

CHAPTER IV

AGRICULTURE AND IRRIGATION

THE Raichur district lies in the northern *maidan* region of the State, comprising vast fertile tracts of black cotton soils. It is bordered by perennial rivers, the Tungabhadra and the Krishna, and is traversed by a few small streams providing a vast irrigational potential. It had some irrigational facilities through the old Vijayanagara channels. But the district remained essentially backward in agriculture till the beginning of the last decade, *i.e.*, till the placid waters of the Tungabhadra flowed down the Left Bank Canal, heralding a new era of prosperity and progress for the district. The scanty and uncertain rainfall of less than 24 inches and frequent visitations of famine, in addition to the lack of initiative on the part of the farmers and lack of encouragement from the feudal regime, had greatly retarded the agricultural industry. In recent years, great improvements have been introduced, in the country, in the methods and practices of this basic industry, encouraging the farmers to follow their profession with greater success and confidence than ever before. This is particularly so in this district, thanks to the mighty Tungabhadra Project.

Agricultural population

The dominant feature of this district's economy is that it is primarily dependent on agriculture, which is the chief occupation of the people as in the other contiguous districts which are all predominantly agricultural in character. Nearly seventy-seven per cent of the population of the district derive their livelihood directly or indirectly from agriculture. In 1951, the number of owner cultivators was estimated at 5,59,302, making up 58.6 per cent of the total population of the district. The number of tenant cultivators was just over 41,000, constituting 4.3 per cent of the population. The number of cultivating labourers was 94,377 and the number of non-cultivating owners 42,126. The total agricultural population of the district was estimated to be 7,36,984, which constituted 77.3 per cent of the total population.

As per the 1961 Census, the total population of 11,00,895 in the district was classified into 5,12,061 workers and 5,88,834 non-workers, the workers being further classified under nine categories

according to economic activities. Among these workers, 3,92,508 persons were engaged in agriculture and this number included cultivators and agricultural labourers, while 1,19,553 were pursuing other economic activities. So far as this chapter is concerned, only workers engaged in agriculture need be taken into consideration. The total number of persons working as cultivators and agricultural labourers (*i.e.*, 3,92,508), constituted 76.7 per cent of the total working force and 35.6 per cent of the total population of the district. The table given below shows the distribution of agricultural population by taluks :—

Sl. No.	Name of taluk	Number of cultivators	Number of agricultural labourers	Total of columns 3 and 4	Percentage of column 5	
					to total working force	to total population
1	2	3	4	5	6	7
1.	Deodurg ..	25,363	7,560	32,923	6.5	3.0
2.	Gangavati ..	28,891	11,606	40,497	7.9	3.7
3.	Koppal ..	34,074	13,313	47,387	9.3	4.3
4.	Kushtagi ..	31,816	8,119	39,935	7.8	3.6
5.	Lingsugur ..	44,589	9,752	54,341	10.7	5.0
6.	Manvi ..	29,823	17,987	47,810	9.4	4.3
7.	Raichur ..	24,064	15,968	40,032	7.7	3.6
8.	Sindhannur ..	30,218	8,994	39,212	7.6	3.5
9.	Yelburga ..	33,582	11,789	50,371	9.8	4.6
District's total ..		2,87,420	1,05,088	3,92,508	76.7	35.6

It can be seen from the above table that the total number of persons working as cultivators and agricultural labourers in Lingsugur taluk accounts for the largest percentages of 10.7 and 5.0, while Deodurg taluk the lowest of 6.5 and 3.0 to the total working force and the total population of the district, respectively.

The pattern of land distribution in the district may be said to be broadly similar to that in other parts of the State, which is characterised by "numerous small holdings, a large portion of them un-economic, a small number of middle class peasants and a sprinkling of substantial owners". As per the report of Mysore Tenancy Agricultural Land Laws Committee, 1958, the extents of

Size of land holdings

lands cultivated in the district by various land-holding groups were as detailed below :—

<i>Sl. No.</i>	<i>Land-holding group (in acres)</i>	<i>Number of holdings</i>	<i>Total area (in acres)</i>	<i>Percentage</i>
1	2	3	4	5
1.	0—5	48,269	1,46,576	5
2.	5—10	49,532	3,76,757	12
3.	10—15	33,066	4,05,291	13
4.	15—30	42,882	9,02,573	30
5.	30—45	12,707	4,63,601	15
6.	45—60	4,533	2,34,579	8
7.	60—75	2,068	1,40,921	5
8.	75—100	1,658	1,44,660	5
9.	100—150	808	97,257	3
10.	150—200	211	35,582	1
11.	200—300	102	25,105	1
12.	300—500	42	14,820	0.5
13.	500—1,000	23	11,218	0.5
14.	1,000 and above	11	25,092	1
Total ..		1,95,912	30,27,030	100

The above extract discloses that the largest single extent of land was held by the fourth category (15 to 30 acres), which constituted about 30 per cent of the total agricultural area, while the next largest extent pertained to the fifth group (30 to 45 acres), which constituted only 15 per cent of the total agricultural area. Another statement, appended at the end of this chapter showing the distribution of sample households engaged in cultivation by size of land and interest in land cultivated, also reveals that the size of land cultivated by the largest single group of cultivating households in 1961 was 15 to 29.9 acres and this group constituted about 25 per cent of cultivating households, while four sizes of lands ranging from 2.5 acres to 12.4 acres were cultivated by about 50 per cent of the cultivating households. The average *per capita* holding in the district worked out to 15.4 acres, while in the neighbouring district of Bellary (which also is benefited by the Tungabhadra Project) it was 11.5 acres.

Prevention of fragmentation

The size of agricultural holdings is one of the important aspects to be taken into account while considering the productivity of land. According to the report of the Mysore Tenancy Agricultural Land Laws Committee, 1958, there were 48,269 holdings of 0.5 acre in extent in the district, covering an area of 1,46,576 acres which constituted five per cent of the total area as shown above. Such uneconomic holdings naturally increase the

unit cost of production in addition to low yield from the land. This excessive sub-division and fragmentation of holdings took place on account of successions of generation after generation and economic necessities of the cultivators. In order to consolidate these small holdings and prevent further fragmentation of lands, the Mysore Prevention of Fragmentation and Consolidation of Holdings Act, 1966, has been brought into force in the district with effect from May 1, 1969. According to the provisions of this Act, the extent of the unit or fragment of a land-holding under cultivation may vary from half acre to four acres. Any land-holding, having an extent of land less than four acres, is regarded as a fragment and such lands cannot be sold to any one except the contiguous holder either by the option of the party or by the process of law. For purposes of consolidation of holdings, a separate scheme, under the above Act, has been brought into force. There is an Assistant Consolidation Officer, appointed under the provisions of the above Act, who prepares and publishes the list of lands which are considered as fragments. Such fragments of land are taken away from them or added on to the holdings of other parties, after declaring the compensation to be paid to them. The lands, which are thus taken away from them, are allotted to others according to the consolidation scheme and the possession of such lands would be made over to them by issuing certificates of transfer after recovering the compensation amount from such parties but without levying any stamp duty or registration fee. (See also Chapter XI).

Out of the total reporting area of 34,47,096 acres for purposes of land utilisation in the district, the extent of land put to agricultural use, in 1952-53, was 26,63,782 acres, while it was 28,52,610 acres in 1957-58; it had decreased to 26,60,562 acres in 1967-68. The main reason for this kind of fluctuation in the area of land put to agricultural use is the respective seasonal conditions of the period. The subjoined tables indicate the cultivable and un-cultivable areas in the district during 1957-58, 1962-63 and 1966-67.

Land utilisation

1957-58

Cultivable Area

Sl. No.	Name of taluk	Area in sq. miles	Area in acres	Cultivable			Total
				Dry	Wet	Bagayat	
1	2	3	4	5	6	7	8
1.	Deodurg ..	595	3,72,622	2,92,262	820	282	2,93,365
2.	Gangavati ..	514	3,26,592	2,41,910	8,062	751	2,50,724
3.	Koppal ..	542	3,40,592	2,62,670	4,918	950	2,68,469

1	2	3	4	5	6	7	8
4.	Kushtagi ..	536	3,38,978	2,72,073	989	584	2,73,647
5.	Lingsugur ..	739	4,81,795	4,01,554	1,446	498	4,03,498
6.	Manvi ..	749	4,42,758	3,71,445	2,587	1,873	3,75,905
7.	Raichur ..	588	3,79,907	2,84,750	10,122	1,277	2,96,151
8.	Sindhanur ..	628	3,94,779	3,46,456	217	268	3,46,942
9.	Yelburga ..	545	3,69,159	3,42,161	1,556	191	3,43,909
	Total ..	5,436	34,47,092	28,15,211	30,717	6,674	28,52,610

Un-cultivable Area

(In Acres)

Sl. No.	Name of taluk	Un-cultivable				Total
		Forest	Gairan	Parampoke, River, Road, etc.	Kharij Khata	
1	2	3	4	5	6	7
1.	Deodurg ..	26,190	21,883	26,525	4,659	79,257
2.	Gangavati ..	37,470	17,229	10,273	10,805	75,777
3.	Koppal ..	29,823	7,892	27,832	6,574	72,122
4.	Kushtagi ..	11,115	11,657	36,696	5,862	65,331
5.	Lingsugur ..	26,619	15,508	34,958	1,211	78,297
6.	Manvi ..	4,650	16,715	42,647	2,838	66,852
7.	Raichur ..	462	13,782	64,224	5,287	83,755
8.	Sindhanur ..	2,619	11,355	29,595	4,267	47,836
9.	Yelburga ..	..	3,844	19,900	1,505	25,250
	Total ..	1,38,948	1,19,865	2,92,653	43,008	5,94,477

Taluk	Forest	Un-cultivable Area			Cultivable Area				
		Barren	Land put to non-agricultural use	Cultivable waste	Permanent pastures	Land under misc. trees	Fallow land other than current	Net area sown	Current fallows
1	2	3	4	5	6	7	8	9	10
Deodurg ..	9,935	87,800	9,532	1,282	14,437	106	..	2,49,435	..
Gangavati ..	1,067	33,675	12,806	..	18,229	..	5,832	2,28,359	26,534
Koppal ..	2	33,180	20,923	4,825	7,732	10,363	42,953	2,20,614	..
Kushtagi ..	5,767	13,332	15,064	5,342	11,624	..	1,841	2,68,686	17,322
Lingsugur ..	9,733	27,411	10,152	7,925	17,652	1,279	36,242	3,05,340	66,283
Manvi ..	4,650	1,094	10,805	..	13,864	4,913	2,662	4,02,479	..
Raichur ..	808	18,068	9,108	5,294	13,759	13,772	831	2,59,719	52,796
Sindhavur ..	2,619	3,778	18,197	..	11,309	..	7,941	3,47,477	3,458
Yelburga ..	..	9,025	8,783	2,234	4,280	..	21,299	3,20,553	2,056
Total ..	34,581	2,27,363	1,15,370	26,902	1,12,886	30,433	1,19,601	26,02,662	1,68,449

Taluk	Forest	Un-cultivable Area		Cultivable Area					Current fallows
		Barren	Land put to non-agricultural use	Cultivable waste	Permanent pastures	Land under misc. trees	Fallow land other than current	Total cropped area	
1	2	3	4	5	6	7	8	9	10
Deodurg ..	9,935	14,084	20,452	5,130	20,470	106	8,423	2,94,567	..
Gangavati ..	1,067	32,796	11,147	8,000	17,792	..	6,867	2,48,333	..
Koppal ..	362	40,077	12,920	6,040	6,584	10,329	31,897	1,89,229	9,717
Kushtagi ..	6,344	13,524	15,070	5,310	11,634	..	21,228	2,51,399	10,000
Lingsugur ..	9,733	31,800	12,780	1,514	16,161	1,279	40,617	3,28,718	26,967
Manvi ..	5,816	3,616	8,733	5,731	15,052	4,913	1,611	4,04,046	14,505
Raichur ..	898	7,658	1,432	2,206	13,890	14,062	14,173	2,68,972	21,264
Sindhaur ..	2,619	18,198	3,778	3,595	11,355	..	2,788	3,17,595	779
Yelburga ..	438	8,046	1,843	1,506	5,018	..	23,355	2,89,377	5,616
Total ..	37,212	1,69,799	88,155	39,032	1,17,956	30,689	1,50,959	25,92,236	88,848

The foregoing tables disclose, in a general way, the pattern of land utilisation in the district of Raichur. The difference in forest area is due to the protected and unclassified forest area included in 1957-58 figures, but left out in that of the other two years. However, there has been a gradual increase in the forest area since 1962-63, but the extent of increase is not large since it is a *maidan* area of low rainfall.

Land development, one of the pre-requisites of successful farming, is executed in the district under two phased programmes, *viz.*, land reclamation by mechanical means or manual labour and soil conservation. Lands are reclaimed either by manual labour or mechanical means; while the former is resorted to in places where reclamation by mechanical means is not feasible, the latter is being taken up on an extensive and intensive scale, involving a heavy expenditure, with the help of improved machinery. In cases where lands are reclaimed by manual labour by the cultivating land-holders out of their own resources, the Department of Agriculture is giving them financial aid at the rate of Rs. 50 per acre.

Land
development

Land reclamation by mechanical means on an extensive scale has been made possible by a fleet of 555 tractors, bulldozers and a fairly large number of agricultural implements specially designed for purposes of levelling lands. The Agricultural Department and the two Land Development Societies at Manvi and Sindhanur, which maintain 31, 19 and 22 tractors, respectively, have taken up the work of land development, on hire basis, in respect of the fields of those farmers who do not possess tractors and other equipments by themselves for such operations. The hire charges vary from Rs. 12 to Rs. 15 per hour in respect of tractors held by the Land Development Societies and other progressive farmers and Rs. 100 to Rs. 160 per acre in the case of Departmental tractors. In places where lands have rugged surfaces of varying slopes, the Departmental tractors are taken to their fields to get their lands levelled.

If the two Land Development Societies, with the assistance of trained technical personnel for organising the work of tractors, are rendering useful service to the cultivators in getting their lands levelled, the Department of Agriculture, with a separate wing at Sindhanur under the control of an Agricultural Engineer and a team of experts and technicians, is educating the cultivators as to how best the lands could be levelled with the help of tractors and bulldozers by organising demonstrations on the fields of the farmers. There are two squads with trained men, located at Manvi and Sindhanur, who survey the lands of the farmers, either at the option of the cultivating land-holders or on the initiative of the Department of Agriculture, in order to find out the percentage of slope of the area and prepare plans for land

development. Survey maps are supplied free of cost to the farmers. The area covered under this survey in 1968-69 was 38,225 acres.

The land development work which is at present concentrated in the irrigated tracts of the five taluks of Sindhanur, Raichur, Manvi, Gangavati and Koppal, is further accelerated by bringing them under the Intensive Agricultural District Programme, a joint venture of the Central and the State Governments. The physical nature of the terrain, the idea of extending the benefits of canal water to as large an area as possible, economising the use of water without much wastage and the sluggishness on the part of the cultivators in making use of the canal water, prompted the Department of Agriculture and the Tungabhadra Board to speed up the work of levelling the lands on an intensive scale in order to make the land fit for irrigation. The year-wise progress of land development under the Left Bank Canal in Raichur district, from 1955-56 to 1968-69, is presented in the statement given below :—

<i>Year</i>	<i>Land developed by the Departmental tractors (in acres)</i>	<i>Land development by the Departmental bulldozers (No. of hours worked)</i>	<i>Area levelled by other means (in acres)</i>
1955-56	2,484	1,500	..
1956-57	5,802	3,453	..
1957-58	3,450	7,000	..
1958-59	752	1,643	..
1959-60	254	1,530	..
1960-61	1,132	1,315	..
1961-62	..	..	..
1962-63	201	983	1,500
1963-64	..	..	3,355
1964-65	..	486	10,356
1965-66	891	1,097	43,099
1966-67	1,260	1,934	21,039
1967-68	2,821	6,256	16,191
1968-69	2,585	1,918	22,357

The total area developed by the Departmental tractors and by other means is 1,39,073 acres, which is about 19.5 per cent of the area irrigated under all sources in the district and about 30 per cent of the total irrigable area of 5,80,000 acres under the Left Bank Canal. According to the figures furnished by the Deputy Administrator, Tungabhadra Project, a total area of 1,75,801 acres of land has so far been intensively developed in the ayacut area, which is about 31.7 per cent of the total irrigable area under the Left Bank Canal.

One of the most important factors responsible for the slow progress in respect of land development is the limited self-financing potential among the cultivators. Another factor is that those few cultivators, who can afford to take up the work by themselves, are rather reluctant to invest on it. As agriculture in the district has now begun to pay dividends, they are persuaded to invest money on land development. As to the first problem, the State Government are giving *taccavi* loans, on easy terms, to the cultivators. Specialised agencies like the Agricultural Refinance Corporation, Agro-Industries Corporation, National Co-operative Development Corporation and scheduled banks are also advancing loans for purchasing tractors and for getting their lands levelled.

Between 1963-64 and 1965-66, a sum of Rs. 7,67,000 was disbursed as *taccavi* loans in the district for land development. As this help was not adequate, the Agricultural Refinance Corporation stepped in to advance loans. This Corporation has sanctioned a scheme for developing two lakh acres of land in the ayacut area at a cost of Rs. 5,59,000 over a period of seven years commencing from 1966-67. The scale of finance depends upon the percentage of slope of the land and special items of work as detailed below :—

Sl. No.	Items	Rate of loan assistance per acre for	
		0-1 per cent slope	1-2 per cent slope
		Rs.	Rs.
1.	Earth work (rate at Rs. 4 per 100 C.ft.)	120	188
2.	Border bunds	..	..
3.	Smoothing of the surface	28	28
4.	Excavation of supply channels and waste water channels	5	5
5.	Drop and turnout gates	32	42
6.	Green manuring	50	50
	Total	235	313
		or	or
		230	310

In addition to Rs. 230 for lands with one per cent slope and Rs. 310 for 1—2 per cent slope per acre, a loan of Rs. 45 per acre is given for purposes of eradicating *Haryali* and Rs. 5 per acre for

clearing shrubs. The amount is distributed among the cultivators through primary land development banks located at taluk levels. Cultivators in compact areas of the two Land Development Societies are persuaded to credit the loan amounts into the respective societies in order to get their lands levelled, so that the loan amounts are not utilised for purposes other than levelling of lands.

During the period between the beginning of 1966-67 and the end of May 1969, the Corporation disbursed a sum of Rs. 1,26,96,938 as against the target of Rs. 2,06,84,750 and an area of 29,800 acres and 29 guntas was developed. The details of the physical and financial progress made by the Agricultural Refinance Corporation from the inception of the scheme to the end of May 1969 in this district is presented in the following statement :—

<i>Particulars</i>	<i>Acres Guntas</i>
<i>Targets :</i>	
(a) Coverage of area ..	70,500—00
(b) Amount ..	Rs. 2,06,84,750
<i>Sanction :</i>	
(a) Coverage of area ..	72,634—33
(b) Amount ..	Rs. 1,71,84,909
<i>Disbursement :</i>	
(a) Coverage of area ..	65,646—23
(b) Amount ..	Rs. 1,26,96,938
<i>Physical achievement :</i>	.. 29,800—29

The total area developed upto the end of May 1969 was only 29,800 acres and 29 guntas, which constituted about 42.2 per cent of the total targetted area of 70,500 acres for the above three years, and about 14.9 per cent of the total area of two lakh acres proposed to be covered by the scheme. However, the progress under the scheme is gradually gaining momentum.

Soil erosion

Soil erosion may be due to abrading and corrosive action of currents of water, winds, etc. In Raichur district, water plays the major role in erosion process which takes away much of the soil fertility. Contour-bunding on catchment basis has been one of the ancient practices followed in the district in checking

soil erosion. The area bunded from 1965-66 to the end of June 1969 was as follows :—

Year	Total area bunded	
	Acres	Guntas
1965-66	585	— 21
1966-67	4,655	— 39
1967-68	9,422	— 14
1968-69	22,556	— 28
1969-70 (upto June)	1,973	— 08
Total	39,193	— 30

The work of contour-bunding is, mostly, taken up under tank, well and lift irrigation schemes for irrigating dry crops under light irrigation.

In order to bring more and more area under cultivation, the Government took up a survey of waste lands in Raichur district also, as in other contiguous districts of the State, during the Third Five-Year Plan period. Out of the total area of 2,82,550 acres of waste land in the district, an extent of 11,832 acres has been covered under the survey work and 11,141 acres and 21 guntas, which are fit for cultivation, have been classified under four grades for purposes of reclamation. The process of reclamation of these waste lands like clearing the jungle, removing the boulders, levelling and bunding the lands, etc., has involved certain expenditure on the part of the cultivators and the Government is helping them in this regard to an extent of Rs. 50 per acre or 25 per cent of the total cost, whichever is less, as subsidy. So far, an area of 598 acres and 25 guntas of waste land has been brought under cultivation. During the period from 1961-62 to the end of 1965-66, the fresh area brought under cultivation was 1,15,457 acres and during the same period, an area of 8,883 acres of land was distributed among 1,553 landless persons.

It is estimated that an area of 32,805 acres of land has gone out of cultivation due to salinity, alkalinity, acidity and water-logging during the period from 1961-62 to 1965-66. The taluk-wise break-up of the area gone out of cultivation, during the above period, is as follows :—

Sl. No.	Name of Taluk	Area gone out of cultivation due to				Total area
		Salinity	Alkalinity	Acidity	Water-logging	
(in acres and guntas)						
1.	Deodurg ..	302-00	194-28	..	15-00	591-28
2.	Gangavati ..	2,395-00	2,319-00	..	319-00	5,033-00
3.	Koppal ..	120-00	15-00	..	135-00	270-00
4.	Kushtagi ..	753-20	127-20	..	130-07	1,011-07
5.	Lingsugur ..	51-39	446-21	..	29-12	527-32
6.	Manvi ..	..	1,188-30	..	568-11	1,757-01
7.	Raichur ..	10,016-12	9,105-16	20-11	2,528-15	21,670-14
8.	Sindhaur ..	329-00	624-20	..	197-00	1,180-20
9.	Yelburga ..	137-24	92-21	..	..	233-05
Total ..		14,137-14	14,596-17	20-11	3,816-17	32,805-19

It can be seen from the above table that the total area gone out of cultivation owing to salinity and alkalinity and water-logging in the district is 32,805-19 acres, constituting about 11.1 per cent of the total area of waste land, while Raichur taluk, the worst affected taluk in the district, accounted for 7.6 per cent and the badly affected taluks of Gangavati, Manvi and Sindhaur accounted for about three per cent to the total area of waste land.

Reclamation Scheme

Reclamation of saline land has been taken up by having a net-work of deep cuts to the slopes of the lands and by leaches. The Department of Agriculture has advised the farmers to grow salt-tolerant crops like paddy, sugarcane, castor, etc., which help a gradual reduction of salt concentration in the affected lands. On some lands, where alkaline reaction is large, gypsum is added to the soil followed by flushing with good quantity of water. Use of acid forming chemicals such as sulphur is also practised for neutralising the effects of salinity. The area reclaimed from 1966-67 to 1968-69 was only 119.17 acres which was rather negligible when compared to the total area gone out of cultivation on this account. This problem is seriously engaging the attention of the Department of Agriculture. The scheme for reclamation of acid and alkaline soils has been in operation in the district of Raichur since May 1964. The main purpose of this scheme is to reclaim such soils by using chemicals, opening good drainages, breaking the hard clods of black cotton soils and creating easy way for percolation of water and lastly by recommending salt-resistant crops to be grown on such affected lands. In 1968-69, an area of 545 acres was reclaimed as against the target of 200 acres. Reclamation of lands was also taken up by individual farmers out of their own resources. In such cases, a subsidy is given to them as an incentive measure. In 1968-69, an amount

of about Rs. 14,700 was distributed as subsidy for reclaiming 401 acres of land.

The success or failure of farming is dependent, to a large extent, on the prevailing weather conditions and their influence begins with the preparatory tillage and continues to prevail throughout the crop-growing period. A proper knowledge of the relation between crops and weather-risks the farmers face at successive stages of plant growth, is necessary for profitable farming. The climate of Raichur may be described as essentially a tropical monsoon-type and is characterised by dryness for the major part of the year. The district as a whole lies in low rainfall area, the average rainfall being only 23.68" and September being the month of peak rainfall. The intensity of the mean annual rainfall is greater in the east and north-east than in the west. The district receives 71 per cent of its annual rainfall during the south-west monsoon period. Yelburga and Kushtagi taluks get better rainfall when compared with other taluks. The following statement gives the average monthly rainfall in the district in millimetres :—

**Agricultural
meteorology**

<i>Month</i>	<i>Rainfall</i>
January	2.9
February	3.5
March	5.4
April	16.6
May	35.3
June	82.2
July	89.6
August	106.3
September	138.2
October	71.4
November	25.1
December	2.8

(For more details in respect of rainfall, see also Chapter I).

