,853	4,911	4,566	7,630	5,045	14,091	5,770	77,397
29	Indigo	..	..	..	..	65	..	..	..	..	..	..	65
30	Other Dyes	3	..	..	..	..	..	353	6	..	..	..	362
	Total, Dyes ..	3	..	..	..	65	..	353	6	..	..	..	427
31	Cotton	40	11	..	5	..	8	11	3	22	297	54	451
32	Bombay Hemp ..	1	1	2	..	1	11	1	2	12	4	5	40
33	Other Fibres	..	..	..	..	..	..	..	..	..	..	..	..
	Total, Fibres ..	41	12	2	5	1	19	12	5	34	301	59	491
34	Vegetables, Green Fodder and Fruits	2,516	987	1,021	499	287	2,289	491	652	190	132	709	9,773
	Grass and Babul ..	173	34	132	86	36	119	64	238	148	70	125	1,225
	Miscellaneous Crops ..	..	..	..	..	..	..	..	..	..	25	..	25
	Gross Area Cropped ..	112,873	73,338	85,665	125,766	1,02,790	82,895	86,562	66,987	56,959	66,867	35,395	8,96,097

Table X—Area under Principal Crops in each Taluka of the Sukkur District in 1924-25

No.	Crop	Sukkur	Garhi Yasin	Shikarpur	Pano Akil	Ghotki	Ubauro	Mirpur Mathelo	Rohri	Total, Sukkur District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	16,472	19,050	33,952	11,770	10,463	14,786	17,704	17,779	141,976
2	Bajri	198	419	5,379	1,279	590	4,406	8,443	138	20,852
3	Rice	9,430	28,622	15,966	1,431	1,057	411	4,991	4,074	65,982
4	Wheat	11,216	8,034	9,911	36,892	48,454	26,725	15,011	23,809	180,052
5	Barley	9	4	28	60	85	66	17	130	399
6	Ragi	..	..	..	1	..	1	3	..	5
7	Rala	13	17	224	9	18	364	367	3	1,017
8	Other Cereals	39	14	889	502	278	18	..	2	1,742
	Total, Cereals ..	37,377	56,160	66,349	51,944	60,945	46,780	46,536	45,935	412,026
9	Gram	20,768	9,012	20,393	4,645	2,144	813	7,063	6,225	71,063
10	Mug	88	148	1,275	6	13	5	94	33	1,662
11	Udid	..	..	3	..	36	32	20	1	92
12	Math	..	..	27	26	88	6	..	..	147
13	Chavli	13	62	3	..	..	..	..	..	78
14	Vatana	3	..	1	..	..	..	..	..	4
15	Lang	2,651	12,088	5,664	4,091	2,879	947	656	3,242	32,318
16	Guvar	..	..	..	..	..	..	1	..	1
17	Other Pulses	..	..	..	..	..	..	..	..	..
	Total, Pulses ..	23,523	21,310	27,366	8,768	5,160	1,803	7,834	9,601	105,365
18	Tobacco	163	428	492	43	94	6	8	807	2,041
19	Other Drugs and Narcotics	14	7	..	..	..	..	..	..	21
	Total, Drugs and Narcotics ..	177	435	492	43	94	6	[illegible]	807	2,062

													431
21	Turmeric	..	..	..	..	..	1	..	..	..	..	..	1
22	Fennel	..	..	..	..	..	21	..	1	..	..	1	98
23	Coriander	..	..	..	..	..	59	17	13	3	2	3	334	494
24	Cumin	..	..	..	..	..	1	..	..	..	..	1	25	31
25	Mustard	..	..	..	..	..	107	..	..	..	4	..	5	116
26	Garlic	..	..	..	..	..	15	2	2	2	1	1	181	207
27	Other Condiments		..	..	..	..	1	6	..	..	..	..	..	49
					Total, Condiments	..	214	81	23	250	16	12	554	1,427
28	Sugarcane	..	..	..	..	..	36	40	1	4	..	3	..	331
29	Sesame	..	..		..	..	614	1,579	477	34	197	492	3	3,524
30	Rapeseed	..	..	..	..	..	390	808	448	103	11	20	358	4,156
31	Jambho	..	..	..	..	..	3,047	2,180	5,511	2,980	1,475	2,899	3,729	22,383
32	Other Oil-seeds	..	..	..	..	..	..	..	..	..	8	..	..	8
					Total, Oil-seeds	..	4,051	4,567	6,436	3,117	1,691	3,411	4,090	30,071
33	Indigo	..	..	..	..	..	..	..	..	..	..	99	6	105
34	Morinda	..	..	..	..	..	9	220	2	..	..	..	..	233
35	Other Dyes	..	..	..	..	..	..	..	..	..	..	..	..	..
					Total, Dyes	..	9	220	2	..	..	99	6	338
36	Cotton	..	..	..	..	..	4	16	208	861	75	290	189	1,665
37	Other Fibres	..	..	..	..	..	1	1	..	..	..	..	3	5
					Total, Fibres	..	5	17	208	861	75	290	192	1,670
38	Vegetables, Green Fodder and Fruits			..	..	..	2,580	4,107	645	591	171	223	3,325	14,538
39	Grass and Babul		..	..	..	..	61	67	75	6	10	..	520	797
40	Miscellaneous Crops		..	..	..	..	3	..	..	..	..	..	16	32
					Gross Area Cropped	..	84,864	103,306	68,145	71,028	50,552	58,416	65,046	568,657

Table XI—Area under Principal Crops in each Taluka of the Upper Sind Frontier District in 1924-25

No.	Crop	Jacobabad	Shahdad-kot	Thul	Khand-kot	Kashmor	Total, Upper Sind Frontier
		Acres	Acres	Acres	Acres	Acres	Acres
1	Jowari	24,958	20,262	28,661	25,517	14,549	113,947
2	Bajri	9,200	303	35,833	26,721	11,674	83,731
3	Rice	52,610	16,665	12,091	15,006	496	96,868
4	Wheat	10,699	4,594	18,492	21,036	34,432	89,253
5	Barley	6	1	12	47	81	147
6	Maize	10	..	..	..	..	10
7	Rala	73	1,842	427	106	36	2,484
8	Other Cereals	..	..	..	491	1,935	2,426
	Total, Cereals ..	97,556	43,667	95,516	88,924	63,203	388,866
9	Gram	29,502	3,973	41,091	34,905	7,016	116,487
10	Mug	517	54	710	368	66	1,715
11	Udid ..	..	..	..	23	119	142
12	Math ..	..	..	..	23	310	333
13	Chavli	27	9	53	1	..	90
14	Lang	21,634	4,420	1,145	4,062	7,869	39,130
15	Other Pulses	370	82	626	74	15	1,167
	Total, Pulses ..	52,050	8,538	43,625	39,456	15,395	159,064
16	Tobacco	2	..	10	10	..	22
17	Other Drugs and Narcotics ..	..	..	..	..	..	..
	Total, Drugs and Narcotics ..	2	..	10	10	..	22
18	Chillies ..	1	..	1	1	1	4
19	Coriander	193	36	54	27	3	313
20	Mustard ..	..	..	72	..	575	647
21	Garlic	1	1	3	..	..	5
22	Other Condiments ..	..	7	..	1	..	8
	Total, Condiments ..	195	44	130	29	579	977
23	Sugarcane	5	3	8	..	..	16
24	Sesame ..	828	930	2,255	782	623	5,392
25	Jambho ..	6,739	3,835	10,404	11,468	153	32,566
26	Rapeseed	494	16,878	2,628	1,517	4,801	26,318
27	Linseed ..	..	..	..	1	..	1
28	Other Oil-seeds	..	..	..	..	..	..
	Total, Oil-seeds ..	8,061	21,643	15,287	13,768	5,577	64,277
29	Cotton	88	16	148	80	31	363
30	Hemp	2	4	1	1	..	8
31	Other Fibres	..	..	..	..	..	..
	Total, Fibres ..	90	20	149	81	31	371
32	Vegetables, Green Fodder and Fruits.	1,227	492	1,142	513	98	3,472
33	Grass and Babul	71	..	8	..	..	79
34	Miscellaneous	..	..	..	..	..	..
	Gross Area Cropped ..	159,257	74,407	155,875	142,781	84,883	617,203