The following four seasons recognised by climatologists are also applicable to this district :—

**Agricultural
seasons**

- (1) Cold-weather period (January to February).
- (2) Hot-weather period (March to May).
- (3) South-west monsoon period (June to September).
- (4) North-east monsoon period (October to December).

The cold season commences by the beginning of December and lasts till the middle of February, December being the coldest month. It is a suitable period for sowing summer crops.

Farmers are usually busy during this period also in marketing their produce, harvested in the previous months. The hot season begins by about the middle of February and continues till the onset of the south-west monsoon, May being the hottest month. The farmers start sowing operations for Khariff crops during this period. The period between June and September is recognised as the south-west monsoon period, though there may be deviations on either side, owing to changes in conditions of pressures and wind directions. During this period, the district gets widespread rainfall resulting in the main peak formations in September and a subsidiary one in July. For agricultural operations, this period is very important except in places where double cropping is practised supplemented by additional water. The work of preparing the land for Rabi crops is started just prior to the commencement of rains. There is practically no rain during the north-east monsoon season; but it helps the growth of Rabi crops like white jowar, cotton, etc.

Sufficient rainfall for the normal crop is generally expected only once in three to four years. Most of the precipitation is during the fag end of the rainy season.

Based on the above seasonal conditions, the district has three distinct seasons which are also based on the crops grown, *viz.*,

- (1) Khariff season, which starts from June and ends in the month of August;
- (2) Cotton season, which starts by about the middle of August and lasts up to the end of March;
- (3) Rabi season, which commences from the middle of October and ends in November; and
- (4) Summer season, which starts from about December or January and goes up to the end of April.

The lands for Khariff sowing will generally be ready by the end of May or the beginning of June and those for Rabi sowing by the end of July or the beginning of August. Agricultural operations go on till about August-September in the case of Khariff crops and November-December in the case of Rabi crops.

Soil types

The predominant soils of Raichur district are black cotton soils and red soils, popularly known as 'Regadas' and 'Chalkas' or 'Masabs' respectively. A large part of the district is covered with black cotton soils. 'Chalkas' or 'Masabs' are exclusively utilised for Khariff crops since they are easily workable even after heavy rains in view of the friable nature of the soil. The deep 'Chalkas' appearing from six to eight inches in thickness are suited to all kinds of irrigated crops, including sugarcane. The shallow 'Chalkas' are found from six to 18 inches in thickness and

are also suitable for wet cultivation. But shallow 'Chalkas' are not as productive as deep 'Chalkas'. If deep 'Chalkas' are found to a lesser extent, shallow 'Chalkas' are found in quite a large area. Gravelly to stony 'Chalkas', varying from three to four inches, are not used for any type of cultivation. They are not suitable even for raising pastures without proper manuring and tillage, but are mostly planted with oilseeds.

Black cotton soils are commonly used for raising Rabi crops, *i.e.*, crops planted in cold season about the fag end of the rainy season, and are rarely used for Khariff crops on account of their plastic and sticky nature when wet. Grey to grey loams to clay loams are found extensively in Sindhanur and Manvi taluks and only to a limited extent in other taluks. Grey to dark grey black cotton soils are found distributed over all the taluks. Chocolate brown to chocolate red soils, mostly appearing as loams up to two feet or more, are well-drained and suitable for Khariff crops as well.

The red soils are generally poor in plant nutrients as they are ordinarily developed under severe leaching conditions. On the contrary, black cotton soils possess high nutrient reserves of basic elements, especially of calcium, magnesium, soda, etc., as they are formed under accumulative conditions. They contain large quantities of water soluble salts and they are very calcareous, with their phosphorous values at 8.5 and above in the surface layers. The red soils in the district, though generally calcareous, are not free from lime, especially in the lower depths. Their phosphorous values are between 7.0 and 7.5 in the surface layers.

The 'Chalka' lands are generally preferred for wet cultivation and the dry 'Chalka' or 'Masab' lands are also valued at par with black soils. Black cotton soils, especially deeper ones, are used for Rabi crops. Once manured, black cotton soils would respond for four to five years, while 'Chalka' lands require frequent manuring. Red soils, on account of their lighter texture, are open and porous and allow excess water to pass through quickly and drain away, carrying insoluble plant nutrients. In addition to it, their clayey quality is low for moisture retention. Hence, the red soils need frequent irrigation or rains for successful plant growth. However, the moisture-holding capacity of the red soils may be improved by constant application of bulky organic manures. The red soils require lesser quantity of water for effective crop growth than black cotton soils which need heavy irrigation. Root and tuber crops like potato and sweet potato, vegetables like radish, and crops like ginger, turmeric, etc., need lighter textured red soils, whereas heavy textured black cotton soils are suitable for other kinds of crops. In order to maintain optimum physical

properties of the soils for a good crop growth, red soils are ordinarily preferred to black soils, provided the plant food and moisture status of the soils are properly maintained.

In the light of the difficulties faced by the farmers and with a view to developing cropping patterns under light irrigation for black cotton soils of the Tungabhadra Project area in Raichur district, a study team was constituted by the Director of Research, University of Agricultural Sciences, Bangalore, in 1967. This team, considering the recommendations of an expert committee on the same subject, which submitted its report in 1955, and other aspects, has classified the soils into the following grades for purposes of localisation of crops :—

Grade I.—‘Chalka’ soils or ‘Masab’ red loams, silt loams, etc. These soils are well suited for heavy irrigation. Red loams in deep phases have been recommended for perennial gardens.

Grade II.—Black soils varying in depth from 18 inches to 36 inches underlaid by murrum. These soils are suitable for crops like sugarcane and light irrigated Rabi crops because of their high moisture retentive power.

Grade III.—Shallow black cotton soils of six inches to 18 inches in depth. This kind of soil is generally excluded from irrigation, but sometimes recommended only for protective irrigation. Brown loam soil is recommended for garden crops, both seasonal and perennial, because of its loamy, friable texture and free drainage.

Grade IV.—Eroded, undulated, skeletal and very shallow soils of less than six inches in depth. These soils are excluded from irrigation, but recommended for afforestation.

Research is being carried on in the field of soil analysis. Several problems relating to soil management are being tackled by the Regional Research Station, Raichur, where investigations on entomology and soil science are being done. There is a soil-testing laboratory at Dhadesugur where soil samples are being analysed, at the rate of 75 samples per day and about 1,500 samples per year, for the benefit of the cultivators. The soil analysis reports and recommendations are passed on to the agriculturists and follow-up programme of such recommendations is also envisaged. An Agricultural Engineering Institute has been also started at Raichur.

Forests

Forests are, undoubtedly, one of the main basic factors which can contribute towards the wealth of a district. But Raichur district, being wholly in the *maidan* region, is poor in point of forests. Forests are mainly confined to the taluks of Manvi,

Lingsugur and Deodurg, with only scattered and isolated areas in the Kushtagi and Raichur taluks. In Sindhanur and Yelburga taluks, there are no forests at all. The total area under forests in 1968-69 was 1,63,103 acres and 26 guntas as against 1,64,409 acres and 91 guntas in 1961-62, which constituted about 4.24 per cent of the geographical area of the district.

The break-up of the forest area in the district, in 1967-68, was as follows :—

Forest area declared under Section 19 of Mysore Forest Act.	46,746.41 acres
Forest area declared under Section 4 of Mysore Forest Act.	46,049.21 „
Protected forests	453.00 „
Unclassified forests	69,855.55 „
Total forest area	1,63,104.17 „

An area of 12,500 acres has been released from the Revenue Department to the Forest Department, in 1968-69. Similarly, the lands fit for agricultural purposes (*i.e.*, 1,306 acres and 29 guntas) have been handed over to the Agricultural Department during the same year.

The forests in the district consist mostly of deciduous trees and scrubs. About 20,000 acres of forest area are under mixed deciduous trees. Thus, the forest potential is poor and the exploitation of this potential is almost limited to the extraction of firewood from dry mixed deciduous forests under a system called "coppice system".

There are no forest areas under private management in the district. There were, in all, 23 plantations in the district upto the end of 1964-65, of which the Hirebergi plantation, Hanamsagar plantation, Munirabad (Tungabhadra Project) plantation and Guntagale plantation were having an area of more than 1,000 acres each. Afforestation work, all along the slopes on either side of the Left Bank Canal bunds, for a distance of 54 miles, had been taken up. A pit plantation, of an area of 195 acres, is located at Hanamsagar and Yergera. During 1965-66, five new plantations were started and in 1968-69, nine more were added, mostly in the ayacut area.

The main forest produce obtained in the forest area of the district is firewood, minor forest produce and miscellaneous trees. The minor forest produce consists of *tarwad* bark, beedi leaves, rousa grass, sharifa or *sitaphal*, honey, soapnut and tamarind.

The revenue realised from the sale of the forest produce, in 1957-58, was only Rs. 63,968. As a result of the increasing attention being paid for conserving and improving the vegetation, the revenue has been raised to Rs. 16,048.05 from firewood, Rs. 14,325.54 from miscellaneous items and Rs. 51,604.85 from minor forest produce, thus making a total of Rs. 81,978.44 in the year 1968-69.

There has not been any large-scale forest-based industry in the district. The light varieties of wood like the *palaku* and the *peddaman* have been made use of by the toy-making industry at Kinhal in Koppal taluk.

A fuel plantation scheme is being implemented in this district for purposes of raising fuel-wood species for the supply of fuel. About 500 acres of plantation is being raised under this scheme.

Soil con- servation

The main purpose of the soil conservation scheme is to check erosion in general and to conserve moisture. Bare and eroded slopes are planted with local and exotic species of trees to check further soil erosion. Gully plugging, bunding and such other works are also taken up. Annually, about one hundred acres are covered under this scheme.

Under a minor forest produce scheme, a hundred-acre plantation is raised annually. Agave plant, a valuable minor forest produce, is planted all along the borders of the plantation.

Foreshore afforestation in the Tungabhadra Project water-spread area has been taken up as a measure to prevent further siltation in the reservoir. The progress of afforestation work in the ayacut area was as follows :—

Year	No. of trenches dug	Planta- tions maintained (in acres)	Foreshore planta- tion	No. of seedlings supplied
1955-56	70	..	..	..
1956-57	150	..	..	..
1957-58	300	..	..	..
1958-59	524	714	..	..
1959-60	600	968	50	..
1960-61	600	537	50	..
1961-62	300	2,102	70	..
1962-63	200	200	140	3,50,000
1963-64	..	..	..	..
1964-65	..	1,790	..	16,000
1965-66	..	..	..	1,70,003
1966-67	..	8	..	..
1967-68	..	8	..	..
1968-69	..	8	..	..

There are five units of nurseries, two at Odderhatti and three at Munirabad, where seedlings are raised and supplied to the public.

The thirsty black cotton soils of the Raichur doab region gaped wide at the baking sun of May, the weary farmer cast his vain look on the idle plough, the dumb animals hung their heads low, as the famine loomed large over the entire region, which might have been caused by the mighty armies of lusty kings shedding the blood of the innocent and devastating the land or the rain-bearing winds receding to the remote corners leaving the standing crops at the grip of the burning sun or only the light showers drenching the outer layer of the soil to leave the seeds or seedlings only to be dried up by the hot sun. The damage caused to the standing crops by hails, locusts, rats, insect pests, diseases, etc., was never felt so seriously as that caused by famine conditions.

**Famines and
scarcity
conditions**

The available records, dating from 14th century, or even earlier, depict vividly the horrors of famine which swept over the district at frequent intervals, leaving a large area barren and taking a heavy toll of human and cattle population. It would do well to quote a few lines from the Badshahnama, written in about 1630 by Abdul Hamid: he says: * "Life was offered for a leaf, but none would buy For a long time, dog's flesh was sold for goat's flesh and the pounded bones of the dead were mixed with flour and sold. Men deserted their wives and children. Women sold themselves as slaves. Mothers sold their children, and some families took poison, others threw themselves into the rivers. Destitution at last reached such a pitch that men began to devour each other and the flesh of a son was preferred to his love. In the streets and still more on the road journeys, men ran great danger of being murdered and eaten".

In the 1472 famine, according to Ferishta: "The towns became almost depopulated, many of the inhabitants died of famine and numbers emigrated for food outside the dominions. In Talingana, Marathwara and throughout the Bahmani dominions, no grain was sown for two years and in the 3rd, when the Almighty showered His mercy upon the earth, scarcely any farmer had remained in the country to cultivate the land." In 1659, Raichur and other parts of the Hyderabad State suffered from a severe famine. The "Dogi Bara" or the skull-famine, known for the appalling number of human beings that perished in all the taluks of the district in 1792-93, left the lands barren and desolate. A large number of people emigrated to the neighbouring districts. Jowar was sold at 2½ seers a rupee. In 1802-03, when the locally called "Ragi Bara" occurred, people,

* Statistical Year Book for 1941-42 to 1944-45 (p. 1049), Government of Hyderabad, 1949.

being unable to bear the brunt of famine, migrated to the Bombay presidency areas. Jowar was sold at three seers a rupee. Another famine, more severe and intense than that of the previous years, broke out in 1804 owing to drought and the Holkar's raid. Thousands of people perished for want of drinking water. Marauders increased the sufferings of the famine-affected people by plundering their property and killing those who opposed them. In 1819, again famine broke out. Cholera added its share to it and multiplied the sufferings. Carrots were largely grown under well irrigation for food, and the famine is still remembered as the "Gajara Kal" or carrot famine. Charity houses were opened and cooked food was distributed among the poor; one seer of jowar per head per day was distributed among the better classes. Again, in 1833, the farmers were thoroughly disappointed by the monsoon winds and the people had to face also the scourge of cholera. Being unable to bear the brunt of famine, thousands of persons emigrated. Many parents sold their children for food and many people ate leaves like animals to quench their burning hunger. Two outstanding measures then introduced by the then Government were the opening of poor houses and the fixation of prices for food-grains by the local authorities. After a lapse of thirteen years, another famine removed a great number of cattle and almost wiped off the fowls. Then again, there was a wide-spread famine of great intensity throughout Southern India which lasted for about two years from October 1876 to July 1878, during which period Raichur got less than 2.41 inches of rainfall. Then gold was sold at the rate of Rs. six to seven per tola. During the same period, a Central Relief Committee was appointed and Special Commissioners were nominated.

The famine in 1896-98, caused by irregular rainfall, was not so severe and it affected Gangavati, Kushtagi, Lingsugur, Sindhanur and Raichur taluks only, leaving the other five taluks almost unaffected. The sudden rise in prices of food-grains left the farmers helpless as their limited resource was drained completely. The Government opened cheap grainshops for a limited period of two to five months, started poor houses and distributed grains to the poor and disabled and clothings to *purdah* women. In the drought of 1905 an army of swarms of locusts destroyed the standing crops and gardens in Deodurg, Manvi, Sindhanur and Lingsugur taluks of the district.

In 1941, rats affected the crops in Raichur, Lingsugur, Manvi and Sindhanur taluks of the district to such an extent that the then Government was forced to take up a special preventive measure at a cost of Rs. 10,000. The Khariff harvest of 1943 failed in 640 out of 832 villages in Lingsugur, Gangavati, Manvi, Sindhanur and Kushtagi taluks and the condition of Rabi crop was even worse. The Government sanctioned a remission of all

arrears in excess of one year's demand and relief works like deepening and silt clearing of wells, distribution of seeds, import of foodgrains from other districts, gratuitous relief and milk rotation to children, etc., were taken up. On account of the failures of Khariff and Rabi crops in Kushtagi, Gangavati, Sindhanur and Manvi taluks in 1945, the then Government declared scarcity conditions in all these taluks and relief was given to the suffering people. The years 1946, 1947 and 1950 were fairly normal, but the year 1951 was again a period of distress. The failure of crops was repeated in 1956 and 1957. Scarcity conditions prevailed in one taluk or the other in the district between 1957-58 and 1968-69. Its effect was felt all over the district in 1957-58. The taluks of Manvi, Lingsugur, Sindhanur and Gangavati were hit hard continuously for a period of three years from 1958-59 to 1961-62. Untimely rainfall was the main reason for such scarcity conditions. The year 1962-63 was, however, free from distress. In 1964-65, Yelburga taluk suffered much from the untimely rainfall. From 1965 to 1968, the Kushtagi, Koppal, Gangavati and Yelburga taluks did not receive sufficient rains for carrying on agricultural operations. The State Government undertook several famine relief measures to lessen the hardships of the people. In 1968-69, 748 villages with a population of 5,99,450 persons were affected by the famine. The Government, therefore, suspended land revenue to a tune of Rs. 4,91,766.78 in parts of Manvi, Kushtagi, Koppal and Gangavati taluks and remission to a tune of Rs. 5,39,227.37 was proposed in parts of the taluks of Yelburga, Gangavati, Sindhanur, Kushtagi and Raichur. In addition, a sum of Rs. 31,93,166.24 was spent towards relief works like construction of roads, digging of irrigation wells, repairs to the existing wells, deepening of drinking water wells, soil conservation works, etc. Milo worth Rs. 2,23,995 and fodder valued at about Rs. 5,910 were also distributed free among the people of the affected areas.

The placid waters of the Tunghabhadra flowed down her course, bordering the southern parts of the district regardless of the hue and cry in the district created as a result of distress conditions; but in 1924 she came in floods without, however, causing much damage to life or property. In 1934, the crops were badly damaged in Sindhanur taluk owing to hail storm. After ten years, Kushtagi taluk felt the pinch of scarcity of jowar due to heavy rains and this famine was popularly called "Sajji Bara" and during this period people used bajra in place of jowar. Heavy rains as a result of cyclone and plague in a deadly epidemic form, played havoc in 1949. While Sindhanur suffered much from the outbreak of plague and Lingsugur from cyclone, the Kushtagi, Manvi and Yelburga taluks were hit hard by heavy rains. In Kushtagi taluk, the rains lasted for 20 days and 70 per cent of ordinary houses collapsed. In Manvi and Yelburga taluks, the heavy rains brought down a number of

houses. This famine is still remembered as "Swati Bara". In 1950-51, a number of houses collapsed in many villages of Sindhanur taluk and the Government helped the sufferers by giving cyclone *taccavi* loans. Heavy rains followed by hailstorms destroyed the Rabi crops in Kallur and nearby villages of Manvi taluk in 1954, injuring a number of agriculturists who were picking cotton in their fields. The land revenue to a tune of Rs. 21,250 was suspended as a relief measure. In 1960-61, the flooded Tungabhadra flowed wild destroying 44 houses in Manvi taluk and 369 acres and 12 guntas of standing crops touching the borders of the Gangavati taluk. The Government sanctioned a flat rate of Rs. 40 to be paid to each family whose house was damaged by the floods, followed by distribution of grains and clothes worth about Rs. 720 supplied by the Red Cross Society. Liberal financial assistance, amounting to Rs. 5,000, was given to persons whose crops were affected by floods. In order to give permanent relief to the worst affected villages of Chikalparvi and Yadwal in Manvi taluk, the inhabitants were rehabilitated in safer places. By the end of 1960-61, a sum of Rs. 1,00,000 was spent for purposes of rehabilitating these people.

Considering the irrigation potential so far created under different sources, which works out to nearly 7,11,379 acres and the proposed Narayanapur Right Bank Canal under the Upper Krishna Project, which would irrigate another five lakh acres, it can be said that a new chapter has been opened in the agricultural history of the district which has been, thereby, put well on the way to prosperity.

IRRIGATION

The meagre and mostly unreliable rainfall of the district, resulting in frequent visitations of droughts and famines, had obviously set a serious limit to the progress of agriculture, and this was continuously hindering the economic well-being of the district. The age-old practice of an artificial application of water to soil for the purpose of supplying moisture essential to the plant growth had been realised, to some extent, by the rulers in the by-gone days also and the famous Vijayanagara channels were of considerable benefit to the agriculturists of the region. The importance of conservation, control and utilisation of the waters flowing down the perennial rivers, the Tungabhadra and the Krishna, and several other small streams of the district, is indeed great and the inhabitants of Raichur district owe a deep debt of gratitude to the originators of the Tungabhadra Project.

Exclusive of the area that was brought under irrigation by the Tungabhadra Left Bank Canal and the Rajolibanda Diversion Scheme, the total area under irrigation in Raichur district in 1957-58 was only about 30,000 acres, of which about 9,700 acres

were irrigated by Government canals, about 10,600 acres by tanks, about 4,000 acres by wells and the rest by other sources.

The total irrigated area, including the area that was brought under irrigation by the Tungabhadra Left Bank Canal and Rajolibanda Diversion Scheme, increased from 1,40,116 acres in 1962-63 to 4,89,421 acres in 1966-67. The taluk-wise distribution of the area irrigated under different sources for 1962-63 and 1966-67 is presented below :—

1962-63

(In Acres)

Sl. No.	Taluk	Canals	Tanks	Wells	Other sources	Total
1.	Deodurg	..	690	..	..	690
2.	Gangavati	42,691	51	24	126	42,892
3.	Koppal	4,637	141	285	150	5,232
4.	Kushtagi	..	..	..	..	..
5.	Lingsugur	..	..	55	4	59
6.	Manvi	815	80	..	..	895
7.	Raichur	4,610	12,797	2,246	977	20,630
8.	Sindhanur	67,590	70	974	447	69,081
9.	Yelburga	..	71	335	231	637
Total		1,20,363	13,899	3,919	1,935	1,40,116

1966-67

(In Acres)

Sl. No.	Taluk	Canals	Tanks	Wells	Other sources	Total
1.	Deodurg	..	959	660	..	1,619
2.	Gangavati	77,083	271	78	630	78,062
3.	Koppal	4,702	148	285	150	5,285
4.	Kushtagi	..	158	1,354	..	1,512
5.	Lingsugur	..	55	4	..	59
6.	Manvi	2,27,536	80	858	..	2,28,474
7.	Raichur	4,610	13,872	2,246	..	20,728
8.	Sindhanur	1,51,620	70	974	437	1,53,101
9.	Yelburga	..	114	350	117	581
Total		4,63,551	15,727	6,899	1,334	4,89,421

Among the taluks having the benefits of canal irrigation, Manvi taluk has the first place and Sindhanur takes the second place. As at present, only five taluks of the district are benefited by canal irrigation, viz., Manvi, Sindhanur, Gangavati, Koppal and Raichur. As per the figures furnished by the Deputy Director of Agriculture, Raichur, the total cropped area in the district in 1967-68 was 26,16,773 acres, of which 19,65,394 acres

were under rainfed conditions and 5,80,000 acres under the Tungabhadra Left Bank Canal and 1,31,379 acres under various other sources of irrigation. Obviously, therefore, the bulk of agricultural production in the district consisting of cereals, pulses, cotton, groundnut and other oilseeds depended on the vagaries of the monsoon. With a very low average of rainfall, which is itself rather erratic in nature, there was always the threat of famine looming before the agriculturists.

**Irrigation
wells**

The total number of irrigation wells in the district is placed at about 6,000 to 7,000 and the area covered by them in 1968-69 was about 1,07,500 acres as against the target of two lakh acres. The agency which executes the work of construction of irrigation wells is, ordinarily, the Taluk Development Boards of the respective taluks. They take up the work of construction of wells under community development programme and scarcity relief works. The total number of works taken up by the different community development blocks in the district for sinking wells was 1,871 in 1967-68, of which 937 wells were completed and the rest were in progress. A large number of such wells was being sunk in Yelburga taluk. The following two tables present the number of wells sunk under the community development programme and under the liberalised rules, respectively, since the inception of the schemes to the end of March 1969 :—

Under Community Development Programme

<i>Sl. No.</i>	<i>Taluk/Block</i>	<i>No. of wells sanctioned since inception</i>	<i>No. of wells completed</i>	<i>No. of wells abandoned or cancelled</i>	<i>No. of wells in progress</i>
1	2	3	4	5	6
1.	Deodurg	198	195	..	..
2.	Kushtagi	251	161	60	3
3.	Koppal	277	218	..	..
4.	Gangavati	127	41	40	46
5.	Kavital	95	63	3	1
6.	Bevoor	117	62	18	37
7.	Lingsugur	128 71	67 39	59 29	.. 3
8.	Manvi	11	..	..	..
9.	Raichur	63	12	2	7
10.	Sindhanur	221	59	..	..
11.	Yelburga	312	120	45	147
Total ..		1,871	1,037	256	244

Under Liberalised Rules

<i>Sl. No.</i>	<i>Year</i>	<i>No. of wells at the beginning of the year</i>	<i>No. of wells sanctioned during the year</i>	<i>Total No. of wells taken up</i>	<i>Total No. of wells completed</i>	
1	2	3	4	5	6	
1.	1960-61	..	..	1,422	1,422	294
2.	1961-62	..	1,114	340	1,454	360
3.	1962-63	..	1,074	510	1,584	201
4.	1963-64	..	1,363	194	1,557	165
5.	1964-65	..	1,362	273	1,635	140
6.	1965-66	..	1,415	..	1,415	314
7.	1966-67	..	1,062	..	1,062	88
8.	1967-68	..	974	..	974	39
9.	1968-69	..	574	..	574	21

The total number of wells constructed both under the Community Development Programme and the Liberalised Rules up to the end of March 1969, was 6,600.

As the level of water in wells is far below the level of the fields, some devices of lifting water to the fields are necessary. Lifting of water is purely a mechanical job and the popular devices of lifting water from the wells to the fields for raising crops in the district are 'motes', persian wheels and water lifting engines. Mote is one of the most commonly practised methods of lifting water from the wells to the fields. It requires two pairs of bullocks to lift the water to the surface of the land by making each pair work alternatively. A pair is made to pull the burden down the mote till the bucket comes up to the top, during which time the other pair, which is not burdened with the yoke, returns to the spot in a circuitous way to bear the burden. The mote, made of leather, is of two sizes, one measuring about 10 feet from mouth to mouth and the other five to six feet. Another popular device followed in the district for lifting water is through the persian wheel. It consists of a large open soaked drum, two parallel loops of rope or chain joined by spacing bars and fifty metal containers. The chains with these containers are made to pass over a cog and as these metal containers pass over the top they spill their contents into the trough from where the water is carried on to the fields.

In 1966-67, there were 115 oil engines and 525 electric pumpsets in the district for irrigation purposes. For a long time, diesel water lifting pumpsets were in use. Electric pumpsets are now becoming more and more popular and are gradually replacing the diesel oil engines.

Tanks

Most of the tanks in the district are fed by rains received between the months of June and September. They are rarely full with water except in the case of a few minor tanks of importance. There are 900 serviceable tanks with an atchkat of 22,409 acres in the district. The following table shows the distribution of tanks in the district and the atchkat area covered by them in each taluk as in 1968-69 :—

Sl. No.	Taluk	Tanks having an atchkat of less than 50 acres		Tanks having an atchkat of more than 50 acres		Total No. of tanks and their atchkat	
		No.	Acres	No.	Acres	No.	Acres
1.	Deodurg	13	2,270	58	600	71	2,870
2.	Gangavati	6	150	10	5,142	16	5,292
3.	Kushtagi	..	..	4	921	4	921
4.	Koppal	7	211	4	718	11	929
5.	Lingsugur	3	287	6	137	9	424
6.	Manvi	7	1,742	47	600	54	2,342
7.	Raichur	39	3,421	690	5,900	729	9,321
8.	Sindhavani	..	..	1	118	1	118
9.	Yelburga	3	78	2	114	5	192
Total		78	8,159	822	14,250	900	22,409

Tank irrigation is mostly concentrated in Raichur, Manvi and Deodurg taluks. Raichur taluk alone has the largest number of tanks and the ayacut area it commands is more than 41.6 per cent of the total area under tank irrigation. The Public Works Department has completed nearly 220 new tank works costing more than 20,000 rupees each, at a total expenditure of Rs. 1,00,95,453 between 1956 and 1968.

Katapur tank

Katapur tank, near Katapur village in Gangavati taluk, is being constructed at an estimated cost of Rs. 23,96,000. It will, after completion, become one of the largest tanks in the district with a catchment area of 47.48 square miles. The construction work of the tank was taken up in the year 1964. The tank is so designed as to have a water discharge capacity of about 12,500 cusecs. It will irrigate an area of 1,600 acres.

Lakshmidivikere

The Lakshmidivikere at Kanakgiri, in Gangavati taluk, is a new tank constructed at a cost of Rs. 9,16,253. The construction of the tank was taken up as early as 1958 and completed in 1963. The tank is designed to have a water discharge capacity of about 9,030 cusecs. It has a catchment area of 66.36 square miles, irrigating an area of 1,500 acres.

Chittavadgi tank

The Chittavadgi tank, located near Kadur village in Kushtagi taluk, was completed at an estimated cost of Rs. 36 lakhs. It

is designed to hold about 201 million cubic feet of water and irrigate an area of 2,200 acres in Raichur district. It will also benefit a few acres in Hungund taluk of Bijapur district.

Lift Irrigation Schemes have also been under way in the district. In order to make the schemes popular, extension of power lines from main production centres has been taken up, wherever possible. The waters of the rivers in the district can be tapped for agricultural purposes through lift irrigation schemes also, and there are already eight such schemes in operation. The biggest among them is located at Hunkunti in Koppal taluk. This work was taken up at an estimated cost of Rs. 1,54,000, but it was subsequently revised to Rs. 4.20 lakhs. The water source for this scheme is the Tungabhadra reservoir. It is so designed as to lift water to a height of 75 feet and irrigate 1,200 acres, with a pumping capacity of 28.00 cusecs of water. The work was still in progress. Some other important lift irrigation schemes are located—one near Katarki village in Koppal taluk, irrigating about 1,000 acres and another at Amaravathi village in Deodurg taluk irrigating about 1,030 acres. The following table gives details of the important lift irrigation schemes in the district and the area benefited by each, as in 1968-69 :—

Lift Irrigation Schemes

<i>Sl. No.</i>	<i>Location</i>	<i>Estimated cost in lakhs of rupees</i>	<i>Water source</i>	<i>Ayacut area in acres</i>
1	2	3	4	5
1.	Tigari village, Koppal taluk ..	3.12	Tungabhadra Reservoir.	550
2.	Katarki village, Koppal taluk ..	4.00	do ..	1,900
3.	Mattur village, Koppal taluk ..	1.46	do ..	700
4.	Hunkunti village, Koppal taluk	4.20	do ..	1,200
5.	Raichur ..	0.70	Rajolibanda Diversion Scheme.	334
6.	Raichur ..	0.77	do ..	750
7.	Chinchonahalli ..	4.90	do ..	250
8.	Amarapur village, Deodurg taluk	0.87	do ..	1,032
Total ..		20.02		5,816

Out of this total ayacut area of 5,816 acres under the lift irrigation schemes, the actual area that will ultimately be benefited will be only 4,195 acres and of this, water is made available so far to an area of only 1,150 acres. Though the lift irrigation schemes on the Rajolibanda Diversion Scheme are almost completed, the ayacut area coming under them is yet to be developed.

There are no special schemes for localisation of crops under tank and well irrigation, but a considerable area under tank irrigation is covered with paddy crops. Farmers are induced to take up the cultivation of hybrid and short duration crops like hybrid jowar, bajra and hybrid maize, as they are mostly light irrigated crops.

The actual percentage of the area irrigated under minor irrigation works out roughly to 2.68. The total probable water potential of the district is of the order of 32,000 million cubic feet, calculated on an empirical basis. To utilise this water potential, 88 new feasible schemes have been proposed. Out of them, 35 minor irrigation works are already in progress which will, after completion, irrigate an area of 11,693 acres. When all the 88 schemes are completed, the district can, at the most, make use of 43 per cent of the available water yield.

Canal Irrigation

Canal irrigation was not widely known to the people of the district in the past till the days of the rulers of Vijayanagara empire, who took up the construction of a few canals which are now known as "Pre-Mughal Canals" or "Vijayanagara Canals" in order to counteract the effects of droughts and famines and to protect the people against the vagaries of the monsoon. However, it is only after taking up the two major projects, namely, the Tungabhadra Project and the Rajolibanda Diversion Scheme, that canal irrigation in the district has attained the present importance as a major source of irrigation.

There are six old Vijayanagara canals taking off on the left side of the Tungabhadra river in Raichur district, namely Hulgi Channel, Shivapur Channel, Anegundi Channel, Upper Gangavati Channel, Lower Gangavati Channel and Buchal Channel. The total area actually irrigated by these channels, including Koregal Channel, at the time of the re-organisation of States, was 10,701 acres. In order to provide regular flow of water into these channels, embankments just like masonry walls were thrown across the river Tungabhadra at certain places. The main purpose of constructing such embankments was to divert the river water into the channels that take off from one end of these anicuts for providing irrigation under their command, by raising the level of the water in the river by a few feet without actually involving considerable water-spread. These anicuts were built probably during the time of Krishnadevaraya and his successors between 1509 A.D. and 1560 A.D. They have been constructed with the locally available boulders placed one over the other and cleverly joined together and made into a sort of masonry wall across the river. These anicuts follow a zig-zag alignment and are joined to the several small islands that are found in the bed of the river. The boulders are sometimes cut into rectangular shapes and joined together with iron hooks so as to keep them

in position. The other details of three such important anicuts in the district are given below :—

Sl. No.	Details	Hulgi Channel	Shivapur Channel	Anegundi Channel
1	2	3	4	5
1.	Length in miles ..	7	9	12
2.	Discharge in cusecs ..	25	29.5	83
3.	No. of distributaries and field channels.	53	50	96
4.	Total area irrigated ..	655	997	2,220
5.	Width of the canal (in feet) ..	8	10	15
6.	Depth (in feet) ..	2.5	2.25	3.50
7.	Amount of remodelling estimate (in lakhs of rupees).	6.17	3.60	12.95

The total area irrigated under these three Vijayanagara channels is 3,872 acres. Sugarcane and paddy are the important crops generally grown under these channels. The farmers are being induced to grow also short duration paddy crops like IR-8, ADT-27, Hamsa, Padma, Jaya and Selection-28, etc.

There are two major irrigation projects in the district, namely the Rajolibanda Diversion Scheme and the Tungabhadra Project. The Rajolibanda Diversion Scheme, a joint venture of Mysore and Andhra Pradesh Governments, consists of an anicut of 2,690 feet long with flooded banks on either side across the Tungabhadra river near Rajolibanda village in Manvi taluk and a 72-mile long canal, which, after covering a length of 27 miles in Mysore State, enters Andhra Pradesh. The construction of the anicut was taken up in the year 1947 by the then Government of Hyderabad. It was completed in 1962 at an estimated cost of Rs. 433 lakhs and the water was allowed in the main canal during the same year creating an irrigational potential of 5,879 acres in this State. The anicut is a Ogee-shaped weir designed to discharge a maximum flood height of 12 feet. The maximum height of the anicut, above the deepest foundation is 31 feet. The canal head regulator consists of five vents of 6 feet by 7 feet with sill R.L. 1082.00. The anicut and canal works, including the construction of the distributaries from No. 1 to 12 falling within Mysore State limits, have been completed and water has been made available for an area of 5,772 acres. Construction of watercourses and field channels upto the last survey number has also been completed. However, the area so far developed is about 5,250 acres.

**Rajolibanda
Diversion
Scheme**

The maximum quantity of water that can be made use of by the Governments of Mysore and Andhra Pradesh from this scheme is only 17 T.M. Cft. Out of this, the share of the Mysore Government, at present, is only 1.15 T.M.Cft. and that of Andhra Pradesh 15.85 T.M.Cft. So the canal is designed for a discharge of 850 cusecs at the head point. The sharing of the discharged water between Mysore and Andhra Pradesh Governments is, at present, of the order of 80:770 cusecs. It is proposed to raise the existing banks of the canal so as to carry the maximum discharge of 850 cusecs at the head point. A revised estimate for the common portion of the canal from mile 0 to 27 is made at Rs. 250.94 lakhs. The twelve distributaries of the canal serve nearly fifteen villages of Raichur district, namely Hanumapur, Yedalapur, Bichal, Gillesugur, Tungabhadra, Bullapur, Gandhal, Chik-Manchal, Gundervalli, Budiinni, Malkapur, Mirzapur, Idapnur, Gangwar and Talmari. The distributary No. 5, which passes nearby the villages of Tungabhadra and Gillesugur, is the biggest distributary, irrigating 808 acres.

The gross command area of the canal upto 27 miles in the district is about 8,015 acres, of which 5,879 acres are localised for irrigation, the intensity of irrigation being 73 per cent. The entire area of 5,879 acres has been localised on the following pattern :—

1. Abi Paddy	..	1,600 acres
2. Tabi Paddy	..	500 acres
3. Light Irrigated crops	..	3,220 acres
4. Garden crops	..	559 acres
		<hr/>
Total	..	5,879 acres

A statement showing the village-wise and distributary-wise localised area under the Rajolibanda Diversion Scheme is appended at the end of the chapter.

Tungabhadra Project

Sir Arthur Cotton, who was called the "Irrigation Wizard of the South", drafted a report in 1860 on the possibilities of a Tungabhadra irrigation scheme, and later on, a note was prepared by Col. Smart which was submitted to the Indian Irrigation Commission in 1902. Consequent on the recommendations of the Ceded Districts Irrigation Committee, constituted in 1925, the prospect of evolving a joint venture under the Governments of Hyderabad and Madras became bright and it was at this stage that the negotiations started between the two Governments. A tentative agreement was arrived at in 1933 at a conference of Chief Engineers of both the States to share the available waters through the project and the scheme was accordingly revised in the same year. However, the project work could not be pushed through

for want of agreement among the Governments of Madras, Mysore and Hyderabad on outstanding questions, such as dependable flow, etc. After a conference of representatives of the Governments of Madras, Hyderabad, Bombay and Mysore, the Government of Madras approached the Government of India for the appointment of an Inter-State Commission which could take a decision on the equitable sharing of waters by the four Governments. Later on, during 1936, representatives of the Governments of Madras and Mysore met at a meeting and came to an agreement. In 1938, Madras and Hyderabad Governments conferred on the basic issues and arrived at an agreement for partial utilisation of the available supply of water to the extent of 50 T.M.Cft. each for new irrigation and 15 T.M.Cft. extra for Hyderabad for power generation which, after allowed into the river, could be utilised by Madras Government for new or old irrigation. The Government of Madras ordered a detailed investigation of the scheme in 1940. Based on the agreement mentioned above and the examination of a number of alternatives and investigations, two new schemes were proposed and agreed to by all the Governments.

In the month of June 1944, an agreement was reached between the Governments of Madras and Hyderabad. The following were the salient features of this agreement* :—

**InterState
agreements**

- (i) To start immediately a joint scheme between Hyderabad and Madras for a partial appropriation of Tungabhadra waters at Mallapuram, leaving all matters of absolute rights, claims and disputed points for future settlement.
- (ii) A partial utilisation of the available flow upto 65 T.M.Cft. on each side which included the supply for the existing and new irrigation, the assistance to the Kurnool—Cuddapah Canal and the Rajolibanda Canal, the latter being treated on equal status with the former.
- (iii) To have a dam constructed at Mallapuram to impound a sufficient quantity for a large eventual utilisation than now agreed to, and to share half the cost of such construction.
- (iv) The canal capacities on each side not to be restricted to utilise their respective share of 65 T.M.Cft. only; in designing them for high capacities, each Government taking their own risk.

*Tungabhadra Project, 1945-58, Tungabhadra Board, Bellary District, Mysore State.

- (v) The natural flow below Mallapuram to be divided half and half at the point of diversion of the Rajolibanda Canal, after making an extra allowance to the Rajolibanda Canal equivalent to the additional draw-off by the Madras pre-Mughal channels over the draw-off of pre-Mughal channels of Hyderabad.

Another agreement was arrived at between the Governments of Madras and Mysore during the month of July 1944. The important features of that agreement were as follows :—

- (i) Mysore to draw 57 T.M.Cft. for the Lakkavalli reservoir and a further quantity for power which would be restored to the river after development of power.
- (ii) 15 T.M.Cft. for the Tunga anicut extension.
- (iii) Mysore not to claim any share from the net available flows at Mallapuram after deducting the abstracts above the dam .

An Inter-State Conference was held at Bangalore on 18th June 1956, under the chairmanship of Shri V. T. Krishnamachari, the then Deputy Chairman of the Planning Commission. The important features of the agreement reached at this conference were :—

- (i) The waters of the High Level Canal to be shared in the ratio of 35:65 between the Governments of Mysore and Andhra Pradesh.
- (ii) The execution of the common works in respect of the High Level Canal scheme to be undertaken by the Tungabhadra Board and the Chief Engineer of the Board to take up immediately the planning and designing of the canal with such changes as may be required as a result of the sharing now agreed to.
- (iii) The cost of the common works of the canal to be shared generally on cusec mile basis.

Another Inter-State Conference was held on the 5th and 6th of October 1957 at the Tungabhadra Dam to consider certain outstanding issues relating to the Tungabhadra Project (right side). The salient features of the agreement entered into at that conference were as given below :—

- (i) Benefits under the Low Level Canal to be shared on the basis of water requirements of the areas localised in Andhra Pradesh and Mysore.
- (ii) Power benefits from both the stages of the project to be shared between Mysore and Andhra Pradesh in

the ratio of 1 : 3 until the first generating unit of the Sharavati Hydro-Electric Scheme is commissioned and thereafter 1 : 4.

- (iii) Liability on account of the headworks to be shared by Andhra Pradesh and Mysore for the time being in the proportion of the quantities of water stored for them for the Low Level Canal, subject to the proportion being readjusted as soon as the High Level Canal is sanctioned.
- (iv) Liability on account of the Power Canal to be shared by the two States in proportion to the quantities of water carried for them for purposes of irrigation under the Low Level Canal.
- (v) Assets attributable to headworks and Power Canal to be shared by Andhra Pradesh and Mysore in the same manner as liabilities.
- (vi) The Hydro-Electric Scheme to pay to the irrigation side of the project a contribution of Rs. 7.50 per k.w. year from the date of commissioning of the first unit for a period of five years and this rate to be reviewed at the end of that period.
- (vii) Assets and liabilities on account of both the stages of power development to be allocated between Andhra Pradesh and Mysore in the ratio in which benefits are shared by them.
- (viii) The public debt on account of the expenditure incurred on the project prior to the 1st October 1953 (both on the irrigation and the hydro-electric side) to be shared by Andhra Pradesh and Mysore in the same ratio as expenditure incurred after that date under the different heads (such as Headworks, Power Canal, Low Level Canal and Hydro-Electric Scheme) is shared by them.

The earlier two agreements (of 1944) mentioned above finally prepared the ground for the execution of the Tungabhadra Project. The scheme for the left side of the river provided a canal in Raichur district and development of power at the foot of the dam and at various drops along the canal. The project was officially commenced on 28th February 1945 as a joint venture of the Governments of Madras and Hyderabad. The construction of the dam and excavations of a part of the canal system were completed by 1953 and water was first made available for irrigation on 1st July 1953. The work was continued after 1st October 1953 by the three Governments of Andhra, Madras and Mysore. After the re-organisation of States in November 1956, it became the concern of the Governments of Andhra Pradesh and Mysore.

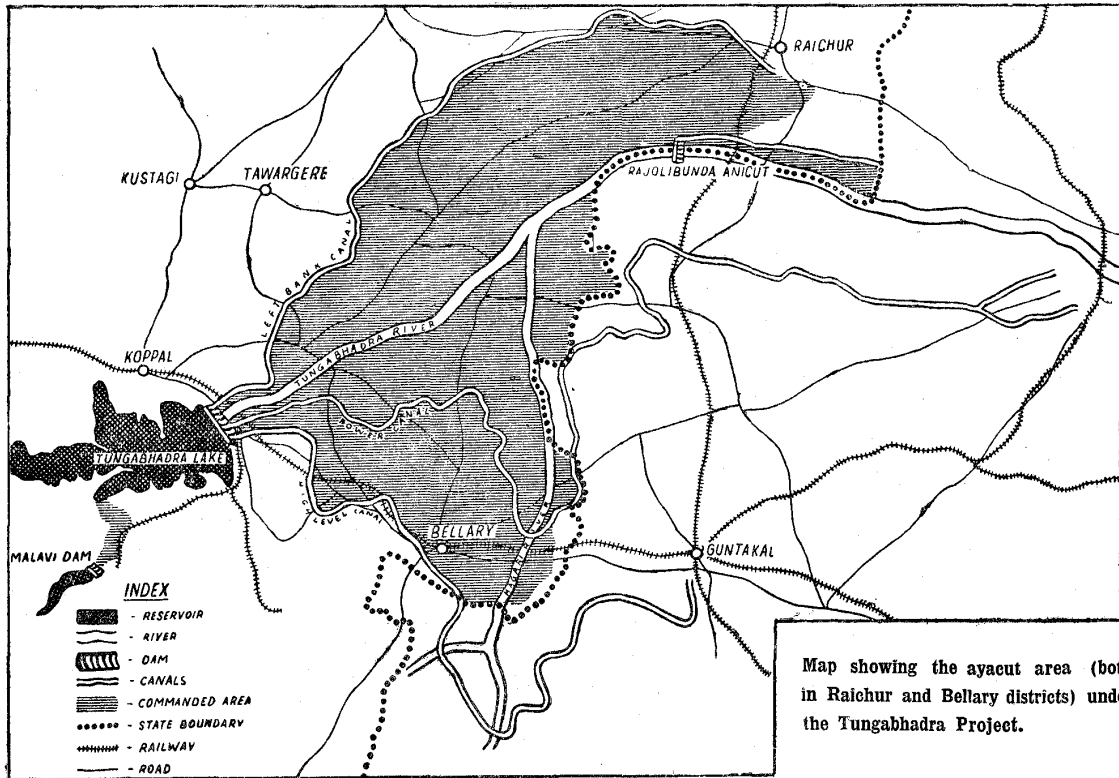
The project was started as a post-war development scheme and subsequently came under the purview of the successive Five Year Plans. It is basically a protective one, affording some protection to the badly affected famine regions, and the benefits are spread over as wide an area as possible for overcoming the vagaries of rainfall. The waters of the river Tungabhadra had been put to use for irrigation purposes by a number of diversions, but the Tungabhadra Reservoir has been the first major reservoir put into operation.

Salient features

The dam, across the river Tungabhadra, is situated at about 6 kms. from Hospet, a railway station on the Hubli-Guntkal rail link of the Southern Railway. The storage dam is of a medium-sized gravity, consisting of a main dam in masonry, 5,712 feet in length, an earthen dam of 500 feet long and a composite dam of 1,527 feet long, with a maximum height of 162 feet over the deepest foundations. The spill-way is designed for a maximum discharge of 6,50,000 cusecs and this is disposed off through 33 lift-type crust gates. There is a vast expanse of water-spread of over 146 square miles.

The catchment area of the reservoir is 10,880 square miles and this has resulted in the submergence of 39,180 acres of land in Raichur district alone, affecting 5,395 houses and 22,752 persons dwelling in 40 villages that were within the revenue limits of Koppal taluk.

The most important work entrusted to the development office of the Tungabhadra Project area in the First Plan period, was the rehabilitation of villages submerged in the water-spread. Out of 40 villages, 10 were completely submerged and the remaining were partially affected. The people of the completely submerged villages were induced to move into the ayacut area where they had better prospects. The amount of compensation sanctioned to lands and houses which were submerged, was arranged to be drawn upon gradually by the awardees for the purchase of new lands and for the construction of new houses. A co-operative store was also established to supply the building materials. Twenty-one rehabilitation centres were started on the foreshore for the re-settlement of the partially submerged villages. Houses, wells, internal roads, schools, community halls and places of religious worship were all provided. Five acres of Government land was given to each family free of cost. Lands were also acquired from surplus holders and allotted to the resettlers who wanted more land on payment of the cost. Free grants to the deserving families and *taccavi* loans for improvement of lands and house-building were also generously given. In addition to these 21 centres on the foreshore, 10 more centres were opened in the ayacut area. Thus, in all, 31 new villages sprang up and 18,000 resettlers were rehabilitated. The cost to



Map showing the ayacut area (both in Raichur and Bellary districts) under the Tungabhadra Project.