AREA UNDER VEGETABLES, GREEN FODDER AND FRUITS

Table XII—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Karachi District in 1924-25

No.	Crop	Karachi	Mirpur Sakro	Ghorabari	Shahbunder	Jati	Sujawal	Mirpur Bathoro	Tatta	Kohistan	Kotri	Manjhand	Total Karachi District
	A.—Vegetables (Roots and Tubers)	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Onion	204	41	2	6	57	15	34	61	11	36	11	478
2	Sweet Potato	95	60	..	..	35	2	67	18	..	..	..	277
3	Potato	1,903	12	3	..	..	..	..	7	..	..	..	1,925
4	Radish	12	8	2	2	45	4	13	3	..	..	..	89
5	Carrot	193	6	..	1	9	10	46	10	2	10	..	287
6	Others	156	..	..	..	..	..	..	..	..	..	..	156
	Total ..	2,563	127	7	9	146	31	160	99	13	46	11	3,212
	B.—Vegetables (Green)												
7	Cabbage	298	..	..	..	..	..	..	..	..	..	..	298
8	Edible Hibiscus ..	89	..	..	..	..	..	..	2	..	1	..	92
9	Brinjal	507	2	6	2	28	6	5	45	..	2	..	603
10	Tomato	30	..	..	..	..	..	..	..	..	..	..	30
11	Fenugreek	68	..	1	2	13	..	1	5	..	3	..	93
12	Musk Melon	142	92	76	42	42	141	90	210	..	738	..	1,573
13	Water Melon	176	45	52	7	2	45	15	35	..	5	..	382
14	Others	233	2	5	18	26	16	2	15	..	7	..	324
	Total ..	1,543	141	140	71	111	208	113	312	..	756	..	3,395

	C.—Green Fodder												
13	Lucerne	1,588	..	..	12	..	..	..	..	..	[illegible]	..	1,604
14	Hot-weather Jowar ..	..	..	..	..	..	..	..	..	..	..	..	..
15	Field Vetch	..	..	..	..	..	..	..	..	..	..	..	..
16	Others	479	9	..	..	8	..	..	..	..	132	205	833
	Total ..	2,067	9	..	12	8	..	..	..	..	136	205	2,437
	D.—Fruit Trees												
17	Plantain	92	9	2	1	30	..	3	8	..	5	1	151
18	Mango	1,030	131	37	34	84	71	259	197	1	5	1	1,850
19	Lime	..	1	..	1	5	..	1	4	..	..	..	12
20	Orange	..	..	..	..	..	..	..	4	..	..	..	4
21	Citron	..	..	..	..	..	..	..	..	..	.	..	..
22	Pomelo	..	..	..	..	..	..	..	..	..	..	..	..
23	Pomegranate	23	5	3	..	5	..	1	27	..	1	1	66
24	Guava	71	9	7	17	17	12	8	37	..	6	..	184
25	Custard Apple	2	..	..	..	..	..	..	..	..	..	..	2
26	Date Palm	130	4	1	..	6	..	1	1	..	50	..	193
27	Fig	6	..	..	..	..	..	..	..	..	..	..	6
28	Papaya	222	..	..	..	..	..	..	..	..	..	..	222
29	Grape	26	..	..	1	3	..	..	2	..	..	..	32
30	Others	35	3	1	..	56	2	3	11	..	..	1	112
	Total ..	1,637	162	51	54	176	85	276	291	1	67	4	2,834
	Total, Orchard and Garden Produce.	7,810	439	198	146	441	324	549	702	14	1,005	220	11,878

Table XIII—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Hyderabad District in 1924-25