Government on this account was about Rs. 38 lakhs. The following statement gives details of the number of villages affected by the waterspread of the Tungabhadra reservoir and the area submerged in each village of Raichur district and new rehabilitation centres started in the ayacut area and on the foreshore :—

<i>Sl. No.</i>	<i>Name of village</i>	<i>Area affected, inclusive of Government land</i>	<i>Sl. No.</i>	<i>Name of rehabilitation colony</i>
1	2	3	4	5
A. G.				
1.	Mannoor ..	834—39	..	In the Ayacut
2.	Lingapur ..	2,045—31	..	1. Hosahalli
3.	Rampur ..	1,546—04	..	2. Egalkera
4.	Koregal ..	2,049—20	..	3. Shivapur
5.	Timmalapur ..	923—31	..	4. Kamsagar
6.	Sangameshvar ..	960—09	..	5. Odderhatti
7.	Singapur ..	635—32	..	6. Jangamar-Kalgudi
8.	Gandehosalli ..	1,268—21	..	7. Siddapur
9.	Hadramaggi ..	939—15	..	8. Heroor
10.	Sankalapur ..	1,413—20	..	9. Hanwal-Guldhal
11.	Yellogi-Gunda ..	1,619—12	..	10. Mushtoor
12.	Silodi ..	1,025—12	..	On the foreshore
13.	Belvinahal ..	1,470—13	..	1. Kanakapur
14.	Akkapoor ..	732—00	..	2. Allanagar
15.	Pura ..	310—00	..	3. Hireboganhal
16.	Mundargi ..	1,7048—26	..	4. Chickboganhal
17.	Hyati ..	1,592—17	..	5. Kirkehalli
18.	Gudlapur ..	1,247—17	..	6. Lachankeri
19.	Katarki ..	1,706—15	..	7. Mundargi
20.	Mattoor ..	1,843—18	..	8. Hyati
21.	Neeralgi ..	1,087—39	..	9. Dombarahalli
22.	Hunkunti ..	709—04	..	10. Belur
23.	Tigari ..	1,215—13	..	11. Gudlur-Katarki
24.	Hireboganhal ..	1,018—24	..	12. Gondbal
25.	Bochanahalli ..	736—06	..	13. Neeralgi
26.	Dachankeri ..	532—21	..	14. Mattoor
27.	Keslapur ..	263—11	..	15. Hunkunti
28.	Gondbal ..	1,457—20	..	16. Bochanahalli
29.	Halwagli ..	820—13	..	17. Nilogi
30.	Belur ..	544—10	..	18. Tigari

1	2	3	4
31.	Chickboganhal ..	950—00	.. 19. Halwagli
32.	Kirkehalli ..	2,290—01	.. 20. Keslapur
33.	Nilogi ..	937—11	.. 21. Bhagyanagar
34.	Dombarahalli ..	79—37	
35.	Mallekeri ..	199—14	
36.	Budihal ..	66—14	
37.	Muddaballi ..	39—26	
38.	Hydernagar ..	00—23	
39.	Hirekasankhandi	268—06	
40.	Hulimuddapur ..	50—00	
	Total ..	39,173—34	
		or	
		39,180—00	

A serious problem before the Tungabhadra Board is that of sedimentation. As per the sedimentation survey of the Tungabhadra Reservoir carried out by the Director, Mysore Engineering Research Station, Krishnarajasagar, under the fundamental and basic research programme sponsored by the Government of India, it is seen that 4,10,500 acre-feet of silt has accumulated in the reservoir as per computed capacity. The loss in capacity of the reservoir due to siltation is 377.29 acre-feet per 100 sq. miles of water-shed area per year on the average. Compared with the original capacity, the total loss so far is said to be 13.49 per cent over a period of ten years. As the quantity of the inflow of sediment into the Tungabhadra reservoir through the Hirehalla stream has been large, it has been proposed to construct an anicut across Hirehalla stream in Koppal taluk. Afforestation work on the foreshore has been also taken up.

Left Bank Canal

The command area of the Tungabhadra Project is fed by three canals, *viz.*, the Left Bank Canal in Raichur district, the High Level Canal and the Low Level Canal in Bellary district. Investigations for the construction of the Left Bank Canal in Raichur district were started as early as 1929 and the scheme was finally approved by the then Government of Hyderabad at an estimated cost of Rs. 17,44,37,142 after examining all the reports submitted to it by various committees in 1934, 1936 and 1943. The Left Bank Canal, nearly 141 miles long, runs for the first nineteen miles in a rugged country, cutting through hill ranges and passing through three subsidiary reservoirs, one at Shivapur and the other two at Sanapur, comprising of 64, 74 and 67 feet masonry and composite dams, respectively, at the 8th, 11th and 14th miles of the canal. Finally, the canal, at its 22nd mile,

enters upon an open country after negotiating a range of hills through a tunnel called Papaiah Tunnel.

The Papaiah Tunnel, 3,557 feet long (1,084 metres) and 22 feet wide and 13 feet deep, is met with in the range of hills locally known as "Sath Pahad" before the canal enters upon an open country in Gangavati taluk. The canal, at this stage, passes through high ridges which involved deep cuttings. To avoid deep cutting of hard rocks and economise the cost of work, a tunnel, at a cost of Rs. 52.22 lakhs, has been constructed. It is named after the late Shri Papaiah, the then Chief Engineer.

The canal is designed to carry a discharge of 7,000 cusecs of water for the first fifteen miles for power development and thereafter 3,100 cusecs for irrigation. The computed maximum discharge of the canal is 45,540 cusecs. The canal crosses 19 aqueducts, 73 culverts and a few nala diversions. The most important aqueducts are across Kanakgiri stream at mile 31, Heera stream at mile 41, Kanakanala stream at mile 58, Maski stream at mile 69 and Mallat stream at mile 96. The biggest of them is Maski aqueduct at mile 69, which consists of 11 vents of 46 feet width and 22 feet 6 inches height.

There are six to seven drops at different places ranging from a height of 1.5 feet to 30.5 feet with a number of escapes at regular intervals along the canal in order to regulate the flow of water and to have better control over the flow. The highest drop is provided at mile 16. The canal from mile 24 to mile 127 is designed to suit the needs of navigation as well and, for this purpose, wharfs have been constructed at ten selected places.

There are, in all, 106 distributaries, in addition to field channels and watercourses, the biggest of them being the distributary No. 54, which is of a length of 26 miles irrigating an area of 80,812 acres and carrying a discharge of 379 cusecs of water, and the smallest being distributary No. 23, which is of a length of one furlong, irrigating an area of 108 acres, with a discharge capacity of 0.91 cusec. Out of the total length of 141 miles, the canal upto the 34th mile and distributaries upto 35th mile were completed by the end of 1957-58. During the first two years of the Second Plan period, the construction of main canal upto 52nd mile and distributaries upto 38th mile was completed. The year 1958-59 saw the canal extended upto the 65th mile and the distributaries upto 54th mile. The rest of the canal construction was completed in subsequent years and opened for the flow of water by reach-wise. The last reach of the canal and the last distributary were opened for the flow of water in July 1968.

As per the Hyderabad Irrigation Act, 1357 Fasli (1947 A.D.); the field channels were constructed upto the capacity of

three cusecs with the intention that the beneficiaries would construct and maintain field channels below that capacity out of their own resources. In view of lack of co-ordination among the beneficiaries and the slow development of the ayacut area, the Government of Mysore, in 1962, took up the construction of water-courses of more than one cusec also. It was expected that the field channels having the capacity of less than one cusec would be constructed and maintained by the beneficiaries. However, the Government, in 1966, ordered the construction of field channels also to each survey number and a part thereof leaving the work of maintenance of such channels to the beneficiaries. It is expected that the construction of field channels over the entire ayacut area will be provided by the end of March 1970. The total cost of the entire work on the Left Bank Canal side, as per the revised estimates, would be Rs. 38,55,29,430 and the outlay upto the end of March 1968 was Rs. 23,03,93,702.

In order to minimise the frequent breaches in the banks of the canal and repeated interruptions in the discharge of water and to eliminate anxiety among the cultivators, the work of strengthening of banks all along the entire reach of the canal has been taken up by the Public Works Department. For purposes of quickening the repair work of the breaches in the canal, a branch-squad has been formed which attends to the work immediately.

The Tungabhadra Left Bank Canal is intended to irrigate an ayacut of 5,80,000 acres under the following cropping pattern:—

<i>Name of crop</i>		<i>Area localised</i>
Abi Paddy	.. ..	50,000 acres
Tabi Paddy	.. ..	10,000 acres
Sugarcane	.. ..	15,000 acres
Kharriff (Light)	.. ..	2,00,000 acres
Rabi (Light)	.. ..	2,00,000 acres
Cotton	.. ..	75,000 acres
Garden	.. ..	30,000 acres
	Total ..	5,80,000 acres

Irrigation practices

In order to make the most efficient use of the available water, special methods and practices in irrigation, based on the climate, soil and such other conditions, have been followed. As the Tungabhadra Project is essentially planned for providing water to as large an area as possible, the practice of dry or light irrigation has been proposed. Dry irrigation simply means an assured supply of water to the dry crops like cotton, groundnut, jowar, etc., which are normally raised on unirrigated lands depending upon the rainfall.

The general methods followed in the district, for purposes of irrigating the fields, are Contour Border Strip Method, Flat Bed Method, Redgerx Furrow Irrigation Method, Ring Basin Method and Sprinkler Irrigation. The Contour Border Strip Method, specially designed to allow sufficient water to enter into the soil by the time the water reaches the take end of the strip, is practised in places where the range of slope of the surface area is between one to two per cent, in order to check the hazards of soil erosion whenever there are erratic downpours. This method is practised for growing crops like jowar, maize, groundnut, cotton, wheat, sateria, bajra, ragi, etc. The Flat Bed Method of irrigation, which ensures a uniform application of water to the soil, is very popular in the district and is mostly followed in respect of crops like paddy, ragi, etc. The Furrow Irrigation Method is one of the improved methods of irrigation. It is cheap and convenient and it also ensures uniform supply of water. It is mostly followed for growing crops like sugarcane, chillies, brinjal, tomato, etc. This can be followed in all kinds of soils irrespective of the topography of the land. In some farms where intensive farming is taken up, sprinkler irrigation is followed. It is a method of applying water to the surface of the soil in the form of a spray, somewhat as in ordinary rain. Movable pipes, with rotating nozzles at frequent intervals, are most commonly used at the crop level in order to cover the area as effectively as possible. The pumping plant supplies the water under pressure and conveys it through the main pipe line and the lateral lines to the sprinklers which distribute the water over the land. In Raichur district, three sprinkler irrigation sets are located in Lingsugur, Koppal and Sindhanur taluks. This system ensures efficient use of water and fertilisers. Though the system is good, it is not very popular because of its very high initial investment towards the cost of equipment.

The Left Bank Canal supplies water to six of the nine taluks of Raichur district. The gross command area of the canal is 10,80,000 acres and the cultivable command area is 8,00,000 acres, whereas the area proposed for irrigation is 5,80,000 acres. The canal provides water for 420 villages spread over six ayacut taluks, namely Raichur, Deodurg, Gangavati, Manvi, Sindhanur and Koppal. The number of villages benefited by the canal in each taluk is as follows :—

Extent of irrigation

<i>Sl. No.</i>	<i>Taluk</i>	<i>Number of villages benefited</i>
1.	Koppal	16
2.	Gangavati	74
3.	Sindhanur	146
4.	Manvi	128
5.	Deodurg	8
6.	Raichur	48
	Total	420

Sindhapur and Manvi taluks get the maximum benefit from the canal. Out of the total irrigable area of 5,80,000 acres, the Public Works Department created real irrigation potential to an area of 5,77,700 acres upto the end of 1968-69 by constructing field channels and watercourses. The following table presents the yearwise progress of the actual area brought under irrigated crops from 1954-55 to 1968-69 :—

Sl. No.	Year	Irrigation potential created	Area brought under irrigation (non-intensive)	Area brought under irrigation (intensive)
1.	1954-55	5,000	..	..
2.	1955-56	16,316	10,298	..
3.	1956-57	30,000	18,000	..
4.	1957-58	34,000	28,659	..
5.	1958-59	1,00,430	40,654	..
6.	1959-60	1,24,000	54,000	..
7.	1960-61	1,95,000	1,26,000	..
8.	1961-62	2,64,000	1,67,000	..
9.	1962-63	2,77,000	2,11,000	..
10.	1963-64	2,83,000	2,21,000	..
11.	1964-65	3,00,000	2,50,000	..
12.	1965-66	4,70,000	3,94,000	..
13.	1966-67	5,02,508	3,97,005	..
14.	1967-78	5,52,626	4,10,103	1,23,765
15.	1968-69	5,77,700	4,40,103	1,75,801

The above table shows that the area intensively developed, as in 1968-69, was only 1,75,801 acres, whereas water had been made available to an area of 5,77,700 acres.

In order to provide maximum benefit, out of the available water, to the farmers, a scheme of localisation of irrigated lands for different kinds of irrigation and fixing up of blocks for various crops, depending upon the topographic situation, drainage conditions, inherent properties of the soil, human and animal resources and the intensity of irrigation under a particular distributary, is in operation in the district. Extension of irrigational facilities to as large an area as possible, economisation of the use of water, adoption of block system of irrigation and reduction of the intensity of the water flow are some of the main objectives of the scheme. In implementing the scheme, a systematised survey was taken up in order to ensure that (i) each village had its share of irrigation, (ii) wet and dry blocks were arranged in a good proportion and (iii) continuous bits of fertile lands were chosen for wet blocks. Blocks of lands have been localised not only

Localisation
Scheme

for wet and dry crops, but also for sugarcane, paddy and other light-irrigated crops as detailed hereunder :—

<i>Crops</i>	<i>Acreage</i>
Sugarcane	15,000
Abi Paddy	50,000
Tabi Paddy	10,000
Light Irrigated Khariff Crops	2,00,000
Mid-Rabi Cotton	75,000
Light Irrigated Rabi Crops	2,00,000
Garden Crops	30,000
Total	5,80,000

The localisation work was started in the year 1950. The Public Works Department, represented by the irrigation unit of the localisation scheme, first surveyed the gross command area, marked the high or elevated lands and arrived at the irrigable command. This information was passed on to the agricultural unit, which examined every survey number falling within the irrigable command, classified the soils into different grades and fixed the crops to be grown in each grade of soil. The details of the classification of soils into different grades are already dealt with under soils. After gaining a thorough knowledge of the soil characteristics and drainage conditions, and, at the same time, keeping in view the cropping scheme and the intensity of irrigation, the irrigation blocks have been fixed for various types of irrigated crops. The entire irrigable area under the Left Bank Canal is localised under the following types of irrigation :—

Heavy irrigation	Paddy and sugarcane
Garden	Perennial and seasonal crops
Light or protective irrigation	Khariff and Rabi crops

Heavy irrigation is usually avoided within four furlongs of the human habitation, but such lands, if localised, were to be reserved for light irrigated crops only. As far as possible, localisation has been done restricting the farmers to grow crops of a particular kind in large well-defined blocks, under a single distributary or field channel, and care has been taken to ensure that water-logging is reduced to the minimum by localising heavy irrigated lands adjacent to natural drainages. Details of localisation completed upto the last distributary are presented in a table appended at the end of the chapter.

The actual progress of localisation work, commencing from 1954 to the end of 1967, and the year of its completion, can be gauged from the following statement :—

Year			<i>Localisation done (Progressive total)</i>
1954-55	..	..	45,200 acres
1955-56	..	..	2,04,234 acres
1956-57	..	..	3,88,578 acres
1957-58	..	..	4,91,116 acres
1959-60	..	..	5,46,894 acres
1960-61	..	..	5,54,651 acres
1964-65	..	..	5,80,000 acres
1966-67	..	..	5,98,593 acres

From the above statement, it is clear that 18,593 acres are localised in excess of the sanctioned cropping pattern of 5.8 lakh acres. This excess area includes the extent of 8,832 acres irrigated under pre-Mughal Channels and 10,041 acres acquired for roads, distributaries, high lands, etc., in the ayacut area.

Upper Krishna Project

The Upper Krishna Project is another mighty project undertaken by the Government ; this will immensely help the dry areas of Raichur, Bijapur and Gulbarga districts. It is proposed to make use of the vast water resources of the Krishna for this project. This river flows for a distance of 104 miles bordering the district of Raichur in the north. Under the present project, two major storage reservoirs will be provided, one at Alamatti in Bijapur district with a left bank canal and another at Siddapur in Muddebihal taluk of the same district with left and right bank canals by constructing dams across the river Krishna. The first stage of the project is presently under execution. The project will bring about 19.5 lakh acres of land under irrigation in the fertile but arid tracts of Bijapur, Gulbarga and Raichur districts. Out of this, an extent of about five lakh acres will come under the irrigable command of Narayanapur Right Bank Canal. The Narayanapur Right Bank Main Canal will take off from Narayanapur Reservoir (near Siddapur) at sill level 1580 and pass through Lingsugur and Deodurg taluks to a distance of 55 miles. Further, it bifurcates itself into two branches, viz., Raichur branch and Maski branch. The Raichur branch will pass through Raichur taluk to a distance of 42 miles. The Maski branch, nearly 36 miles long, will pass through Manvi taluk and end in Lingsugur taluk. The proposed taluk-wise command area, in Raichur district, under the Narayanapur Right Bank Canal is as given below :—

Lingsugur	..	..	88,215 acres
Deodurg	..	..	2,15,903 acres
Raichur	..	..	1,14,580 acres
Manvi	..	..	45,302 acres
Total	..	..	<u>5,00,000 acres</u>

The cost of Narayanapur Right Bank Canal is estimated at Rs. 1,800 lakhs. The construction of the canal is proposed to be taken up during the II stage of the project, by about 1975, and completed in 1983.

The actual irrigational potential created so far in the district from different sources is as follows :—

(1) Irrigation by wells	.. ..	1,07,500 acres
(2) Irrigation through tanks	.. ..	12,273 acres
(3) Irrigation through old Vijayanagara Channels	.. ..	5,789 acres
(4) Rajolibanda Diversion Scheme	.. ..	5,879 acres
(5) Tungabhadra Left Bank Canal	.. ..	5,80,000 acres
Total	.. ..	<u>7,11,441 acres</u>

Irrigation potential

While the total irrigational potential created in the district is 7,11,441 acres, which is about 26.7 per cent of the cropped area, the water potential of the district is estimated at 32,000 million cubic feet on empirical basis. The proposed Upper Krishna storage project may irrigate about another 5.00 lakh acres in the district.

The maintenance and management of the major sources of irrigation, including tank irrigation, rest with the Public Works Department. The ayacut development staff is entrusted with the management of the irrigation water. The distribution of water is regulated at the outlet points of distributaries. The officers appointed for the purpose work out the requirements of water in each distributary according to the number of acres localised under that distributary. Only the required quantum of water is let out in that particular distributary. This is regulated with a view to seeing that water reaches the lower portions of Raichur and Deodurg taluks and facilitates the irrigation programme in the entire command area. The programme is worked out in great detail by the irrigation engineers. A calculated quantum of water is let out from the main canal to each distributary, which would be sufficient for the area localised under that distributary. Supervisors and sluicemen are required to see that water is not unduly wasted and the cultivators are not allowed to take water direct to their fields from the distributary. The internal distribution of water beyond the outlet points rests with the ayacutdars. The water is supplied to perennial crops like sugarcane for eleven months in a year. In respect of paddy crops, water is made available during Khariff season only. In respect of light irrigated area, the farmer is permitted to irrigate only 50 per cent of the localised area under his control in Khariff season and the remaining 50 per cent in Rabi season

Irrigation management

so that the entire area is covered. Thus, the percentages of areas covered under different types of irrigation are as follows :—

Wet irrigation ..	12 per cent
Perennial irrigation ..	2.7 per cent
Light irrigation ..	79.9 per cent
Garden ..	5.4 per cent

Water is first let out through the pipe outlet fixed on each distributary and the field channels take the water to the fields. The most difficult stage is where the water is let out from one cultivating field to another. There is the human element to be dealt with here. Various delicate situations are tackled, in an impartial way, by the revenue authorities through the *Neeradies* (water regulators) or *Sawadies*, who have to ascertain the needs of farmers under a particular field and regulate the water supply.

As such methods of irrigation were unknown in the area previously, the distribution of water from one cultivator to another had been a problem. There had been several instances in Ganga-vati taluk where cultivators had tampered with the sluices by breaking open the shutters. In some cases, the field channels excavated by the Public Works Department had been closed by the cultivators. Various punitive measures were taken to prevent these illegal activities. A systematic propaganda drive was undertaken to tell the cultivators to level up their lands to conserve water. Unauthorised irrigation or violation of the principle of localisation is punishable under the Mysore Irrigation Act, 1965.

The entire area is divided into units, with an area of 15,000 to 20,000 acres under each unit, headed by a section officer of the cadre of a Junior Engineer or Supervisor. He is assisted by three to four Irrigation Inspectors, who are appointed for every 5,000 acres of ayacut area. These Inspectors are required to undergo a training in irrigation rules and practices before they are appointed and entrusted with the work. There are a number of committees called "Distributary Panchayat Committees" for solving irrigational problems arising within the area of their jurisdiction. The general problems concerning the development of the ayacut area are discussed at the meetings of the Tungabhadra Advisory Board or the Consultative Committees.

The low density of population per square mile, inadequate supply of labour, lack of sufficient bullock power, fairly large holdings, limited means of transport and communications and uneven surface of the land, coupled with lack of proper enterprising spirit and capital with the ayacutdars, contributed their share to the rather slow development of the ayacut area in the earlier stages.

Attracted by the ample irrigational facilities provided in the district, a number of families have migrated from the neighbouring districts of Andhra Pradesh into the ayacut area of this district and are carrying on farming. They moved to this district from Krishna and Godavari districts of Andhra Pradesh to take up cultivation of newly converted wet lands in the ayacut area. They left their native places after selling away the small extents of wet lands which they possessed for a good price and purchased large extents of dry lands in the ayacut area out of the sale proceeds and converted them into wet lands, irrigated by the canal water. Besides, about a thousand families of repatriates from Burma and Ceylon are also being rehabilitated near Jawalgera village in the Sindhanur taluk. These people are to be given an area of 5,000 acres reserved for them for cultivation. The first batch of these repatriates have already come and settled in this area and have begun to cultivate the lands.

The district had roughly 26,15,173 acres of cropped area (including current fallows) in 1967-68 which constituted nearly 76.7 per cent of the total geographical area of the district. The following tables show the area under each important crop (inclusive of both Khariff and Rabi seasons) for the years 1957-58, 1962-63 and 1966-67 :—

Main Crops

1957-58

(In Acres)

172

MYSORE STATE GAZETTEER

Sl. No.	Name of taluk	Paddy	Jowar	Bajra	Kangani	Wheat	Gram	Pulses	Ground-nut	Cotton	Karad	Sesamum
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Raichur	14,549	111,481	9,609	12,991	1,692	2,058	4,056	48,980	46,981	8,488	586
2.	Manvi	382	1,37,502	11,682	18,691	3,634	2,941	4,789	28,719	1,35,707	2,261	2,348
3.	Deodurg	1,047	97,088	10,821	2,974	2,484	2,302	13,713	32,151	62,818	4,162	1,484
4.	Lingsugur	450	1,48,386	40,331	11,408	12,053	5,145	48,584	45,339	79,610	670	11,672
5.	Kushtagi	1,550	78,491	19,974	16,449	10,772	3,823	46,785	43,576	31,765	3,208	3,448
6.	Sindhanur	217	1,02,903	9,708	36,231	2,455	3,048	6,943	4,490	1,57,191	1,205	305
7.	Koppal	2,680	43,356	5,073	14,028	13,773	1,699	14,509	45,017	30,032	2,510	2,550
8.	Yelburga	1,445	61,962	7,014	6,558	32,616	5,706	10,480	61,631	78,334	8,153	1,042
9.	Gangavati	7,647	15,468	4,096	19,226	749	1,308	11,334	31,075	60,327	1,809	2,783
	Total	29,967	7,96,637	1,10,308	1,38,556	80,228	28,030	1,61,193	3,40,978	6,81,765	32,463	26,218

Sl. No.	Name of taluk	Paddy	Jowar	Bajra	Maize	Wheat	Total cereals and small millets	Gram	Tur	Pulses
1	2	3	4	5	6	7	8	9	10	11
1.	Raichur	17,474	1,14,689	8,561	..	1,593	1,61,130	1,520	2,320	20,083
2.	Manvi	80	1,74,810	18,980	..	3,402	2,05,819	4,901	4,300	1,681
3.	Sindhaur	1,982	1,19,073	10,208	8	2,684	1,64,953	4,076	1,773	5,194
4.	Gangavati	18,318	81,117	13,579	..	215	1,30,961	321	1,077	22,138
5.	Keppal	1,692	58,122	5,130	..	11,000	95,587	1,424	6,050	37,345
6.	Yelburga	1,491	64,509	8,846	..	33,120	1,24,819	5,817	5,811	38,984
7.	Kushtagi	2,042	85,954	21,419	..	10,416	1,29,833	2,477	16,218	35,996
8.	Lingsugur	253	1,24,668	30,762	36	11,009	1,77,993	4,302	14,852	5,149
9.	Deodurg	690	1,22,920	12,860	..	2,185	1,41,081	2,675	4,535	15,925
	Total	44,022	9,45,862	1,30,345	44	75,624	13,32,176	27,510	56,936	1,82,495

1962-63—(contd.)

(In Acres)

174

MYSORE STATE GAZETTEER

Sl. No.	Name of taluk	Ground-nut	Castor	Cotton	Sugar-cane	Total food-grains	Total pulses	Total oilseeds	Net sown area
1	2	12	13	14	15	16	17	18	19
1.	Raichur ..	23,045	115	42,622	174	1,85,053	23,923	29,600	2,59,719
2.	Manvi ..	12,103	201	1,53,383	..	2,16,701	10,882	25,315	4,02,479
3.	Sindhanur ..	1,431	285	1,56,167	17	1,75,996	11,043	11,750	3,47,477
4.	Gangavati ..	13,529	77	49,918	9,470	1,54,497	23,536	14,154	2,88,359
5.	Koppal ..	42,205	290	28,225	3,152	1,40,403	44,016	46,380	2,20,614
6.	Yelburga ..	59,532	668	71,327	9	1,75,431	50,612	72,376	3,20,553
7.	Kushtagi ..	39,419	1,619	35,118	8	1,84,524	54,691	46,751	2,68,686
8.	Lingsugur ..	23,202	2,160	68,240	29	2,02,296	24,303	33,399	3,05,340
9.	Deodurg ..	16,350	N.A.	62,375	10	1,64,216	23,135	21,584	2,49,436
	Total ..	2,30,816	5,424	6,67,375	12,869	15,99,117	2,66,941	3,01,309	26,02,662

Sl. Name of taluk No.		Paddy	Jowar	Bajra	Total cereals and small millets	Wheat	Gram	Tur	Pulses
1	2	3	4	5	6	7	8	9	10
1.	Raichur	14,625	1,02,738	7,705	1,43,089	1,630	1,220	1,757	18,587
2.	Manvi	4,281	1,19,846	19,829	1,60,720	2,254	3,252	2,960	7,328
3.	Sindhanur	14,969	1,02,244	11,069	1,59,393	3,133	2,200	1,320	18,192
4.	Gangavati	23,494	42,066	10,780	96,346	11,306	1,438	6,002	20,499
5.	Koppal	2,942	51,940	4,583	88,881	7,200	1,320	5,562	35,508
6.	Yelburga	1,340	55,664	5,890	1,08,554	28,000	5,800	6,440	47,301
7.	Kushtagi	1,098	27,628	18,792	78,324	8,093	2,891	10,479	43,238
8.	Lingsugur	252	1,16,436	32,180	1,73,006	11,218	4,920	18,408	4,124
9.	Deodurg	882	1,20,122	15,730	1,39,555	2,821	2,415	3,860	1,050
Total		63,883	7,38,684	1,26,558	11,47,868	75,655	25,456	56,788	1,95,827

1966-67—(contd.)

(In Acres)

Sl. No.	Name of taluk	Sugar-cane	Ground-nut	Castor	Cotton	Total food-grains	Total pulses	Total oilseeds	Net sown area
1	2	11	12	13	14	15	16	17	18
1.	Raichur ..	188	27,186	120	35,465	1,64,653	21,564	31,908	2,68,972
2.	Manvi ..	59	20,000	300	1,73,153	1,74,260	13,540	35,008	4,04,046
3.	Sindhaur ..	1,095	1,874	125	153,497	1,81,105	21,712	9,596	3,17,595
4.	Gangavati ..	13,479	64,212	1,630	44,490	1,24,285	27,939	71,091	2,48,333
5.	Koppal ..	2,583	37,103	260	27,835	1,31,271	42,390	41,089	1,89,229
6.	Yelburga ..	31	49,677	371	67,880	1,68,095	59,541	60,435	2,89,377
7.	Kushtagi ..	21	29,488	1,844	33,311	1,34,932	56,608	37,926	2,51,399
8.	Lingsugur ..	20	28,116	781	73,218	2,00,458	27,452	38,957	3,28,718
9.	Deodurg ..	7	23,914	45	71,619	1,46,880	7,325	35,477	2,94,567
	Total ..	17,483	2,81,570	5,476	6,80,468	14,25,939	2,78,071	3,61,487	25,92,236

Jowar is the most important cereal of the district and is almost entirely concentrated in the light irrigated tracts. Next in importance is bajra, which is chiefly grown in association with jowar, paddy and wheat. Groundnut among oilseeds and cotton among fibres are the most valuable commercial crops grown in the district.

The area under non-food crops is roughly more than half of the area under food crops. But it is seen that the bulk of the cultivated area is under food crops. The relatively greater importance given to commercial crops like cotton, groundnut, etc., represents a step towards increasing the money earning capacity of the cultivators. The district as a whole, in respect of crops grown, comes under the northern *maidan* region of the State. The taluks of Lingsugur, Deodurg, Koppal, Yelburga and Kushtagi are grouped under a central sub-region, growing crops like jowar, bajra, wheat, cotton, oilseeds and pulses and the rest of the taluks of Sindhanur, Manvi, Raichur and Gangavati are under a sub-region, Tungabhadra, growing crops like cotton, jowar, bajra, oil-seeds and pulses.

A study team of the University of Agricultural Sciences, Hebbal, has recommended the following cropping pattern, under light irrigation, for black cotton soils of the Tungabhadra Project area. While suggesting a suitable cropping pattern, they have taken cognisance of the system of localisation and the available information on various aspects of soil, climate, crop production, water management and marketing. They have recommended the following pattern for different seasons to be followed in the black cotton soils of the district :—

**Cropping
pattern**

Khariff :—

- (1) Hybrid Maize : Deccan or Ranjeet.
- (2) Hybrid Jowar : CHS-1, D-340 and C7-1195.
- (3) Hybrid Bajra : HB-1 and D-174.
- (4) Sateria : K-221-1.
- (5) Transplanted Ragi : Purna.

Groundnut, at present, has been found to be highly remunerative for cultivation in red soils.

As dry crops and second crops :—

- (1) Mexican wheat ;
- (2) Bengalgram ; and
- (3) Safflower.

Rabi :—

- (1) Mexican Wheat—Lermarojo and Senera-64.
- (2) Hybrid Maize—Deccan and Ranjeet.
- (3) Safflower as an entire crop.

- (4) Hybrid Bajra or D-174.
- (5) Jowar M-35-1 and M-47-3.
- (6) Transplanted Ragi—Purna.

In the area localised for Rabi crop, the following short duration crops have been recommended to be grown as dry crops :—

- (1) Hybrid Bajra,
- (2) Sateria,
- (3) Ragi—Purna,
- (4) Pulses and, in addition, Sunnhemp or Sesbania may also be grown.

Cotton :

Lakshmi or Hampi (5110) variety to be sown during the second fortnight of August.

There is a possibility of raising certain crops such as chillies, onion, sateria and ragi as mixed crops with cotton. New crops such as soyabean and tobacco can also be introduced.

Paddy

Rice or paddy (*Oryza sativa*).—As per the final figures of 1967-68, the area under rice cultivation in the district was 25,603 hectares which constituted about 2.3 per cent of the area under rice cultivation in the State. This crop is mostly concentrated in the six ayacut taluks of the district. Paddy is a staple food-crop of the people in the taluks of Raichur, Gangavati, Sindhanur and Manvi. In the irrigated tracts, specially under heavy irrigation, paddy is transplanted and in rainfed area broadcast sowing of seeds or sprouts is followed. Abi, the autumn or monsoon or early paddy, also called main season paddy, is sown in June, transplanted in July and harvested in November-December. Tabi paddy, also called the summer paddy, is transplanted in January and harvested in March-April. The total area localised for paddy cultivation under the Left Bank Canal is 60,000 acres, of which 50,000 acres are for Abi paddy and another 10,000 acres for Tabi paddy. The new varieties of paddy that are being introduced in the district are TN-I, IR-8, IR-5, Rajahamsa, ADT-27, SR-26B, HR-35, HR-19, Selection 28, Krishna Basangi and Kichidi. Some of these varieties are early ripening, in about 90 to 120 days, and some are late ripening, in about 120 to 180 days. Specially recommended practices are followed for cultivating these improved varieties of paddy and special dosages of chemicals and fertilisers are also recommended. The yield per acre varies from 10 to 25 quintals. The district has an exportable surplus in respect of paddy crop.

Jowar or great millet (*Sorghum vulgare*).—Jowar as the **Jowar** staple food crop of the district, is grown in an area of 3,82,977 hectares. In 1966-67, the area under jowar was 3,61,000 hectares which constituted nearly 13.8 per cent of the total area under jowar crop in the State. Among the jowar-growing districts of the State, Raichur has the third place. Jowar is the most important cereal and at the same time the largest and most widely grown food crop of the district. It is equally important as a fodder crop. It is essentially a crop of heavier soils. In parts, where soils are shallow, it gives place to bajra. The jowar crop may be grouped under three varieties, viz., (1) the early sown or Khariff variety, (2) the late sown or Rabi variety and (3) the irrigated hot season variety, mostly grown for fodder. Khariff jowar is sown in medium and light soils during the month of July and harvested in December. Rabi jowar variety, grown mainly in black soils, is sown in September and harvested in February, and this variety is highly drought-resistant and thrives well under rainfall of 18 to 25 inches. This variety is predominant in Manvi and Sindhanur taluks. The hot season variety jowar is sown between November and February and it requires irrigation before it ripens. A good variety of jowar called Raichur variety is still popular, the other popular varieties being Dagdi and Maldandi. The improved hybrid and short duration varieties introduced in the district are D-340, Mathur, Basavanapada and local variety Khalsa. A special type of cultivation for these hybrid varieties is recommended under the package of practices programme. The district has an exportable surplus also in respect of jowar crop.

Bajra (*Pennisetum typhoideum*) stands third in importance **Bajra** as the cultivated cereal crop of the district. The area under bajra, in 1967-68, was 59,702 hectares* as against 1,10,308 acres in 1957-58, 1,30,345 acres in 1962-63 and 1,26,558 acres in 1966-67. The decrease in area during 1966-67 was due to adverse seasonal conditions. It is grown in almost all parts of the district, but Manvi and Lingsugur taluks account for the largest acreage.

It is ordinarily grown as a Khariff crop and it grows well when the climate is moderately dry and when the monsoon rains come in light down-pours followed by plenty of sunshine. It is grown practically as a mixed crop. As a dry crop it is sown at the advent of south-west monsoon and harvested in September and October. Hybrid irrigated bajra is grown in medium black soils and red loams.

Among the bajra-growing districts of the State, Raichur takes the third place. Consumption of bajra in the district is very little and the crop grown is mostly exported outside the district. The improved strains introduced in the district are HB-I and D-174.

*one acre=0.405 hectare.

Mexican wheat

The area under wheat, as in 1967-68, was 32,303 hectares, (i.e., 77,883 acres) as against 75,624 acres in 1962-63 and 75,665 acres in 1966-67. The district has the fifth place among the wheat-growing districts of the State. The chief wheat-growing taluks of the Raichur district are Yelburga, Lingsugur, Gangavati and Koppal. This crop is generally grown on silts, silt loams and clay loams of high fertility. As a dry crop, it grows well in deep black cotton soils. It is sown alone and sometimes mixed with safflower, linseed or gram and is generally rotated with cotton and jowar. When the crop is irrigated, lighter soils are selected as they ensure good drainage. The best varieties of wheat that were common in the district as distinguished by their trade name were 'Bansi', 'Lal' and 'Jod Gehoon'. 'Bansi' wheat is semi-hard, golden yellow or amber in colour, elongated in shape and it is ordinarily grown as a dry crop. 'Lal' variety of wheat is grown as a dry crop. 'Jod Gehoon' or spelt wheat is hard, red in colour, elongated and slender in appearance and is mostly grown as an irrigated crop. Mexican wheat, lermarojo, is a new variety introduced in the district. It is grown in all types of soils, except in very light and shallow soils. There is a surplus of Mexican wheat in the district.

Other Cereals

Maize (*Zea mays*) is cultivated as a Khariff crop and is usually followed by a Rabi crop of wheat. The area under maize in the district was 240 acres in 1967-68. It is grown also as a fodder crop. The popular varieties of this crop are Deccan hybrid, suitable for all seasons, composite variety and white maize. Among other cereals, ragi is also grown in a comparatively smaller area, particularly in loamy and well drained black soils, mostly under irrigated conditions. The area under this crop in 1966-67 was less than 500 hectares. Sateria is another minor dry land food crop, which is grown in medium black soils. Ordinarily, red loams are much favoured under normal rainfall for this crop. The important local varieties of sateria are HB-1 and D-174 for both Khariff and summer seasons.

The total area under cereals and small millets in the district was 13,32,176 acres in 1962-63 and 11,47,868 acres in 1966-67, which came to about 51 per cent of the net sown area; the decrease during the latter year was due to adverse seasonal conditions.

Groundnut

Groundnut (*Arachis hypogaea*) is the major single oilseed crop grown extensively in more than five taluks of the district. Among the groundnut-growing districts of the State, Raichur district takes the fifth place, and among the taluks of the district, Gangavati takes the first place. Gangavati, Koppal and Yelburga taluks have larger areas under groundnut than that of other taluks. The total area under groundnut crop in the district was

3,40,978 acres in 1957-58, 2,30,816 acres in 1962-63 and 2,81,570 acres in 1966-67. The changes in monsoon conditions were responsible for this decrease in the area. Moreover, a part of the area under groundnut crop in 1957-58 was subsequently used for heavy irrigated crops and for other hybrid varieties. For example, Yelburga taluk had the largest acreage under groundnut, *i.e.*, 61,631, in 1957-58, but subsequently it fell to 59,532 acres in 1962-63 and to 49,677 acres in 1966-67 owing to this reason. The nuts are ordinarily used for human food and also as food for livestock or crushed for oil and oilcake.

As it is a hardy plant, it can easily be grown both as a dry and an irrigated crop. It needs little ploughing beyond weeding and it requires only a little manure except when grown for several years on a comparatively heavy soil. Two or three hoeings, before the nuts are formed, usually suffice. It is often grown in rotation with a cereal or cotton crop.

The two varieties of groundnut grown in Raichur district are the "Spread" or the trailing variety and "Bunch" or the erect variety. Plants under the erect variety have a bushy growth and the pods cluster round the bunched stems. Plants under the trailing variety or "Spread" variety creep along the ground and soon cover it; the pods are formed all along the ground in running stems. Erect varieties are easier to harvest and are more suited to heavier soils, while the trailing varieties give the highest yields on light soils. The "Bunch" variety is partially an irrigated crop and it is generally sown under well or canal irrigation.

No other commercial crop save cotton has assumed such a degree of importance in the agricultural economy of the district as groundnut. In the erstwhile Hyderabad State, groundnut crop was chiefly grown in Raichur, just like in other parts, as an exportable crop. Even as early as 1945, Raichur had the largest area under groundnut crop among the districts of the Hyderabad State.

The new hybrid varieties introduced in the district under package of practices of high yielding varieties are TMV-2, Assiriya Mwitunde and S-206 (both for Khariff and summer). Red and sandy soils are suited for TMV-2 variety of groundnut. It is grown both as an irrigated and rainfed crop. The yield from the crop, if grown under irrigated conditions, is almost double when compared with the yield of that grown under rainfed conditions. The Assiriya Mwitunde variety requires light soils and sandy loams. It does not thrive well in stiff clay, alkaline and acid soils. The yield from the crop is eight to ten quintals per acre if grown under rainfed conditions, whereas it rises to 20 to 25 quintals under irrigated conditions.

Castor

Castor (*Ricinus communis*) is another important oilseed grown in the district. The total area under this crop was 5,865 acres in 1967-68, as against 5,424 acres in 1962-63 and 5,476 acres in 1966-67. It is mostly an annual crop. Lingsugur taluk was one of the largest castor growing taluks in the erstwhile Hyderabad State. At present, Gangavati, Kushtagi and Lingsugur taluks have large areas under castor cultivation. The castor plant prefers a deep, free soil, of which the light soils and sandy loams of the district are typical. The Rabi castor is grown on black soils as the sole crop of the year. The crop is ordinarily sown in rainy season and lasts till the end of winter season. The harvesting is not uniform as the crop ripens at different stages. The popular varieties of castor that are being cultivated in the district are Rosy castor and NPH-1. NPH-1 is preferred to Rosy castor, because it is a drought-resistant and short duration crop. It can be better grown in medium black soils. Ordinarily, the crop is grown under rainfed conditions and as a mixed crop, in both Khariff and Rabi seasons.

Sesamum

Among the other oilseeds, sesamum (*Sesamum indicum*) and linseed are grown largely in the district. The total area under sesamum crop was 24,403 in 1967-68. It flourishes well on lighter soils, but ordinarily grows in all types of soils in the district. It is grown both as a Khariff and a Rabi crop. It does not withstand heavy rainfall when the plants are young. Raichur was one of the chief marketing centres in the erstwhile State of Hyderabad for sesamum. The crop is sown in June or July and harvested in September or October.

The area under linseed was 4,939 acres in 1967-68. The principal linseed-growing taluks of the district are Yelburga and Kushtagi.

The total acreage under all kinds of oilseeds in the district increased from 3,01,309 in 1962-63 to 3,61,487 in 1966-67.

Cotton

Cotton (*Gossypium* sp.) is, at present, the only single fibre crop grown in the district, and in respect of area it is next to jowar. Among the chief cotton-growing districts of the State, Raichur has the first place insofar as the area under the crop is concerned, and among the taluks of the district, Sindhanur stands first. The total area under cotton in 1968-69 is roughly estimated at 7 lakh acres as against 6,67,375 acres in 1952-53 and 6,81,765 acres in 1957-58. The total area under cotton crop in the district comes to about 28.6 per cent of the total area under cotton in the State. Thus it is the most extensively grown commercial crop of the district. The following table shows the block-wise and

variety-wise acreage under cotton in the district during the year 1968-69 :—

<i>Taluk/Block</i>	<i>Lakshmi</i>	<i>Hampi</i>	<i>Jayadhar</i>	<i>Total</i>
Raichur ..	64,016	283	..	64,299
Sirvar ..	65,276	160	..	65,436
Manvi ..	72,869	524	15,000	88,393
Deodurg ..	50,120	51	500	50,671
Lingsugur ..	72,393	89	2,746	75,228
Sindhanur (Block I) ..	84,810	820	3,056	88,686
Sindhanur (Block II) ..	61,659	554	1,000	63,213
Kushtagi ..	47,360	18	..	47,378
Gangavati ..	16,325	200	9,200	25,725
Koppal ..	31,980	171	..	31,151
Yelburga ..	65,180	154	..	65,334
Total ..	6,41,988	3,024	31,502	6,73,514

The cultivation of cotton crop is mostly concentrated in the taluks of Sindhanur, Lingsugur, Manvi, Yelburga and Deodurg taluks. It is cultivated both as a Khariff and a Rabi crop.

The different varieties of cotton grown in the district are grouped under two broad kinds, namely 'Bowrie' and 'Bunsee', locally called 'Jawe Hatti' and 'Desi Hatti'. The 'Bowrie' variety has short staple and its colour is inclining to light-yellow. In respect of 'Bunsee' variety, the staple is long, white, fine and strong and hence this variety is generally favoured. New varieties like Lakshmi, Jayadhar and Hampi have been introduced. Of these, the Hampi variety is much favoured as it has long and fine staple. But the Jayadhar and R-5 varieties of cotton are largely grown in Manvi and Lingsugur taluks, while the Lakshmi variety is grown all over the district. The much favoured Hampi variety is largely grown in Gangavati, Sindhanur, Manvi and Raichur taluks, mostly under rainfed conditions.

In the erstwhile Hyderabad State also, Raichur was considered as a chief cotton-growing tract. The popular variety of cotton was called by the trade name Kumpta. The different varieties of cotton were also divided according to their botanical types in so far as they were grown in the district of Raichur, viz., G. N. Cutchica (Mungari or Mathio), a Khariff variety grown in all parts of Raichur, G. N. Malvensis, a Khariff variety grown in the north-eastern parts of Raichur, G. Hirsutum (American or

Buri), locally called Vilayithi Hatti, a Rabi variety grown on lighter black soils and G. Herbaceum (Hingari or Kumpta), a Rabi variety grown on heavier black soils.

Sowing of Khariff cotton is done from June to middle of July. The Rabi crop is sown in September or early part of October. The harvest season commences from the end of October or the beginning of November. There are usually four pickings, with an interval of three weeks between any two pickings. At present, most of the produce is marketed as *kapas* or unginned cotton. In respect of Hampi cotton, the number of pickings goes up to six with an interval of a fortnight between any two pickings. Crops raised on deep black soils yield four to six pickings, while those grown on light soils three pickings only.

Cotton is generally grown as a mixed crop with tur plant, which is sown after every 10 to 15 rows of cotton. The distance between the rows varies under rainfed and irrigated conditions. Cotton plants provide food for cattle in the form of seeds, leaves for sheep and goats and the dry stalks, if small in size, serve the purpose of fuel.

In view of the importance of cotton as a commercial crop, a comprehensive scheme called Cotton Development Scheme was introduced in the district in April 1963. Various developmental activities are taken up under this scheme and it covers all the taluks of the district. Prior to the implementation of the scheme, a few varieties of cotton seeds were sown together on the same piece of land and the seed multiplication programme was not properly organised. Consequent on the introduction of the scheme, a rapid development has taken place in the coverage of the area under cotton crop and in the method of cultivation.

**Cotton
Development
Scheme**

The Cotton Development Scheme aims at obtaining higher returns from cotton by adopting better methods like selection of improved seeds, increasing the area under irrigated cotton, growing cotton in the bunded areas and in rice fallows, etc. The total area covered under this scheme in 1968-69 was 72,976 acres. Cotton seeds upto 3,556.13 quintals were distributed. Under a Centrally-sponsored scheme for cotton development, an area of 7,004 acres has been covered under intensive cultivation and 150 quintals of seeds have been distributed. Some of the equipments required for the cultivation of cotton were supplied at 50 per cent subsidised rates. In 1968-69, an area of 3,024 acres was covered under Hampi cotton. It is expected to bring about 25,000 acres under irrigated cotton, of which 20,000 acres would be under the Hampi variety and 5,000 acres under the Lakshmi variety. Seed-cum-fertiliser drills are being supplied at 25 per cent subsidised rates. Crop competitions are being conducted and prices are given to the successful candidates.

The yearwise area covered under improved and irrigated varieties of cotton in the district, during the years from 1966-67 to 1968-69, are presented below :—

Year	<i>Area covered under improved varieties</i>		<i>Area brought under irrigated cotton</i>	
		<i>Acres</i>		<i>Acres</i>
1966-67	..	5,70,000	..	100
1967-68	..	6,11,000	..	3,000
1968-69	..	6,76,500	..	7,000

Since the inception of the scheme, the progressive total area covered under the improved varieties comes up to 6,76,500 acres, which is almost equal to the total area of the district under cotton crop, whereas the area brought under irrigated cotton is only 7,000 acres. The Centrally-sponsored scheme for maximising production of cotton in the areas of assured water supply is in operation since April 1968 in Raichur, Manvi and Sindhanur taluks.

The Hampi variety of cotton, released for general cultivation in 1966-67, has caught the imagination of the farmers. A large area of more than 30,000 acres was brought under Hampi cotton in 1969-70. An intensive plant protection scheme covering more than 7,000 acres is in operation and pesticides costing Rs. 7.50 lakhs have so far been distributed free among the growers of cotton. Plant protection equipments are being supplied at 50 per cent subsidised rates.

There is considerable scope for development of cotton cultivation in the district, as more than 75,000 acres of this crop are under irrigated conditions. The Indian Cotton Mills Federation, Bombay, has taken up a survey work in this district. They are considering the question of establishing a cotton project, in about 1,500 acres, by shifting the present project from Gokak to Raichur.

Raichur has the sixth place among the sugarcane growing districts of the State. It covered an area of 12,869 acres in 1962-63 and 17,483 acres in 1966-67 as against 20,466 acres localised under the Left Bank Canal. The cultivation of this crop is mostly concentrated in Gangavati, Koppal and Sindhanur taluks, where irrigational facilities are available. It is planted in rows on a raised bed and the water is made to rest in the furrows.

It is a twelve-month crop and requires water all through the year. The yield of sugarcane per acre in the district is rather low when compared to the other districts of the State. The University of Agricultural Sciences, Hebbal, conducted a survey in the district in order to find out the reason for this low production per acre. It was found that the low production was the result of not observing the principle of rotation of crops, ploughing deep in the soil, not using improved strains and not maintaining proper space between the rows, etc. The Department of Agriculture has taken measures to advise the growers to remedy these defects.