No.	Crop	Hyderabad	Hala	Tando Alahyar	Dero Mohbat	Tando Bago	Badin	Guni	Total Hyderabad District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
	A.—Vegetables (Roots and Tubers)								
1	Potato	....	....	....	....	....	....	....	....
2	Sweet Potato	699	65	184	29	43	26	46	1,092
3	Onion	125	140	30	44	108	131	116	694
4	Carrot	16	40	7	5	16	44	15	143
5	Radish	4	2	....	3	10	13	34	66
6	Others	....	....	....	....	....	8	....	8
	Total ..	844	247	221	81	177	222	211	2,003
	B.—Vegetables (Green)								
7	Cabbage	5	....	....	....	1	....	....	6
8	Brinjal	32	27	10	1	1	7	33	111
9	Tomato	1	....	....	....	....	....	....	1
10	Fenugreek	7	120	3	....	....	1	15	146
11	Edible Hibiscus	14	10	....	....	....	....	10	34
12	Musk Melon	421	1,017	182	11	146	240	135	2,152
13	Water Melon	59	420	....	....	5	9	....	493
14	Others	74	....	3	12	23	20	....	132
	Total ..	613	1,594	198	24	176	277	193	3,075

	C.—Green Fodder									
15	Lucerne	88	....	....	....	1	5	2	96	
16	Hot-weather Jowar	16	....	....	....	....	....	....	16	
17	Field Vetch	512	....	801	380	44	....	216	1,955	
18	Others	669	23	....	4	41	112	100	949	
	Total ..	1,285	23	801	384	86	117	320	3,016	
	D.—Fruit Trees									
19	Plantain	40	3	1	3	2	8	14	71	
20	Mango	976	465	79	301	226	145	204	2,486	
21	Lime	20	25	6	3	7	2	5	68	
22	Sweet Lime	....	3	....	....	....	....	....	3	
23	Orange	4	1	....	....	....	1	....	6	
24	Citron	1	....	....	....	....	....	....	1	
25	Pomegranate	111	20	2	23	2	3	32	193	
26	Guava	186	19	3	22	13	21	49	313	
27	Custard Apple	1	....	....	....	....	....	....	1	
28	Fig	15	....	....	....	....	....	....	15	
29	Date Palm	5	1	....	2	....	3	10	21	
30	Grape	9	1	....	1	1	....	1	13	
31	Others	285	98	11	13	8	1	40	456	
	Total ..	1,653	636	102	368	259	184	445	3,647	
	Total, Orchard and Garden Produce ..	4,395	2,500	1,322	857	698	800	1,169	11,741	

Table XIV—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Thar Parkar District in 1924-25

No.	Crop	Mirpurkhas	Digri	Jamesabad	Samaro (Pithoro)	Umarkot	Khipro	Sanghar	Diplo	Mithi	Nagar Parkar	Chhachro	Total, Thar Parkar District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
	A—Vegetables (Roots and Tubers)												
1	Potato	..	..	..	..	..	..	..	..	..	..	..	..
2	Sweet Potato	8	4	..	..	2	..	..	..	..	1	..	15
3	Onion	8	32	9	18	63	11	8	2	1	23	..	175
4	Carrot	9	12	8	9	26	6	2	1	..	4	..	77
5	Radish	4	8	4	5	17	3	1	2	7	7	4	62
6	Others	..	..	..	..	..	..	..	..	..	..	..	..
	Total ..	29	56	21	32	108	20	11	5	8	35	4	329
	B—Vegetables (Green)												
7	Cabbage	..	1	2	..	1	..	..	..	..	..	..	4
8	Brinjal	6	3	2	1	6	1	..	..	..	6	..	25
9	Tomato	..	..	..	..	..	..	..	..	..	..	..	..
10	Fenugreek	1	2	..	..	..	..	..	..	..	..	..	3
11	Edible Hibiscus ..	..	..	..	..	2	1	..	..	..	..	..	3
12	Musk Melon	2	4	14	..	18	2	..	..	..	..	..	40
13	Water Melon	..	..	..	..	4	..	..	..	..	..	..	4
14	Others	3	8	5	4	10	3	3	1	1	..	..	41
	Total ..	12	18	23	5	41	7	3	1	1	6	..	117