Pulses

Among the pulses grown in the district, gram is important. It is grown as a Rabi crop in deep black soils in tank beds. It is also grown as an irrigated crop by liberally manuring and regularly watering the plant. The crop is generally sown in October and harvested in February. The gram crop does well on soils of clay loams and it is used in a variety of ways. Its foliage and grain are used, when green, as fodder and vegetable. The foliage is often sun-dried and stored and used when required as fodder. The ripe grain is used for dhal or eaten parched or made into sweetmeats. It is also the commonest food for horses and is an excellent food for fattening sheep. It is a valuable rotation crop fit for cultivation on dry and irrigated lands as it is a restorative like other leguminous groups. There are four varieties of grain, *viz.*, green gram or mung, redgram or tur, black gram or urd and horsegram.

Among the grams, redgram or tur is almost in daily use in the district. It is grown almost invariably as a mixed crop with the dry land cereals like ragi, jowar and saje. The conditions of soil, climate, the season for sowing and the method of preparation of soil are all the same as required for dry land cereals. Lands are ploughed once and furrowed 3 to 4 times. The seed rate per acre is 5 kgs. The total area under pulses in the district was 1,82,495 acres in 1962-63 and 1,95,827 acres in 1966-67. It is grown on medium black and red loamy soils.

Agricultural operations

Agricultural operations change according to the nature of the crop, the quantity of rainfall and the nature of the soil of the tract. They consist of preparing the soil by digging or ploughing, pulverising the soil, application of manures and fertilisers, sowing the processed seeds or planting seedlings, interculturing, weeding, watering the crop, protecting the plants against pests and diseases and birds and cattle, harvesting, preparing the crops for the market and storing. Added to these processes, the farmers are also to provide permanent improvements to their lands in order to better their fertility and increase the yield, by taking measures such as bunding, levelling, draining the excess water from the lands, reclaiming the lands, etc.

Ploughing is an age-old process. The traditional method of ploughing is still found in many parts of the district though there is an awareness on the part of the farmers to change over to better methods. This operation is done in order to aerate the soil and to trap and store water for the crops. The system of ploughing is almost uniform in red soils throughout the district. A field is ordinarily ploughed twice, lengthwise and across the land, with the help of the wooden or iron plough. The plough is so designed as to leave a deep furrow of 7 inches by 10 inches in the soil. Red soil, locally called "Masab", is generally ploughed at the rate of an acre per day with the help of a plough drawn by a pair of bullocks. The deep black soils crack heavily in hot weather and "plough themselves". So it may not be necessary to carry out deep ploughing in such soils. Research work carried out at Sholapur has also indicated that deep ploughing in black soils even once in six years is not much advantageous. In medium black soils, however, ploughing with the help of an iron plough yoked to four or six bullocks, once in three or four years, would be advantageous, as it may help to catch more moisture in the soil. Ploughing

In the case of hard soils (called 'Kharab' or 'Chowk'), the lands are ploughed every year with an eight-bullock plough. However, this is not the case in all places of the district, but only in places where the land is allowed to lie fallow for a long time. The preparation of soil for Khariff crop requires a four-bullock plough for every half an acre per day and for Rabi crop a twelve-bullock plough or a heavy iron plough worked by eight to twelve bullocks. The first rate soil of both Khariff and Rabi crops requires a heavy iron plough drawn by twelve bullocks if it is not ploughed for a period of ten to fifteen years. Till recently, the black soils were ploughed once in five to ten years. In view of the recent developments and package of practices followed in the field of agriculture, the fields are ordinarily ploughed once or twice every year. For ordinary soils, the land is not ploughed every year. It is sufficient if such lands are tilled with the help of levelling and sowing machines, and this practice is followed for all ordinary crops. But for all heavy irrigated crops, ploughing is done every year and for each crop. One week before sowing, water is allowed to the land and one or two shallow ploughings are done with the heavy iron plough. After this, the levelling plank is taken on the fields to prepare a good seed-bed.

Pulverisation of the soil is done by one of the two implements, viz., the beam harrow or the blade harrow. The blade harrow is used when the clods become wet and brittle by rain. "Kunte" is also used to break the clods and to level the ground. The work of levelling is done by a pair of bullocks four times over the same area of the Khariff soil and as many times as are necessary in the case of Rabi soil. Two, four, six and at times twelve Pulverisation

bullocks have to work in order to render the surface even. In case any hard clods escape the above operations, they are generally broken by wooden clubs. The ploughing is commenced in the month of February and the ploughed land allowed to remain untouched till the onset of monsoon in June when "kunte" is used to crush the clods.

Cleaning the field

Cleaning of the field is done by picking up the remnants of the previous crop like stubble, etc., and by using "kunte" in the case of red soils, to remove deep rooted weeds and grass. In some lands, root grasses called "nut" and "kurke" are common. The farmers have to dig and remove them to their very roots. They collect these grasses and burn them into ashes. The labour and cost of attending to the work of cleaning the fields are rather more in the case of black soils. Light works like picking the remnants are done by women and children.

Manuring

Manure is applied to soil, more or less, of every description. The red soil, owing to its inferior quality, requires manuring every year. In the past, dry crops were seldom manured as all the available manure was used for paddy fields. There are two ways of obtaining the manure required for the fields or of manuring the lands. The manure obtained by the first method is popularly called mixed manure. It is prepared by putting stubble, ashes, dust, dung and urine of cattle, and all such kinds of rubbish into a pit of three to four feet deep, specially dug for the purpose, and allowing the whole thing to decompose. When the ploughing work is commenced, this manure is carried to the fields in carts, heaped and, later on, evenly spread over the field and then mixed with the soil by means of a harrow. The second method of manuring the fields is by quartering sheep and goats on the fields for a few days. The shepherds are paid often in kind and sometimes in cash. This method is followed for seven to ten days in different portions of the land. The dung and urine of sheep and goats serve as good manure. In places where black soils were found, no manure was applied to fields, but those, who were well-to-do, manured their fields by quartering sheep and goats on their fields. Use of green manure and chemical fertilisers are now becoming popular. The farmers are recommended to treat the soil by applying the required dosage of chemical fertilisers by the time of preparing the soil. Accordingly, many of the farmers take up periodical application of chemical fertilisers as recommended by the Department.

Sowing

The seeds are sown, either by broadcasting or by the use of a drill, in lines. When the land is moist enough, the seeds are dibbled into the soil by hand. A seed drill worked by a man and a pair of bullocks can sow four to five acres a day in respect of Khariif crops, and three men and three pairs of bullocks can sow three acres of land in a day in the case of Rabi crops. In

some cases, sprouted seeds are sown and in case of crops like rice, seedlings are first raised and then they are transplanted. In respect of crops grown under irrigated conditions, ridges and furrows are formed in the fields and seeds are sown on the sides of the ridges by hand dibbling. Ordinarily 18 inches seed drills are used for sowing. Four acres, both of "Masab" and "Regada" grounds, can be sown with seeds by means of three men and six bullocks working the sowing implement steadily. Generally, sowing operations coincide with the outbreak of the monsoon. The farmers observe asterisms for determining the proper time of sowing the seeds. Sometimes, seeds are sown by dibbling behind the country plough. The seeds are dropped by hand uniformly in the plough furrow by women walking behind the plough. For purposes of sowing, the 'Tiphani' seed-drill is used. Seed drills with tines of 9 inches apart and 'Bukkha' of 2 inches apart from each tine are also used. This method is also followed in respect of crops like China-mung and Vyshakamung.

Interculturing is done to till or stir the soil in between the lines of the crop so as to remove weeds and prune the roots of the crop. Generally two or three hoes called the 'Kolpa' or Bullock hoe (kunte) are used with a pair of bullocks to remove weeds. Interculturing is done as many times as are necessary for the crop, depending upon the life and the habit of the growth of the crop. Care is taken not to stir the soil beyond two inches deep. Sometimes, interculturing is done by working with a small blade-harrow or sickle or 'dunti'. In respect of some crops, two hoeings and weedings are done to stir the soil and to remove weeds. The second hoeing is done one month after the first hoeing is completed. **Interculturing**

Intercultivation is essential for controlling weeds and loosening the soil. About two to three timely intercultivations are carried out during the life period of the crop. The first intercultivation is done with silt hoes. Weeds are ordinarily removed by interculturing, but some weeds escape the hoes and are to be removed by hand with the help of a weeding hook or sickle and this is generally done in respect of most of the crops. Weeding is also done with the help of the 'Khurpi' or hand-hoe. Harrowing is also done to remove weeds by working with the 'Bakhar' or blade-harrow with a pair of bullocks. **Weeding**

Earthing-up means digging the soil from near about the plants by hand or a plough or a blade-harrow and heaping the earth up at the base of the plant. It is essential in order to give support to the plant and keep the roots under the soil. This operation is done in respect of crops like sugarcane, hybrid maize, etc., after a month from the date of sowing. Earthing-up also controls the insect-pest called stem-borer to a certain extent. **Earthing-up**

Top-dressing

Top-dressing consists in applying of quick-acting manures and fertilisers on the surface of the soil and then mixing it up with the soil. This method is followed when the crop begins a rapid growth. The period of top-dressing varies from crop to crop. Special dosage of fertilisers is recommended for mixing it up with the soil in respect of almost all the hybrid varieties. This kind of operation was not widely prevalent in the district until recently.

Watering the crop

Irrigation is done from wells, tanks and canals. Water is lifted from the wells and rivers by working with water-lifts such as motes, persian wheels or oil and electric pumps and taken to the fields in small field channels. Two or three men are employed in order to lift and regulate the supply of water to the fields. In the case of canals, water is mostly taken by gravitational flow.

Fields are flooded with water for certain crops. In respect of crops grown in rows, water is taken in furrows. Careful and restricted irrigation is followed in order to avoid heavy attack by pests. Irrigation is ordinarily based on the soil type and the nature of the crop grown. Irrigation before the sowing of seeds and again at the milking or ripening stage or tusselling time is of special importance. Generally, water is given once in a week in respect of red soils and once in 10 or 12 days in respect of black soils. In respect of paddy crop, water is allowed to remain at a level of 2 inches evenly in the field and is let out once in a month or so. The fields are allowed to dry up for two to three days and once again watered to a level of 2 inches or 5 cms.

Crop protection

The farmers take precautionary measures to control pests and diseases of crops by spraying or dusting special insecticides or fungicides as recommended by the Department of Agriculture. Special care is taken to treat the seeds before they are sown. It was found customary in the district to rub the cotton seeds with fresh cowdung and ashes by hand before they were sown. The process of spraying or dusting the crop against pests and diseases at regular intervals is continued during the entire period of the growth of plants. The plants are also protected against birds and cattle by keeping constant watch during the season. Local methods of bird-scaring consist in laying of a long rope just above the earhead of the crop from one corner to the other and shaking the rope at intervals. In some places, high platforms are erected from which stones are hurled by means of slings in order to scare the birds.

Harvesting and thrashing

Harvesting and thrashing is one of the most important agricultural operations, next only to ploughing and sowing. The crops are harvested or reaped when they are fully ripe. The period of ripening varies from crop to crop. Food crops like paddy, jowar, bajra, wheat and gram are harvested by cutting

the crop close to the ground with the help of a sickle. They are then tied in bundles and stacked in the field for some time to dry. Later on they are carried on to the thrashing ground where they are threshed either on a clean ground or on mats to separate the grain from the hay. Again, bullocks are made to trample on the stacks so that the remaining grains are separated. The grains are separated from chaff by winnowing against the breeze.

Pulses are mostly cut as a whole and are directly taken to the thrashing ground. The foliage is dried and used as fodder. The vegetables are picked by hand. Cotton is usually picked by hand, cleaned and sent to the market-yard. Root crops like groundnut, potato, etc., are harvested by digging or picking the plants from the ground. Sometimes, the pods are left in the ground and in such cases the fields are harrowed with a two-tooth or a blade harrow. The pods come upon the surface and then they are collected and dried on the thrashing floor.

The most common agricultural implements, both indigenous and the improved variety, are the wooden and iron ploughs, ridges, bund formers, levellers and scrapers, sugarcane crushers and pans and jaggery making equipment. It was estimated that the district had about 1,00,000 ploughs, 230 sugarcane crushers, 130 oil engines, 185 tractors and about 80 *ghunns* in 1957-58 and the number of carts in the district was estimated at about 31,500.

According to the 1961 census figures, the district had 1,19,380 wooden ploughs, 10,189 iron ploughs, 201 tractors, 525 electric pumps for irrigation purposes, 115 oil engines and about 40 *ghunns*. Older types of agricultural implements are still found in many parts of the district in spite of the fact that some progress has been made in introducing modern improved implements. Several hand-tools are also in use for carrying on sundry agricultural operations. The indigenous ploughs are, however, giving place to iron ploughs. Tractor-drawn ploughs and disc-harrows are being gradually introduced in the ayacut area. Highly improved types of tractor-drawn implements are in use in some farms only. Recently, electric water-lifting pumps are replacing the oil engines. In Raichur district, the trend is towards mechanisation of agriculture.

The indigenous plough, made out of *jali* or *babul* wood, is still found in many parts of the district. The plough-share is made out of iron. The country plough in this district is almost of the same type as that found in other parts of the State except the fact that it is somewhat heavier and designed to be yoked to four pairs of bullocks. The heavier ploughs are needed to break the heavy black soils of the district. The light ploughs are yoked to a pair of bullocks, and are ordinarily used in red soils. These ploughs are designed in different sizes to suit different conditions. They open a triangular furrow. It is necessary to

Ploughs

Agricultural implements

plough the field several times. But they are not designed to vary the width or depth of the furrow. So, modern iron ploughs are introduced to overcome these two disadvantages. The country ploughs are simple and can be repaired by the village carpenter. In the case of iron ploughs, repair works are to be attended to by shops located at distant places of the district.

Seed drills

Seed drills are agricultural implements made for purposes of sowing seeds in straight lines in a field at uniform lengths. The furrows in which the seeds are deposited are opened by coulter. Three such coulters are fixed to a small log of wood. The seeds are allowed to pass through the hollow tubes into the soil. These tubes are connected to a single seed bowl at the top. It is usually drawn by a pair of bullocks. This implement is called the 'Tiphani' seed drill. This requires one man to drive the bullocks and another man to fill the bowl with seeds. Seed drills are light or heavy according to the season and the nature of the crop. For purposes of sowing cotton seeds, a seed drill called the 'Mogha' is generally used. This can easily be worked by a plough drawn by a pair of bullocks. A hollow perpendicular tube is attached to the plough by a thread and seeds are allowed to pass through the tube into the soil. This is operated upon by a man to drive the bullocks and a woman to fill the seed bowl with seeds. Seed drills of 18 inches are becoming popular. The seed-cum-fertiliser drill, presently introduced from Dharwar, is being improved upon and put to use in Sindhanur taluk as an experimental measure.

Harrows

In Raichur district, the common harrow in use is called 'Bakhar' or blade or dunti harrow. It is used to break the clods and bring the field to the proper condition of tilth to receive the seed. The blade harrow or 'Bakhar' consists of a mild steel blade of varying width and thickness fitted to a frame. Sometimes, it is used to remove weeds also. It is drawn by three to four pairs of bullocks and the number of bullocks may vary according to the nature of the soil. Two to six bullocks are yoked to the plough in order to render the hard soil smooth and even. When drawn by bullocks, the blade works at an angle resulting in stirring of the soil over the whole length of the blade. The depth of penetration could be varied by tying the harrow near or far from the yoke. It consists of a steel blade of about 2 inches to 5 inches in length and 3 inches in width. It can cultivate the land to a depth of $3\frac{1}{2}$ inches to 4 inches.

Hoes

The hoe is a miniature blade-harrow. It is used for interculturing of crops like jowar, bajra and other foodgrains. In Raichur, the 'Kolpa' or bullock hoe is popular. It is used to remove weeds in between the lines of crops, to stir the soil and to conserve moisture. It has a light steel frame fitted to a log of wood at an angle. It is worked with a pair of bullocks by a

man. Ordinarily, hoeing is done two to three times during the plant growth.

Besides the agricultural implements worked with the help of bullocks or power, there are a few more tools worked by hand, namely, axe, pick-axe, spade, weeding hook, sickle, etc. The bullock cart is still the common means of transport. Most of the interculturing is done by means of a weeding hook called 'kharpe'. Sprayers, capable of spraying 20 acres or more, mounted on a bullock cart, have been recently introduced.

Farm mechanisation requires heavy initial capital investment and skilled labour. The district is lacking in adequate bullock power. To make up this deficiency and to popularise the scheme of mechanisation of agriculture, farmers are being persuaded to purchase tractors. The Tungabhadra Project Board was advancing tractor-purchase loans to the ayacutdars from 1960-61 to the end of 1967-68. The amount of loans thus advanced by the Board during the period was as noted below :—

**Farm
mechanisation**

<i>Year</i>		<i>Rs.</i>
1960-61	.. ..	66,000
1961-62	.. ..	86,000
1962-63	.. ..	1,35,000
1963-64	.. ..	1,85,000
1964-65	.. ..	1,53,000
1965-66	.. ..	4,46,500
1966-67	.. ..	12,94,000
1967-68	.. ..	2,41,000

Some of the progressive farmers purchased tractors out of their own resources and a few farmers obtained loans from the scheduled banks for the purpose. The Agro-Industries Corporation has been supplying tractors on hire-purchase system to the farmers. To speed up the land development work in the ayacut area, the Government thought of establishing tractor service units in the ayacut taluks. Under this scheme, two Co-operative Land Development Societies have come into existence. As a result of all these measures, the number of tractors in the district has been enormously increasing. According to the figures supplied by the Deputy Director of Agriculture, Raichur, the number of tractors existing in different taluks of the district in 1968 was as given below :—

<i>Sl. No.</i>	<i>Name of taluk</i>		<i>No. of tractors</i>
1.	Deodurg	.. ..	19
2.	Kushtagi	.. ..	1
3.	Koppal	.. ..	38
4.	Lingsugur	.. ..	16
5.	Gangavati	.. ..	76
6.	Manvi	.. ..	118
7.	Raichur	.. ..	105
8.	Sindhanur	.. ..	74
9.	Yelburga	.. ..	11
Total			458
Additional tractors purchased during 1969			97
Grand Total			555

Thus, Raichur is one of the few districts in the State which possesses such a large number of tractors. The tractors are distributed mostly among the five ayacut taluks of the district where land development work is in progress. Among the taluks of the district, Manvi has the largest number of tractors and it is said that even among the taluks of the State as a whole, where tractors are largely used to carry on agricultural operations, Manvi taluk possesses the largest number of tractors. The total number of tractors in the district at present (1969) is 555. The total area ploughed by these tractors during the year 1968-69 was 79,000 acres.

**Sindhanur
Land
Development
Co-operative
Society**

The Sindhanur Land Development Co-operative Society was established in the year 1967 with a total share capital of Rs. 5,77,700. The Mysore Government has contributed a sum of Rs. 5,00,000 towards the share capital and another Rs. 50,000 for the construction of a workshop. The National Co-operative Development Corporation has also subscribed a sum of Rs. 50,000 towards the share capital of the Society, besides sanctioning a loan of Rs. 40,000 and a subsidy of Rs. 55,000. The Mysore State Agro-Industries Corporation, Bangalore, has also given a loan amounting to Rs. 64,504-90 to the Society. The assistance thus received is to be utilised for the establishment of the workshop.

The Society owns twenty-two tractors of different makes, *viz.*, six Massey-Ferguson, ten Escorts, five Mackormic International and one Hindustan. The capacity of these tractors varies from 32.5 H.P. to 50 H.P. In addition to these tractors, the Society possesses also a number of agricultural implements required for

different agricultural operations. The tractors and other agricultural implements are being made available to the farmers on hire basis as detailed below :—

Sl. No.	Operations	Rates per hour of work.		
		Rs.	P.	
1.	Ploughing	..	..	15—00
2.	Levelling	..	..	14—00
3.	Tilling	..	..	12—00
4.	Sowing	..	..	10—50
5.	Harrowing	..	..	10—50
6.	Puddling	..	..	25—00
7.	Mileage	..	..	0—50

(per running mile)

Any farmer in the district can get these implements on the rates noted above, though preference is ordinarily given to the members of the Society. The work turned out by these tractors during 1967-68 and 1968-69 was as under :—

Sl. No.	Type of work	1967-68	1968-69		
(In acres and guntas)					
1.	Levelling	..	..	292-28	597-20
2.	Ploughing	..	..	1,359-21	2,231-18
3.	Tilling	..	..	566-30	1,044-05
4.	Sowing	..	..	162-00	248-00
5.	Puddling	..	..	56-10	137-38
6.	Harrowing	..	..	..	72-00

It is proposed to establish a workshop at Sindhanur for repair work of tractors and agricultural implements, in view of the financial assistance given by the State Government and the National Co-operative Development Corporation.

The Land Development Co-operative Society, Manvi, was established in 1967 with a share capital of Rs. 6,58,900. It has 19 tractors and 46 different kinds of agricultural implements. The tractors are of different makes and of varying capacities, viz., ten Escorts—37, four Massey-Ferguson, four Mackormic International and one Hindustan. The capacities of these tractors also vary from 32.5 H.P. to 50.00 H.P. These tractors and

**Land
Development
Co-operative
Society, Manvi**

other agricultural implements are hired out to agriculturists on the following rates :—

For 32.5 H.P. tractors :

	Rs.
(a) Levelling ..	15 per hour
(b) Tilling ..	15 ”
(c) Ploughing ..	15 ”
(d) Disc-harrowing ..	15 ”
(e) Paddy puddling ..	25 ”
(f) Sowing ..	15 ”
(g) Local-kunte ..	15 ”
(h) Maize sheller ..	17 ”

For 50 H.P. tractors :

(a) Levelling ..	25 per hour
(b) Tilling ..	15 ”
(c) Ploughing ..	25 ”

Except in a few cases, the Society has almost prescribed a uniform rate for all operations. The work turned out by these tractors during 1968 and 1969 was as under :—

<i>Sl. No.</i>	<i>Work turned out</i>	1968	1969
(1)	Levelling under A.R.C ..	416 acres	916 acres
(2)	Levelling in general ..	130 ”	15 ”
(3)	Tilling ..	437 ”	273 ”
(4)	Ploughing ..	374 ”	279 ”
(5)	Sowing ..	213 ”	250 ”
(6)	Paddy puddling ..	..	101 ”
(7)	Diso-harrowing ..	..	40 ”
(8)	Maize sheller ..	..	95 hours

The major item of work turned out by the Society during 1968 and 1969 was the levelling of land taken up under a scheme sanctioned by the Agricultural Refinance Corporation. During the year 1969, the Society earned a sum of Rs. 2,40,000 in the form of hire charges as against Rs. 1,14,796 in 1967-68. The Agro-Industries Corporation has agreed to supply four more tractors to the Society on hire-purchase system. It is proposed to establish a repair/service centre and a custom service centre, for repairs of Society tractors and other agricultural implements under a composite scheme. For this purpose, the Society will get financial

assistance to a tune of Rs. 1,60,000 towards the purchase of machinery, equipment, tools, etc., construction of workshop and work-sheds, margin money for securing bank accommodation or working capital and construction of sheds for tractors, and another sum of Rs. 90,000 as subsidy towards the construction of work-sheds, managerial cost, construction of sheds for tractors and subsidy for tractor operators. In addition to the above, the Government have sanctioned an amount of Rs. 50,000 as share capital for taking up the construction of workshop and to purchase the required machinery. Two American Peace Corps volunteers and a German volunteer are, at present, assisting the Society in the proper maintenance of tractors, etc.

The spate of tractors in the district has brought in its wake several problems, mostly pertaining to the easy availability of spare parts and technical personnel to repair them, which cannot be solved by any individual member acting in his own individual capacity. In order to solve such problems encountered by the tractor owners of the district and to meet the increasing demand for tractors, an organisation has been formed to bring together all the tractor owners, Government officials concerned, dealers and manufacturers on a single platform. Tractor owners from all over the four districts of the Gulbarga Division attend these meetings. As a result of their efforts, dealers in tractors have opened a service/repair centre at Sindhanur and the manufacturers have instituted a phased training programme for the benefit of tractor owners and operators. In 1968-69 a tractor owners' convention was held at Manvi which was attended by more than 300 delegates from all the four districts of the Gulbarga Division.

Tractor-owners' Association

The tractors, bulldozers and other agricultural implements of the Department of Agriculture are placed under the control of an Agricultural Engineer who is stationed at Sindhanur and they are made available to farmers on a hire-basis. The Department is maintaining in all, twelve Massey-Ferguson tractors, eighteen Zettor tractors and one Escort tractor, two D-7 bulldozers, one C-100 bulldozer and two DT-54 bulldozers along with twelve trailers and two lorries. These agricultural implements and other machinery are hired out to the cultivators at the following rates :

Departmental tractors

Tractors

		Rs.	P.
(1) Levelling (0.1%)	..	153.00	per acre
(2) Levelling (1.2%)	..	221.00	"
(3) Ploughing	..	25.00	"
(4) Tilling	..	12.00	"
(5) Puddling	..	35.50	"
(6) Disc-harrowing	..	12.00	"
(7) Ridging	..	12.00	"
(8) Mileage	..	0.50	per mile
(9) Transportation of manure in the trailer.	..	0.85	per mile

<i>Bulldozers</i>		<i>Rs. P.</i>
(1) D-7 bulldozer	..	40.00 per hour
(2) C-100 ..	..	45.00 ..
(3) DT-54 ..	..	35.50 ..

Unlike the hire charges levied by the two Societies for the use of their tractors by the cultivators, the Department is hiring them on a more concessional basis. The physical progress achieved by these departmental tractors and bulldozers in 1967-68 and 1968-69 was as under :—

<i>Sl. No.</i>	<i>Work turned out</i>	<i>1967-68</i>	<i>1968-69</i>
1.	Levelling ..	626—02 acres	566—34 acres
2.	Ploughing ..	1,658—27 ..	2,265—24 ..
3.	Tilling ..	435—20 ..	581—12 ..
4.	Disc harrowing ..	64—00 ..	101—00 ..
5.	Ridging ..	31—00 ..	9—00 ..
6.	Puddling ..	6—00 ..	20—29 ..
7.	Seed drilling ..	...	1—00 ..
8.	Bulldozers ..	6,256—30 hours	1,948—30 hours

The major items of work turned out by the departmental tractors are ploughing and levelling. In addition to the above, the Department is equipped with 122 types of agricultural implements, like ridgers, cage wheels, multipurpose blades, mould-board ploughs, disc ploughs, tillers, paddy disc harrows, maize shellers, grain thrashers, low volume sprayers, seed planters, etc. They are made available to the farmers along with the tractors. The Department conducts demonstrations to impart the technical know-how about the machinery to the farmers. Six tractor operators' training courses were conducted during 1968-69 and 106 candidates received training in operating the tractors.

A separate scheme for popularisation of improved agricultural implements is in operation in the district since April 1963. The main aim of the scheme is to popularise the use of improved agricultural implements in rural areas by educating the farmers, through series of demonstrations, in the technical know-how. Under this scheme, five scrapers, two bund formers, twenty-five ridgers, two paddy puddlers, three Jagath ridgers, fifteen paddy weeders and ten seed treating tubes—in all 62 implements—have been distributed among the farmers, at 25 per cent subsidised rates. Sprayers and dusters of improved varieties are also supplied to farmers at 50 per cent subsidised rates. It is proposed to distribute 500 sprayers and 90 dusters in all the taluks of the

district. The Agro-Industries Corporation has so far supplied 61 tractors on hire-purchase system. The scheduled banks have advanced loans for the purchase of 63 tractors. The agricultural implements like Gurfar plough, puddler, Mysore bar point plough, etc., are being supplied by the Department at 25 per cent subsidised rates.

Efforts have been made by the Department of Agriculture Improved seeds

to introduce improved varieties of seeds all over the district. A medium-grained long duration strain of paddy known as NR-35 had been selected from an indigenous variety and being distributed in large quantities. Khariff jowar of an improved variety (D-340) had been released from the Tungabhadra Agricultural Development Centre, Dhadesnur. It is a selection from the local variety particularly suited for light irrigation. The grain is white and the stem is juicy. An erect variety of groundnut, TMV-2, can be grown both in Khariff and the Rabi seasons. It has been found to fare well. The most common varieties of cotton grown in this district are the Lakshmi and the Jayadhar varieties. The popular variety of sugarcane from Coimbatore, CO-419, is grown in Raichur district. Another variety, CO-467, has also been found to yield a good quality of cane and is now being tried on the demonstration plots. Different methods of obtaining seeds are adopted by the cultivators of Raichur district. Some progressive farmers preserve the seeds of healthy and vigorous plants till the time of next sowing. In some cases, seeds are obtained from societies and progressive farmers who grow their own seeds and have a surplus to sell. Improved strains of high-yielding varieties are also obtained from the different seed farms located in the district.

Use of good seeds is most essential for increasing crop yield. Good seed is defined as one which is pure, viable and also of the improved variety recommended for a particular tract. The improved variety is developed by bringing about botanical improvement by adopting various methods of plant breeding such as introduction from outside, selection from the available material, hybridisation and the like. As soon as the plant breeder finds out a promising variety or varieties, large-scale trials are conducted to test them at least for three years in the Research Station where they are developed. When they show a better performance than the existing varieties, they are released for district trials on the fields of cultivators in various tracts to decide the area to which the seeds are particularly suited. That variety of seed, which goes through these scientific trials successfully, becomes the recommended variety. It is released for general cultivation and steps are taken to multiply the seeds of such tested varieties on a bigger scale. It is neither practicable nor feasible to multiply the seeds of recommended varieties only through Government agencies, but at the same time it is necessary to multiply the seeds

in early stages on the departmental farms and at later stages on the farmers' fields. While the stages in the multiplication of seeds vary from crop to crop, multiplication of seeds of food crops like jowar, paddy, wheat, gram, etc., is done in three stages, *viz.*, (1) *Nucleus Seed*: This seed is produced in the Research Stations by the plant breeder himself; (2) *Foundation Seed*: Nucleus seed is multiplied in the departmental seed farms; and (3) *Registered Seed*: The foundation seed is multiplied on the fields of seed growers under the close supervision of the extension staff. In order to provide good seed, the State Government has decided to produce sufficient quantity of registered seeds of recommended variety of important food crops so as to cover 25 per cent of the total area under the crop. As a measure to achieve this object fully, a Central State Farm is located in this district.

The Director of Agriculture, in consultation with the research experts and the regional committee, has to decide on the particular strain of seeds to be used in a particular area. The nucleus seed in respect of the approved strain is supplied by the Agricultural Research Station to the government seed multiplication farms for multiplication. This foundation seed is supplied to the registered seed-growers only and not to cultivators direct. A registered seed-grower is a private cultivator who has entered into an agreement to sow his land with the foundation seed supplied by the seed multiplication farm exclusively and to cultivate the land under the supervision of the officers of the Agricultural Department to the requisite standard. He will ordinarily be under an obligation to sell the crop, if so required by the Agricultural Department, to the cultivators selected by the Department on terms mentioned in the agreement. The registered seed-grower should normally be a progressive farmer who is willing to sow a minimum of two and a maximum of five acres of his land with the foundation seed.

The seed-growers are registered by the Deputy Director of Agriculture of the district in consultation with the Extension Officers in the community development areas and village level workers. The village level workers are held responsible to see that the registered seed-growers, who have drawn the seed supply, really sow their lands with the seeds as agreed upon. The village-level workers and the Agricultural Extension Officers have to visit the fields of the registered seed-growers at periodical intervals to see that the cultivation is being carried on properly. The Assistant Director of Agriculture, whose office is located at Sindhanur, co-ordinates the work of these officers.

Seed Farms

There are four seed multiplication farms in Raichur district. The main object of these seed farms is to multiply and produce improved foundation seeds of the tract so as to cover a large area under improved varieties of crop and obtain better results.

The following are the seeds that are being multiplied in these seed farms : Paddy, D-340 Jowar, M-35-1 Jowar, Groundnut TMV-2, Assiriya Mwitunde Groundnut, NPH-1 Castor, HK-289 Navane, K-221-1 Navane, K-28 Wheat, Lermarojo, Chotolilerma, Safedlerma, Tur C-28, Ragi, Castor, Hampi Cotton and Lakshmi Cotton.

The Seed Multiplication Farm, Gangavati, was established in 1958 with an area of 62 acres and 7 guntas. Originally, this farm was intended for demonstration purposes. Now it is a multipurpose farm for demonstration purposes, seed multiplication, sugarcane breeding and agronomical trials conducted by the Indian Council of Agricultural Research. It has been converted into a medium Research Station. The Seed Multiplication Farm, Dhadesugur, in Sindhanur taluk, was established in 1958 with an area of 41 acres and 12 guntas. The Seed Farm at Guladhalli, in Koppal taluk, was established in 1969 with an area of 57 acres and four guntas. During the same year, another seed farm was established at Turkondona with an area of 83 acres and 33 guntas. The main agricultural farm of the district for rainfed cultivation is situated near Raichur town. This farm has been in existence for the last 35 years and has been a centre of dry farming activities in the district. The farm consists of a number of research sections carrying on research on various aspects of agriculture. This farm will be dealt with under Agricultural Research Station, Raichur.

The quantity of improved seeds produced in these seed farms from 1961-62 to 1965-66 was as detailed below :—

Sl. No.	Name of seed	1961-62	1962-63	1963-64	1964-65	1965-66
(In kilograms)						
1.	K. Jowar D-340 ..	N.A.	6,876	3,545	6,000	6,040
2.	Groundnut TMV-2 ..	1,000	1,727	1,880	765	4,000
3.	Sateria ..	2,000	174	1,350	3,300	..
4.	Tur C-28 ..	100	260	35	..	1,500
5.	Paddy HR-35 ..	7,500	12,508	2,435	7,500	8,035
6.	R. Jowar M-35-1 ..	1,875	1,909	85	3,575	8,300
7.	Wheat K-28 ..	560	863	145	1,200	2,015
8.	Gramochaffa ..	800	884	120	..	915
9.	Cotton ..	1,180	1,251	110	1,400	..
10.	Dhancha ..	..	181	..	..	..
11.	Paddy HR-19 ..	900	1,220	..	..	1,180
12.	Paddy DP-17 ..	600	410	..	..	..
13.	Paddy Italian ..	..	355	..	..	..
14.	Paddy DP-33 ..	..	27	..	..	..
15.	Safflower ..	..	443	..	..	..
16.	Castor ..	..	25	..	..	..
17.	Sugarcane ..	..	50,000	..	..	..
18.	R. Jowar ..	..	..	..	710	..

**Central State
Farm**

The Central State Farm is situated on either side of the distributary No. 54 of the Left Bank Canal of the Tungabhadra, about 54 miles from Raichur, at a distance of six kilometres from the main road of Raichur-Sindhanur, near Jawalgera village of Sindhanur taluk. It has an area of 7,569 acres. The Farm has begun its work from the year 1969. The main objectives of the Farm are (1) to produce and multiply high-yielding varieties of wheat, cotton, hybrid jowar, hybrid maize, hybrid bajra, sateria, ragi and other cereals and legumes like soyabeans, grams, etc. to meet the increased requirements of seeds of high-yielding varieties in the IV Plan period; (2) to serve as a demonstration farm in the Tungabhadra Project area so that farmers can understand the benefits of irrigation, fertilisers, seeds of high-yielding crops, use of agricultural machinery, etc; (3) to provide facilities for repairs and maintenance of agricultural implements, machines and other equipments; (4) to provide trained personnel to other farms in the use of agricultural machinery; and (5) to provide gainful employment to the people. A General Manager (at present called Director) is in charge of the Farm. He is assisted by a Mechanical Engineer, an Irrigation Engineer, a Deputy Director and an Administrative Officer.

The Soviet Union Government has given agricultural machinery worth about 51 lakhs of rupees to this farm. The machinery supplied includes bulldozers, different kinds of tractors, caterpillars, graders, scrapers, harvesters, cotton planters, etc., besides agricultural implements like ploughs, disc harrows, seed drills, fertiliser distributors, etc. This farm, when fully developed, will produce about 1,00,000 quintals of seeds of different high yielding varieties. At present, the farm work is in its initial stages.

**Seed Processing
Unit,
Sindhanur**

There is a Seed Processing Unit at Sindhanur established in 1956. The main purpose of starting this unit was to process and certify the hybrid seeds produced in Gulbarga Division. It is placed under the control of an Assistant Director of Agriculture with the required staff to assist him. It is a fairly well-equipped unit. It possesses a grain thrasher with a capacity of threshing three quintals per hour, two seed cleaners, two seed treaters, one maize sheller and one crop sprayer. Seeds of crops like Mexican wheat, paddy, soyabean, etc., are cleaned, processed and certified. Provision has also been made to store the processed seeds, which are unsold in the warehouse at Raichur. In 1967-68, a total quantity of 575.63 quintals of hybrid jowar, 117.18 quintals of hybrid bajra and 489.72½ quintals of hybrid maize was stored in the warehouse. The total income derived by processing the seeds was Rs. 31,811-30 in 1968-69 as against Rs. 13,159-74 in 1966-67. The unit also provides loans called "Q" loans and advances to the cultivators for the purchase of processed seeds. In 1967-68, the total

advances made by this unit was of the order of Rs. 5,68,876-50 as against Rs. 5,40,990 in 1966-67.

Seed treatment for paddy, Khariff jowar, Rabi jowar, cotton, groundnut, etc., is being done on a campaign basis before they are allowed to be sown. Agrosan G. N., Seed Tox, Captan, etc., are commonly employed for seed treatment.

The Tungabhadra Agricultural Development Centre, Dhadesugur, is also multiplying improved strains of seeds such as D-340 jowar, Taichung Native-1 and I.R-8 paddy, TMV-2 groundnut and castor seeds and is also producing parent seed materials for the production of hybrid jowar and hybrid bajra.

The standing crops take away much of the fertility of the soil for their growth and drain the soil of nutrients which ultimately reflect on lower yields even from a very fertile soil. Careful maintenance of soil nutrients in the earth is thus a most important factor for obtaining good yields. In addition to the crops removing the plant food, the soil loses its plant food in several other ways also; hence the need for manuring. Soil exhaustion can be avoided by a judicious rotation of crops, fallowing and by regular and adequate manuring, especially with organic manures.

**Increasing of
soil fertility**

Rotation of crops is growing a number of crops in a regular sequence on the same piece of land during a specified period. It helps to enrich the soil, maintain plant food, curb the growth of weeds and parasites, minimise soil erosion and conserve moisture. For inclusion in a rotation, crops should be carefully selected. Crops which enrich the soil, like legumes and green manures, are included in rotation. This method of rotating the crop has been traditionally practised in the district. Groundnut is rotated with Khariff jowar or cotton. Glyricidia, a green manure plant, is grown in the district as it gives to the soil more nitrogen than it absorbs from the soil for its growth by way of bacterial nodules. Cotton is rotated with jowar in heavy soils and with bajra in light soils. But the rotation is modified according to the district's seasonal conditions and the nature of the field. Pulses are valuable as rotation crops in dry and irrigated lands, as they are restorative of plant food like other leguminous crops.

**Rotation of
crops**

The raiyats are well aware that the cultivation of cotton is more profitable than jowar, but they are obliged to observe the rotation of crops to ensure their productiveness. The judicious alteration of cotton, jowar, gram and such other crops, contributes to the fertility of the soil and mutual productiveness of the different crops.

As per the results of research work, cultivation of jowar, groundnut and cotton by rotation is found to be more economical. Rabi jowar is rotated with cotton or groundnut or wheat.

Taking a leguminous crop like groundnut or gram in two or three years' rotation helps in increasing the yield of the succeeding crop.

Fallowing

Allowing the field to remain without any crop for a season or more between successive crops is generally called fallowing. Land may be allowed to remain fallow without cultivation or after first cultivation. Growing of green manure crops amounts to allowing the field to remain fallow. It helps to maintain soil fertility. In Raichur district, large tracts of land were allowed to remain fallow as current fallows for a few years. The area under current fallows in 1966-67 was 88,848 acres.

Mixed crops

Two or more crops are grown together on the same piece of land during the same period. This has been practised mostly in rain-fed areas of the district. It helps to keep up nitrogen in the soil. This practice is followed as a safeguard against the total failure of crops. The mixed crops naturally increase the plant food in the soil that is necessary for the growth of the main crop. In Raichur district, *togare* or tur is grown almost with dry land cereals like ragi, jola and sajjje. This practice is still in existence in the district. Castor, niger, lab-lab and jowar are some of the crops grown as mixed crops, but harvested at different periods. Groundnut, in rain-fed areas, is grown with redgram.

Manures

Plants require several elements for their good growth and high productivity. Of these, nitrogen, phosphorous and potassium are the most important and are generally found deficient in soils. Ordinarily, these three elements are supplied by manuring. Green manure, farmyard manure, compost and chemical manure are some of the types of manures available to the farmer in the district. It has been a practice with the cultivators to use mixed-manure and to quarter sheep and goats in the fields for several days. Green manure crops like sunnhemp, dhaincha, sesbania and pillipesera are also grown. The cultivation of glyricidia, as a good green manure crop, has been found profitable. The scope for development of compost-making in the old Hyderabad Karnatak area was very large. Adequate grants were provided for the continuation of the scheme by extending loans to municipalities for the intensification of compost production. The entire amount required for this scheme was obtained as a loan from the centre. The progress in the district regarding manufacture and distribution of urban compost was well maintained and a sum of Rs. 1,225 was spent for this purpose in 1958-59.

Development of local manurial resources and large and better utilisation of local resources for production of manure in rural areas was a notable feature of the 'grow more food' campaign. There were three main items coming under this scheme. The first item was the preparation of compost out of cattle and

agricultural waste in the rural areas. The scheme envisaged the training of village leaders in the methods of conservation of waste and preparation of compost. This work was proposed to be started in 85 National Extension Service Blocks in the whole State. Actually, the district of Raichur got the benefit in five blocks. The next item in the programme was the utilisation of village wastes and night soil for compost making. This work was entrusted in bigger villages to panchayats. Each panchayat was given an initial loan of Rs. 2,000 for this purpose. The panchayats were mainly responsible for utilisation of all waste and night soil under technical supervision. In the smaller panchayats, this work was entrusted to a scavenger, who would have to conserve and prepare compost from night soil. The cost of maintaining one scavenger was estimated to be about Rs. 500 per annum.

A separate scheme has been taken up in the district since April 1961 with the main object of intensifying the rural and urban compost production and preparation of night soil composts. It is also proposed to increase the area under green manure crops. Cow-dung manure is also being popularised. In 1968-69, nearly 12,500 urban compost and 2,41,120 rural compost pits were prepared. Green manure seeds of glyricidia, sunnhemp, dhaincha, sesbania, pillipesera were supplied to the tune of 560.55 quintals and 260 compost pits of green manure leaves were prepared. Seedlings or cuttings of green manure plants were distributed. In all, green manure crops were grown in about 9,000 acres. Glyricidia green manure plants are sown on bunds, waste lands, etc. During the Third Five-Year Plan, 17,000 tons of urban compost and 2,77,000 tons of rural compost were prepared. Green manure crops were grown in 8,000 acres. The financial outlay for this scheme was Rs. 1,16,000. The following table shows the details of urban and rural compost pits prepared in the district from 1961-62 to 1965-66 :—

<i>Particulars</i>	1961-62	1962-63	1963-64	1964-65	1965-66
Urban Compost pits	5,200	10,615	9,875	5,865	8,870
Rural Compost pits	8,300	..	18,438	75,826	89,936

Distribution of fertilisers to grow more food crops is one of **Fertilisers** the basic policies of the Agricultural Department. Out of about 75,000 tons of fertilisers to be procured for the entire State in 1959-60, 50,000 tons were actually distributed. The share of Raichur district in the scheme of distribution came to 2,360 tons. A margin of Rs. 30 per ton was allowed between the procurement price and the maximum retail price in respect of ammonium sulphate. This amount would not be sufficient to cover transport

and other charges in respect of certain taluk headquarters and other distribution centres which were far away from the railhead. In such cases, subsidies were given to meet the transportation charges.

It has been proved that the use of fertilisers for rainfed crops helps to develop the root system and thus makes it resistant to drought conditions. Compound and complex fertilisers are recommended for use in the district by the Agriculture Department. Chemical compounds are used as soil insecticides, seed treating chemicals, weed killers, etc. An experiment to explore the possibilities of replacement of farm-yard manure and cake partially or fully by inorganic fertilisers was conducted for a period of three years from 1960-61 to 1962-63. The results of this experiment consistently indicated that farm-yard manure and cake could be wholly replaced by inorganic fertilisers.

The Marketing Co-operative Societies in the district have taken up the work of distribution of fertilisers among the farmers. The total value of fertilisers distributed by the Marketing Societies and Primary Land Development Banks was Rs. 97.77 lakhs in 1968-69 as against Rs. 145.07 lakhs in 1967-68 and Rs. 90.5 lakhs in 1966-67. Further, they supplied improved seeds worth about Rs. 3.34 lakhs in 1967-68 and Rs. 3.63 lakhs in 1968-69 (upto end of 31st March 1969). They had also supplied insecticides worth Rs. 3.91 lakhs in 1967-68 and Rs. 2.70 lakhs in 1968-69. The following table shows the year-wise distribution of fertilisers in the district from 1965-66 to 1968-69 :—

Statement showing the distribution of fertilisers (in tons) in Raichur district from 1965-66 to 1968-69

Sl. No.	Name of fertiliser	1965-66	1966-67	1967-68		Total	1968-69		Total
				Through co-operative societies	Through other agencies		Through co-operative societies	Through other agencies	
1	2	3	4	5	6	7	8	9	10
1.	Ammonium Sulphate ..	3,869	7,172	6,473	1,920	8,393	7,948	2,855	10,803
2.	Urea ..	970	6,262	4,055	3,080	7,145	4,913	6,229	11,142
3.	A.S.N. ..	2,567	1,097	689	100	789	270	200	470
4.	C.A.N. ..	217	574	160	320	480	852	163	955
5.	Ammonium Phosphate ..	..	2,044	913	1,230	2,143	1,217	5,081	6,298
6.	Diammonium ..	..	..	411	81	491	1,236	54	1,290
7.	Ammonium Chloride ..	..	..	547	..	547	145	..	145
8.	M.O. Potash ..	..	..	620	..	620	371	1,382	1,753
9.	Superphosphate ..	4,676	5,753	..	5,860	5,860	..	11,363	11,363

The foregoing table reveals that the supply of fertilisers has registered a considerable increase during recent years. The awareness, on the part of the farmers, of the benefits of the use of fertilisers and the recommended package of practices and the Intensive Agricultural District Programme recently introduced in the district have increased the demand for fertilisers. In addition to the supplies of fertilisers by the Department, four private companies are also in the field. They are taking up demonstration plots on the fields of the farmers and popularising their products.

**Plant
protection**

It is natural that the standing crops are ordinarily exposed to several types of diseases and pests. The plant protection programme includes seed treatment, anti-rat campaign, control of soil and polyphagous pests, intensive plant protection measures, chemical weed control, etc. Seed treatment for paddy, khariff jowar, rabi jowar, cotton, groundnut, etc., is being done on a campaign basis before the sowing season. Chemicals like Agrosan G.N., Seed Tox, Captan, etc., are used for this purpose. There is a well organised campaign against rats. Chemicals like Zinc Phosphide, Ratafin, etc., are used for this purpose. Soil and polyphagous pests, including white ants, root grubs and root aphids and pests attacking more than one crop like army-worm, red-headed hairy caterpillar, Deccan wingless grasshopper, etc., are controlled by using chemicals like B.H.C. 10 per cent, Lindane, Heptachlor, Chlordane, Aldrin, Diadrin, Malathion, 50 per cent E.C., etc. Intensive plant protection measures are also taken up under high-yielding variety crops, including mass spraying. The broad-leafed weeds in paddy fields and striga in jowar fields are controlled by the use of 2 or 4-D weed killer, etc. The following are some of the diseases and pests commonly found in the district in respect of some of the important crops.

**Diseases
and pests**

Grain-smut (*Sphacelotheca sorghi*) is the most widely prevalent and destructive disease affecting the jowar crop. It is popularly known as *kadiga roga*. It is caused by the fungus *Sphacelotheca sorghi* which affects the ovaries. The loss due to this infection is sometimes 20 to 25 per cent of the crop. The disease can be diagnosed only when the earheads develop. Individual grains here and there on the earhead are converted into elongated white bodies which later turn grey in colour. These bodies are the sacs, filled with black dusty powder, which are the spores of the fungus. In severe cases of infection, all or most of the grains in the earhead will be affected. The infection takes place between the time of germination and the sprouting of the seedlings and cannot be made out until the plant develops earheads. The ideal treatment for this disease is sulphur dusting. These seeds should also be dusted with sulphur before sowing.

Loose-smut (*Sphacelotheca cruenta*) is another disease which affects jowar and which is often confused with the grain smut. But the species of the fungus causing the disease is different. The infected ears are somewhat looser than the healthy ones. Infection is observed on all the spikelets. The treatment of the seed before sowing with Sulphur dust, Ceresan, Agrosan, Arasan or Fermate controls the disease.

Head-smut is another disease which affects jowar. In this case, the whole earhead is affected. This is also a fungus disease. The membrane ruptures and exposes the black spores in mass which are easily disseminated by wind and other agencies. The fungus sometimes infects also the leaves surrounding the smutted earheads. All the infected plants should be removed completely as soon as the infection is noticed. Jowar should not be cultivated for a few years in fields severely infected with this disease.