	C—Green Fodder												
15	Lucerne	134	319	181	..	1	1	..	..	..	..	..	63
16	Hot-weather Jowar ..	..	..	..	..	..	..	..	..	..	..	..	..
17	Field Vetch	277	313	233	24	1,304	53	61	866	3,473	6,640	12,740	25,984
18	Others	186	101	36	..	..	..	..	..	..	..	..	323
	Total ..	597	733	450	24	1,305	54	61	866	3,473	6,640	12,740	26,943
	D—Fruit Trees												
19	Plantain	25	17	18	2	7	6	1	..	..	..	..	76
20	Mango	284	192	175	60	97	91	42	..	..	..	..	941
21	Lime	12	10	11	2	10	2	2	..	..	..	..	49
22	Orange	18	2	6	2	..	..	..	..	..	..	..	28
23	Citron	..	1	1	..	..	..	..	..	..	..	..	2
24	Pomegranate	22	11	17	7	1	2	2	..	..	..	..	62
25	Guava	24	27	17	4	31	10	5	..	..	..	..	118
26	Fig	2	1	..	..	5	..	..	..	..	..	..	8
27	Date Palm	..	1	..	..	3	1	..	..	..	..	..	5
28	Grape	9	..	1	..	1	1	..	..	..	..	..	12
29	Others	76	28	34	6	16	14	7	1	..	..	..	182
	Total ..	472	290	280	83	171	127	59	1	..	..	..	1,483
	Total, Orchard and Garden Produce.	1,110	1,097	774	144	1,625	208	134	873	3,482	6,681	12,744	28,872

Table XV—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Nawabshah District in 1924-25

No.	Crop	Nawabshah	Sinjhoro	Shahadadpur	Sakrand	Moro	Nausharo	Kandiaro	Total, Nawabshah District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
	A—Vegetables (Roots and Tubers)								
1	Sweet Potato	....	1	....	....	....	....	....	1
2	Onion	2	29	47	19	16	53	70	236
3	Carrot	....	8	4	2	....	12	5	31
4	Radish	1	2	1	....	....	3	3	10
5	Others	....	....	50	....	11	39	124	224
	Total	3	40	102	21	27	107	202	502
	B—Vegetables (Green)								
6	Cabbage	....	....	....	....	....	....	1	1
7	Brinjal	....	2	8	....	....	1	3	14
8	Tomato	....	....	....	....	....	....	....	....
9	Fenugreek	....	4	3	....	2	18	10	37
10	Edible Hibiscus	....	....	....	....	....	....	2	2
11	Musk Melon	....	3	37	8	73	59	12	197
12	Water Melon	6	1	1	....	7	1	1	17
13	Others	1	5	3	15	16	50	11	101
	Total ..	7	20	52	23	98	129	40	369

	C—Green Fodder									
14	Lucerne	....	333	....	....	....	....	....	333
15	Hot-Weather Jowar	....	....	....	....	....	....	....	....
16	Field Vetch	9,974	885	763	328	582	2,084	155	14,771
17	Others	....	146	3	....	....	278	37	464
	Total ..	9,974	1,364	766	328	582	2,362	192	15,568
	D—Fruit Trees								
18	Plantain	....	15	1	1	....	1	....	18
19	Mango	7	265	104	15	100	403	69	963
20	Lime	1	15	1	2	17	42	6	89
21	Sweet Lime	....	4	....	....	....	1	....	5
22	Orange	....	2	1	....	3	41	2	48
23	Pomelo	....	....	....	....	....	....	....	....
24	Citron	..	....	....	....	....	....	....	....
25	Pomegranate	5	16	3	1	....	....	1	26
26	Guava	1	7	5	1	....	2	....	16
27	Custard Apple	....	....	....	....	....	....	....	....
28	Pine Apple	....	....	1	....	....	....	....	1
29	Fig	....	....	1	....	....	....	....	1
30	Grape	....	2	....	....	1	1	1	5
31	Others	3	14	9	2	4	51	9	87
	Total ..	17	339	126	22	125	542	88	1,259
	Total, Orchard and Garden Produce ..	10,001	1,768	1,046	394	832	3,140	522	17,698

Table XVI—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Larkana District in 1924-25

No.	Crop	Larkana	Ratodero	Mirokhan	Kambar	Warah	Labdara (Dokri)	Mehar	Kakar	Dadu	Johi	Sehwan	Total, Larkana District
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
	A—Vegetables (Roots and Tubers)												
1	Onion	18	66	20	36	30	155	35	69	58	18	32	537
2	Carrot	116	11	5	3	3	14	4	11	4	2	5	178
3	Radish	8	9	3	4	5	2	5	9	1	1	1	48
4	Others	111	43	24	17	27	130	4	18	3	1	..	378
	Total ..	253	129	52	60	65	301	48	107	66	22	38	1,141
	B—Vegetables (Green)												
5	Cabbage	22	..	..	..	1	3	..	..	..	..	..	26
6	Brinjal	14	5	2	4	2	9	..	5	..	2	..	43
7	Tomato	..	..	..	..	..	..	..	..	..	..	..	..
8	Fenugreek	2	1	1	1	3	13	..	..	1	1	1	24
9	Edible Hibiscus ..	7	1	..	..	..	..	..	..	..	..	1	9
10	Musk Melon	368	215	463	132	82	163	135	154	64	1	147	1,924
11	Water Melon	218	192	40	25	42	86	78	82	2	..	7	772
12	Others	268	134	132	67	70	174	95	228	31	7	53	1,259
	Total ..	899	548	638	229	200	448	308	469	98	11	209	4,057

	C—Green Fodder												
13	Lucerne	..	..	..	..	..	..	..	..	..	..	..	..
14	Hot-Weather Jowar ..	..	..	..	..	..	..	..	..	..	94	14	108
15	Field Vetch	..	33	..	1	..	..	2	..	..	..	2	38
16	Others	55	161	296	49	11	458	1	..	22	5	421	1,479
	Total ..	55	194	296	50	11	458	3	..	22	99	437	1,625
	D—Fruit Trees												
17	Plantain	2	1	1	..	..	1	..	1	..	..	..	6
18	Mango	1,053	80	29	101	11	1,011	123	56	..	1	17	2,482
19	Lime	15	10	1	1	..	12	1	5	..	..	1	46
20	Sweet Lime	2	..	1	..	..	2	..	..	..	..	..	5
21	Orange	1	1	..	1	..	1	1	..	..	..	..	5
22	Citron	..	..	..	..	..	..	..	..	..	..	..	..
23	Pomegranate	1	..	1	2	..	2	1	3	..	..	1	11
24	Guava	3	1	..	1	..	2	..	3	..	..	4	14
25	Fig	..	..	1	..	..	..	..	..	..	..	..	1
26	Date Palm	205	16	1	50	..	44	2	1	..	..	..	319
27	Grape	..	..	..	..	..	1	..	..	..	..	1	2
28	Others	27	7	1	3	..	6	4	7	3	..	1	59
	Total ..	1,309	116	35	160	11	1,082	132	76	4	..	25	9,250
	Total, Orchard and Garden Produce.	2,516	987	1,021	499	287	2,289	491	652	190	132	709	9,773

Table XVII—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Sukkur District in 1924-25

No.	Crop	Sukkur	Garhi Yasin	Shikarpur	Pano Akil	Ghotki	Ubauro	Mirpur Mathelo	Rohri	Total, Sukkur District
	A—Vegetables (Roots and Tubers)	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1	Potato	843	32	324	8	1	5	..	349	1,562
2	Sweet Potato	..	..	..	..	..	..	..	..	..
3	Onion	294	593	144	70	79	21	18	421	1,640
4	Carrot	47	15	15	5	25	7	5	4	123
5	Radish	5	2	4	1	1	1	2	..	16
6	Others	45	31	44	102	150	32	57	14	475
	Total ..	1,234	673	531	186	256	66	82	788	3,816
	B—Vegetables (Green)									
7	Cabbage	10	..	16	..	..	..	..	..	26
8	Brinjal	19	14	19	2	10	3	1	2	70
9	Tomato	..	..	..	..	..	..	..	..	..
10	Fenugreek	1	36	32	3	..	1	2	..	75
11	Edible Hibiscus	18	2	6	1	4	1	1	5	38
12	Musk Melon	357	418	454	82	130	35	40	140	1,656
13	Water Melon	408	673	1,169	5	2	3	1	12	2,273
14	Others	207	104	169	9	9	19	12	39	568
	Total ..	1,020	1,247	1,865	102	155	62	57	198	4,706

	C—Green Fodder											
15	Lucerne	..	..	..	..	..	..	..	..	..	..	..
16	Hot Weather Jowar	..	..	..	..	..	..	..	..	..	..	..
17	Field Vetch	6	..	..	..	..	..	23	..	29
18	Others	2	555	378	209	10	32	52	315	1,553
	Total ..	8	555	378	209	10	32	75	315	1,582
	D—Fruit Trees									
19	Plantain	8	1	60	..	2	..	..	13	84
20	Mango	148	58	347	39	62	3	4	318	974
21	Lime	31	11	82	13	13	1	2	19	172
22	Sweet Lime	5	2	53	2	1	1	1	2	67
23	Orange	3	..	4	..	..	..	..	2	9
24	Citron	1	..	2	..	..	..	..	..	3
25	Pomegranate	36	5	145	2	2	3	1	40	234
26	Guava	2	1	46	1	2	..	..	6	58
27	Fig	..	..	6	..	..	..	..	..	6
28	Date Palm	329	15	236	82	85	3	1	1,528	2,279
29	Grape	6	..	36	..	..	..	..	..	42
30	Others	65	17	316	9	3	..	..	96	506
	Total ..	634	105	1,333	148	170	11	9	2,024	4,434
	Total, Orchard and Garden Produce ..	2,896	2,580	4,107	645	591	171	223	3,325	14,538

Table XVIII—Area under Vegetables, Green Fodder and Fruits in each Taluka of the Upper Sind Frontier District in 1924-25

No.	Crop	Jacobabad	Shahdadkot	Thul	Khandkot	Kashmor	Total, Upper Sind Frontier District
	A—Vegetables (Roots and Tubers)	Acres	Acres	Acres	Acres	Acres	Acres
1	Potato	6	4	2	..	..	12
2	Onion	13	5	80	28	11	137
3	Carrot	26	9	19	8	10	72
4	Radish	15	5	2	6	3	31
5	Others	21	14	19	7	5	66
	Total ..	81	33	122	53	29	318
	B—Vegetables (Green)						
6	Cabbage	10	1	2	1	1	15
7	Brinjal	4	2	2	..	..	8
8	Fenugreek	5	3	..	..	..	8
9	Edible Hibiscus	6	..	1	..	..	7
10	Musk Melon	427	199	183	199	29	1,037
11	Water Melon	441	137	478	176	8	1,240
12	Others	97	76	13	1	2	189
	Total ..	990	418	679	377	40	2,504
	C—Green Fodder						
13	Hot Weather Jowar ..	1	..	..	..	..	1
14	Field Vetch	92	8	245	68	6	419
15	Others	1	21	54	5	16	97
	Total ..	94	29	299	73	22	517
	D—Fruit Trees						
16	Plantain	1	1	3	1	..	6
17	Mango	38	5	22	4	4	73
18	Lime	5	2	7	1	..	15
19	Sweet Lime	1	1	1	1	..	4
20	Orange	..	1	..	..	1	2
21	Citron	..	..	..	..	..	..
22	Fig	..	..	..	..	..	..
23	Pomegranate	6	1	1	1	1	10
24	Guava	1	..	..	..	..	1
25	Date Palm	6	..	1	..	..	7
26	Grape	..	..	1	..	..	1
27	Others	4	1	6	2	1	14
	Total ..	62	12	42	10	7	133
	Total, Orchard and Garden Produce	1,227	492	1,142	513	98	3,472

INDEX

Explanatory Note.—The index differs from other similar attempts in giving more detailed information than a mere alphabetical arrangement of the names of the crops or other items touched in the Bulletin. For instance, a reference to the general head, "Vegetables" in the index will give a complete list (alphabetically arranged) of all the vegetables treated in the Bulletin while a further reference to individual heads such as "Potato" or "Celery" will indicate the details to be found under these vegetables. Thus, a reference to "Potato" will show that information under fourteen different heads such as area, manure, seed, soil, etc., will be found under that vegetable while a reference to "Celery" will show that nothing beyond an indication of the centres of cultivation will be found under that crop. By previous reference to the index the reader will thus be in a better position to know what he may expect to find under the different heads.

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