Rust (*Puccinia purpurea*) is a very common disease affecting jowar, caused by the fungus *Puccinia purpurea*. Numerous small, bright and purplish-red spots appear on the leaves of the plant affected by this disease. The infection usually takes place on grown-up crops and increases as the crop reaches maturity. Lower and older leaves of the plant are severely affected. Cultivation of jowar successively year after year on the same field keeps the fungus alive. In severe cases of infection, rotation of crops should be practised.

Wilt disease is the most destructive disease affecting cotton and is caused by the fungus *Fusarium vacinifectum*. The disease is rampant in black cotton soils. Infection is observed in plants, seven to twenty days old, in patches which go on extending in the field. Symptoms become apparent when the plants are five to six weeks old. The lower leaves turn yellow, wilt and wither. The upper leaves also get rotten, leaving the stalks bare. The fungus plugs the water conducting vessels of the roots and stems and cuts off the supply of water to the plant. A brown or black discolouration can be clearly seen in the water-conducting vessels. The disease cannot be effectively controlled except by pulling out all the infected plants and destroying them. It is recommended to treat the seeds with Ceresan as a preventive measure.

Cotton
diseases

Black-arm is also a serious disease affecting cotton crop and is caused by bacteria. The leaves, petioles, stems, twigs and bolls of the plant are affected by this disease. Plants with poor growth in drought areas or in poor soil suffer most. Small and irregular water-soaked spots appear thickly scattered on the lower surface of the leaves and bolls. When the infection extends to the stems and twigs, it is known as black-arm disease. At this stage, black patches of varying sizes appear. The familiar

treatment to ward off this disease is to treat the seeds with three grams of Ceresan per kilogram as a preventive measure before they are sown.

Root-rot is a fungus disease which affects cotton. This is chiefly a seedling disease. Mature plants are also sometimes attacked. Soft yellow patches are noticed on the tender stems of the seedlings at the ground level. The patches later turn black and the seedlings collapse. Grown-up plants affected by this disease dry up and wither. The best way to control the disease is to practise rotation with non-susceptible crops.

Red-leaf blight is a physiological disease occurring on weak plants in poor and deficient soils. The leaves turn red, reddish brown or yellow and wither prematurely. The yield and the quality of lint are reduced to a great extent. Sulphur dusting is a popular remedy for this disease.

Groundnut diseases

Leaf spot is a major disease of the groundnut crop prevalent all over the district. This is a fungus disease which usually affects plants when they are one to two months old. The lower leaves are first attacked. The spots are brown to black in colour, nearly circular in shape, usually two to four millimetres in diameter and surrounded by a yellow ring. They may be found on the petioles and stems also. The leaves lose their colour and break off. In severe cases, the plants stand out with bare stalks. Infected plants do not develop mature nuts. About 30 to 50 per cent of the crop is lost due to this infection. The effective remedy to control the disease is to steep the seeds in 0.25 per cent Formalin solution for four hours. The crop should be thoroughly sprayed with one per cent Bordeaux mixture.

Root-rot is another fungus disease of a soil-dwelling variety. Usually the collar regions of the plant are infected near the ground level. The fungus passes on to the roots and into the seeds under-ground. Small brownish sclerotia, looking like ragi grains, develop at the infected regions and drop down in great numbers on the field. Rotation of crops is the only remedy to control the disease.

Tikka disease appears when the crop is 1½ to 2 months old. It can be traced by observing small brown spots on the leaves. Such infected crops are dusted with sulphur at the rate of 10-12 kgs. per acre.

Sugarcane diseases

Red-rot is the most serious disease of sugarcane caused by a fungus. The mature leaves in the middle of the shoot begin to fade, wither at the tip and extend down the margins leaving the centre green. Later, the whole cane withers and it becomes light and poor in juice. On splitting open a diseased cane, a sour

smell emanates from it and a reddish discolouration in elongated patches or streaks is observed at the internodes starting at the base. The disease spreads rapidly during rainfall. Spraying of one per cent Bordeaux mixture is the usual remedy for this disease.

Collar-rot is a disease caused by another fungus, but the symptoms of the disease are the same as found in the red-rot. The top leaves wither from the tip along the edges. On splitting the cane, the upper part is found to be pithy and dry in the centre. Sometimes, a central cavity, surrounded by a dry white flaky pith, is formed along each internode. Spraying of Bordeaux mixture is recommended to ward off this disease.

Smut is the most easily recognised sugarcane disease. It is prevalent more on thin canes than on old thick canes and is caused by a fungus. A long, curved and whip-like slender shoot, often several feet in length, is produced from the growing point of the cane. This abnormal growth is first covered by a silvery-white thin membrane which soon ruptures exposing the minute spores of the fungus as a dense mass of black dust. Remedies like immersing the cane-cuttings in Formalin solution before planting are employed to check the disease.

Mosaic disease is caused by an infective virus and is noticed by the peculiar molting of the leaves. The longitudinal streaks of green colour, caused by the paling of many small and ill-defined areas, are easily observed on the upper young leaves when held against light. This is a serious disease and can be warded off by cultivating resistant varieties of canes.

Blast or *Benki-roga* is the most common disease affecting Paddy paddy crop. The infection is noticed in three forms, on the diseases leaves and leaf-sheaths, on the stalk of the earheads and on the grains. Small pale and somewhat watery spots appear on the leaves and leaf sheaths. The spots increase in size and turn brown in colour, with ashy grey centres. They coalesce with one another thus involving the whole leaf. The infected leaves dry and shrivel. Treatment of the seed with chemicals like Agrosan is the common remedy for this disease. Bordeaux mixture is also sprayed on the infected crops to ward off the disease.

Stem-rot is prevalent in all the rice-growing areas of the district. But it is generally overlooked due to the obscurity of its symptoms. The infection is noticed on mature plants with slight discolouration at the base of the culms. On splitting open such culms, numerous minute, round and black shining bodies are found. Collection and destruction of all the infected straw and stubble reduces the incidence of this infection.

Bacterial-blight is another kind of paddy disease, found to affect mostly Taichung Native and IR-8 varieties of paddy. The infected leaves turn red and ultimately dry up. The disease is checked by spraying three grams of Streptocylene mixed in 25 gallons of water.

Insect pests

The following are the important insect pests affecting the crops in the district :

Paddy

(i) *Paddy-hispa* (*Hispa armigera*).—Locally termed as 'Hispa-henu', the insect occurs both in *Abi* and *Tabi* crops of paddy and at times causes serious damage by scarifying the epidermal layers of the paddy leaves. The local practice to prevent the spread of this pest is to clip and burn the leaves containing the larval and pupal stages of the insect. Dusting of B.H.C. 5 per cent has also been taken up by the farmers in recent years.

(ii) *Stem-borer* (*Schoenobius incertellus*).—This insect is more prevalent on *Tabi* paddy, especially if sown early. The larva of the insect bores into the stem of the paddy plant. This results in the formation of empty earheads in later stages, while the plants dry up if the attack occurs in younger stages. The local methods of control against this insect have not been very successful. Hence the nursery plants are sprayed with 4.5 ml. of Parathion and 50 per cent E.C. after 15 days of sowing. The crop is again sprayed at regular intervals with 100 grams of Cuman or 200 grams of Dithane.

(iii) *Grass-hoppers*.—These insect pests appear in large numbers in the months of July and November and eat away the leaves and earhead portions of the plants. In order to control these pests, the nursery plants are sprayed with 4.5 ml. of Parathion and 50 per cent E.C. and the crop is again sprayed at regular intervals with 100 grams of Cuman.

(iv) *Case-worm*.—These insects appear within 40 days after transplantation. The larva appears on the leaves and makes a case. It eats away the leaves and remains in the case. This pest is checked by spraying the crop at regular intervals with 4.5 ml. of Parathion and 50 per cent E.C. or 100 grams of Cuman or 200 grams of Dithane.

Sugarcane

(i) *Early shoot-borer* (*Chilo traea infuscatellus*).—This pest occurs on the late *eksal* crop planted in February—March. The younger larvae bore into the stalks of freshly germinated sugarcane, turning them into 'dead-hearts'. The cultivators have realised that by planting the crop in December-January, they are able to overcome the attack of early shoot-borer to a

large extent. The plants are sprayed with 2 per cent Endrin mixed with a litre of water.

(ii) *Top shoot-borer* (*Scirpophaga nivella*).—The incidence of this insect pest is not so severe as that of the early shoot-borer. It appears when the cane is 1½ to 2 months old. The attacked sugarcane plants present a bunchy appearance and their vertical growth virtually ceases. The cultivators in the district have not so far undertaken any definite and effective control measures against this pest. Therefore, they are now recommended to apply two per cent Endrin granules into whorls.

Jowar

(i) *Shoot-fly* (*Atherigona indica*).—Attack of this pest occurs both on the Kharif and Rabi crops, but is severe on the latter. The attack is only in the younger stages, soon after germination. It causes serious loss, specially when hybrid jowar is sown in December and January. Cultivators adopt a high seed rate to compensate for the loss of jowar seedlings on account of shoot-fly attack. They can also be controlled by applying Thimet granules to furrows before dibbling the seeds or by spraying one ounce of Endrin with four gallons of water once in five days from the date of sowing.

(ii) *Leaf-mite* (*Paratetranychus indicus*).—The attack of Leaf-mite is more severe on the Rabi crop than on the Kharif crop. The insects are found after 60 days of dibbling the seeds. They take shelter underneath the leaf and the leaf becomes red. No control measures were undertaken by the cultivators in the past against this pest. Now it is controlled by spraying wettable Sulphur or ½ kg. of Cosan with 32 gallons of water.

(iii) *Deccan Wingless Grass-hopper* (*Colmanva sphenoceros*).—This insect pest occurs only in certain areas of the district in an epidemic form. The attack is more on the Kharif crop. When the attack is severe, the cultivators re-sow the crop. But they are, to a little extent, also controlled by spraying one ounce of Malathion with six gallons of water.

(iv) *Flee-beetle*.—These insects appear immediately after germination and eat away the leaves and make large holes in them. They are killed by dusting B.H.C. 10 per cent at the rate of 8 to 10 kgs. per acre, after about 10 or 15 days of sowing.

(v) *Ear-head Bugs*.—Most of the hybrid jowar plots are attacked by ear-head bugs which eat up the grain. They are controlled by spraying one ounce of Malathion with six gallons of water. To control the attacks of minor pests and aphids on hybrid jowar, Malathion five per cent dust is sprayed after 15 days of sowing.

Groundnut

(i) *Groundnut Aphid* (*Aphid craccivora*).—This is the major insect pest of groundnut in this district. The severity of the attack coincides with the flowering period of the crop and hence the yields are much reduced.

(ii) *Root-rot*.—This is another kind of insect which dwells in the soil and infects the collar regions of the plant near the ground level; it gradually passes on into the roots and also into the stem. The plant ultimately dies away. The pest is checked by following rotation of crops.

Cotton

(i) *Spotted Bollworms* (*Earias fabia* and *Earias insulana*).—The caterpillars bore into the growing shoots, flower buds and bolls. The incidence of this pest results, on an average, in a loss of 40 to 60 per cent of the crop. The affected plants are uprooted and destroyed. The plants are dusted with two per cent Parathion or 10 per cent B.H.C. or Malathion. The work of spraying is taken up at two stages of plant growth.

(ii) *Jassids* (*Eupoasea devostanus*).—The leaf-hopper is a major pest of cotton in the district. Nymphs and adults suck the cell sap from the underside of the leaves with the result that their edges turn downwards and subsequently dry up. The affected crop does not grow well.

(iii) *Cotton Mites*.—These appear during the seedling stage of the crop and continue to remain till the harvest. They infest the lower surface of the leaves and also the stem. They lacrate the surface and stimulate a dense growth of whitish hairs, which prove fatal to the plant. They are checked by spraying Endrin or dusting 10 per cent B.H.C. twice a month.

Hybrid Maize

The insect pests like stem-borer, leaf-blight and rust attack the maize crop. In order to control these pests, a mixture of Endrin and Cuman is sprayed. Cob-caterpillars appear on the cobs, eat away the tender grains and thus destroy the crop. Carbaryl 50 per cent w.p. is mixed with water and sprayed to check their growth. As a measure of controlling the soil-insects, root-grubs, etc., Heptachlor six per cent dust is applied to the ridges before dibbling the seeds and, after 15 days of sowing, Malathion is dusted. Dusting the crop with B.H.C. 10 per cent helps to control the insect pests like top shoot-borers, flea-beetles and grass-hoppers.

Mexican Wheat

Mexican wheat is attacked by pests like stem-borer and rust before the crop attains the earhead stage. A mixture of Endrin and Cuman is sprayed against such pests. Rats also attack the crop and eat away the grains. Therefore a 'rat control campaign' is organised in the district in order to prevent their growth. Zinc-phospide and Ratafin chemicals are used for this purpose.

A separate scheme called plant protection scheme is in operation in the district since October 1961. The main object of this scheme is to reduce the loss in the yields of crops due to pests and diseases. The targets and achievements under this scheme in 1968-69 were as below :—

	Target	Achievement
1. Seed treatment ..	1,25,500 acres	1,50,289 acres
2. Control of field rats ..	1,50,000 ..	94,008 ..
3. Control of soil and polyphagous pests.	90,000 ..	39,614 ..
4. Intensive plant protection measures.	60,000 ..	64,085 ..
5. Weed control ..	1,000 ..	1,018 ..

A sum of Rs. 10,43,536 was spent under this scheme in 1968-69 as against the allotted amount of Rs. 18,14,530. Large quantities of chemicals were distributed among the cultivators in the district for purposes of plant protection against pests and diseases. The following statement indicates the quantum of chemicals distributed from 1966 to 1969 :—

Nature of Chemical	1965-66		1966-67	
	Dust	Ammonium sulphate	Dust	Ammonium sulphate
1	2	3	4	5
1. Dust form (in tons) ..	178	79,903.38	1,106.68	1,29,589.94
2. Liquid form (in litres) ..	750	26,890.32	7522-½	65,520.30

Nature of Chemical	1967-68		1968-69	
	Dust	Ammonium sulphate	Dust	Ammonium sulphate
1	6	7	8	9
1. Dust form (in tons) ..	497.550	2,76,664.25	1,150.41	90,000
2. Liquid form (in litres) ..	3,057-½	1,17,407.75	11,267.60	3,50,000

**Farmers'
Sons' Training
School,
Dhadesugur**

The Farmers' Sons' Training School, Dhadesugur, started in 1966, is attached to the Tungabhadra Development Centre, Dhadesugur. Farmers' sons and daughters are being trained in this school in batches every year. A ten months' course is conducted and training is imparted in improved agricultural methods, water management, growing of high-yielding variety crops, compost making, plant protection, etc. Ordinarily, the trained candidates settle on their own lands. The actual number of students trained in 1967 was 24 as against 25 in 1966. At present, 50 students are undergoing training. Training courses for tractor operators have been proposed to be conducted at this centre with the assistance of Messrs. Escorts Ltd.

**Farmers'
Training and
Education
Centre,
Odderhatti**

The Farmers' Training and Education Centre, Odderhatti, was started in 1967. The following institutional courses are being conducted at this centre :—

- (i) Training in high-yielding varieties to farmers ;
- (ii) Training in high-yielding variety programme to farm-women ;
- (iii) Training in high-yielding varieties to young farmers ;
- (iv) Production-cum-demonstration camps ; and
- (v) *Charcha Mandals*.

Admissions to the above courses are open only to the residents of the district of Raichur and the four ayacut taluks of Bellary district. More than 230 farmers were trained at this centre in 1968-69 as against 300 farmers in 1967-68. The training course in high-yielding variety programme is open to farm-women, the duration of the course being 10 days ; 307 women were trained at the centre in 1967-68. The duration of the course for training young farmers in high-yielding variety programme is three months. Forty-five young farmers attended this course in 1968-69 as against 67 in 1967-68.

**Gramsevaks'
Training
Centre,
Gangavati**

A Gramsevaks' Training Centre and a Home Science Wing are located at Gangavati. These institutions are imparting training to gramsevaks, block officers and farmers in improved agricultural practices and allied subjects. District training camps at the district, block and village levels are also being conducted here. The numbers of such camps conducted during the last three years were as given below :—

Year	At the district level	At the taluk level	At the circle or village level
1966-67	.. 2	9	346
1967-68	.. 3	27	195
1968-69	.. 3	27	450

The training programme includes refresher courses to gram-sevaks and training in Applied Nutrition Programme to gram-sevaks, members of mahila mandals, village-level workers, village panchayat members and associated women workers, up-graded courses for gram-sevaks and peripatetic training for farm-men and women. In 1967-68, in all, 225 training camps were conducted wherein 1,131 officials, 7,623 farm-men and 332 farm-women received training. The total number of training camps conducted in 1968-69 was 480.

The Regional Research Station, Raichur, was started as early as 1932 under the State Department of Agriculture. It was transferred to the University of Agricultural Sciences, Bangalore, on 1st October 1965. It is situated two miles away from the Raichur Railway Station on latitude 16.12° N. at an elevation of 1,278 feet above the mean sea level. It has an area of 72 hectares with red and black soils. The mean annual rainfall at the station, taking the average of 17 years, is 718 mm. The major crops grown in the station are jowar, cotton, wheat, groundnut, bajra and navane. The major research programme is to tackle the problems arising out of the introduction of new irrigation practices in the district. Research work on entomology and soil science is also concentrated at this station.

The research station has been recently re-organised and upgraded into a centre of activities in many branches of agricultural sciences. The results of the research work are released by the Directorate of Extension Services of the University. Field days are conducted once or twice a year and the activities of the station are explained to the farmers and their problems are freely discussed. The scientists of the research station lay out national demonstration plots on the fields of the farmers located around the research station. They also collaborate with the technical staff of the Agricultural Department and participate in their programmes whenever called for. The Chief Scientific Officer (Entomology), who co-ordinates the work on problems of various pests attacking different crops in Mysore State, is stationed here. Problems relating to soil management are also being tackled. This is the main station for conducting research on oilseeds and pulses. The station has recently released the following varieties of seeds:—

Groundnut : RS. 206 : It yields 30 to 40 per cent of more pods over TMV-2 and contains about 1.5 per cent more oil in the kernel. It is a bunch-type variety.

RS. 230 : It is better than Pondicherry-8 as it yields 30 to 40 per cent more crops and contains 2 per cent of more oil.

These two varieties of groundnut are found to be suitable to be grown under rainfed conditions.

Cotton : A new variety of cotton called Raichur Hatti or RS. 5117 has also been released for general cultivation. When compared with Western-1, it has 10 per cent more yielding capacity of seeds and the ginning out-turn is 11 per cent more.

A Horticulture and an Animal Science Wing are also attached to the Station. Research is also conducted on fruit and vegetable production. The Animal Science Wing is being strengthened.

**Medium
Research
Station,
Gangavati**

The Medium Research Station, Gangavati, was established in 1956 by the Government of the erstwhile Hyderabad State to investigate into problems connected with the raising of crops under irrigation so as to evolve suitable crop-growing practices for the area. This station now stands transferred to the University of Agricultural Sciences, Hebbal, Bangalore, with effect from October 1, 1965. This is one of the eleven medium-sized research stations under the control of the University. It has an area of 117 hectares, of which 13 hectares are under dry cultivation and 62 hectares under wet cultivation. The mean annual rainfall in the area, taking the average of 12 years, is 507 mm. The soils at this station are typical medium black with a depth ranging from one and a half feet to three feet. Some parts of the area are utilised by the farm unit section for demonstration purposes. The major crops grown in the station are sugarcane, paddy, gram and jowar. Research is mainly conducted on agronomic aspects of sugarcane cultivation, in addition to other high-yielding varieties. Model agronomic trials sponsored by the Indian Council of Agricultural Research are also being conducted at this station. Cultural, manurial and rotational experiments in the field of cultivation have been carried out on crops like Khariff jowar, cotton, groundnut, wheat and maize under light irrigation.

**Agricultural
Engineering
Institute,
Raichur**

The University of Agricultural Sciences, Bangalore, has set up an Agricultural Engineering Institute at the Regional Research Station, Raichur. This Institute is functioning here from the academic year 1969-70. At present the Institute is offering a three-year diploma course in soil and water management and farm machinery. Besides offering the three-year diploma course, the Institute will also help post-graduate students in their research work pertaining to soil and water management and farm machinery problems. They will work on the problems of the area to obtain their Master's and Ph.D. degrees in the subject. The work at the Institute will also be co-ordinated with research work in other subjects such as plant breeding, soil science, agronomy, animal

science, plant pathology, entomology, etc., of the Regional Research Station, located in the same campus. There will also be integration of teaching, research and extension activities and knowledge will be disseminated to the farmers of the area and their problems will be brought back to the laboratories of the Institute and the Research Station, so that they can be expeditiously tackled by the scientists working there.

There is a farm called the Tungabhadra Agricultural Development Centre at Dhadesugur, which was established for research on irrigated cultivation, mainly of the rainfed crops of the district, and to study the changes that take place in the properties of deep black cotton soils by switching over from dry to irrigated cultivation. The farm is situated at a distance of 16 miles south of Sindhanur. The main objectives of the station are :—

**Tungabhadra
Agricultural
Development
Centre,
Dhadesugur**

- (a) to work out the cropping pattern for the Tungabhadra Project ayacut ;
- (b) land development and irrigation studies ;
- (c) production of foundation seeds of different crops required in the ayacut area ;
- (d) to lay out trials on important crop studies ;
- (e) to study the climatic and water requirements of different crops in the ayacut area ;
- (f) to provide practical training for farmers' sons ; and
- (g) to provide practical training for tractor operators of the area.

With the completion of the Tungabhadra Project Left Bank Canal in Raichur district, 5,80,000 acres have come under irrigation. Nearly 80 per cent of this area is under light irrigation of rainfed crops. Since the cultivators of this tract had been accustomed to rainfed cultivation, it became necessary to induce them to switch over to irrigated cultivation. The Agricultural Development Centre helps to develop irrigated cultivation by evolving suitable strains of crops. The area of the farm is about 343 acres, of which 164 acres are under light irrigation and 15 acres under localised paddy and the remaining area is uncultivable. Even though the research station was established in 1943, the actual experimental work was started only in 1952-53, due to absence of irrigation facility. The different sections functioning at this station have specific programmes to be tackled.

The soils of the farm are deep black to shallow black cotton soils, with a clay percentage varying from 45 to 50 per cent. The soils along the river bank are light chalka; they are well drained and suitable for paddy crops. It is proposed to instal a sprinkler irrigation equipment in the farm to irrigate 50 acres of land all the year round so as to study the different sowing dates suited to the Tungabhadra Project ayacut. It is also proposed to establish a 'B' class meteorological observatory here. Trials on food and cash crops, sugar-beet and soyabeans have been taken up along with the agronomic practices on groundnut.

Crop varieties like jowar D-340 and paddy DP-17, etc., have been tried and released for cultivation in view of their better performance. Weedicide trials on hybrid jowar, hybrid maize, paddy and wheat were conducted and the use of weedicide was found more economical than hand weeding. Nucleus seeds required for the area are multiplied in the centre on a large scale. The total expenditure on the centre in 1968-69 was Rs. 2,05,356 as against Rs. 1,67,887 in 1966-67.

**Soil Testing
Laboratory**

A Soil Testing Laboratory is located at the Tungabhadra Agricultural Development Centre, Dhadesugur. The soil samples are analysed at this centre and test reports sent to the raiyats for follow-up of recommendations. In the year 1968-69 upto the end of August, more than 2,320 soil samples were analysed as against 2,971 samples in 1967-68. The laboratory can analyse about 15,000 samples per year on an average.

**High-yielding
variety
programme**

A high-yielding variety programme was taken up in the district during the summer of 1965-66 in an area of 856 acres under hybrid jowar and 349 acres under hybrid maize for increasing the food production in the district. The introduction of high-yielding varieties is one of the significant land-marks in the agricultural development of the district. The following crops have been introduced in the district under the high-yielding varieties programme (H.Y.P.): (1) Taichung Native-1 paddy, (2) hybrid jowar, (3) hybrid maize Deccan, (4) hybrid bajra HB-1 and (5) cotton. The first requisite for the success of this programme is good seeds. There are, at present, four seed farms in the district where multiplication of hybrid seeds has been taken up. The Central State Farm near Sindhanur has already commenced its work. This has given a tremendous fillip to the seed industry in Raichur district and there is also a seed processing unit at Sindhanur. In 1965-66, 1,305 acres of land were brought under hybrid jowar and hybrid maize. In 1966-67, an area of 9,121 acres was brought under hybrid varieties, which represented a fresh area of 7,265 acres over the previous year. The area brought under all hybrid varieties in 1968-69 was 1,03,765 acres as against 35,497 acres covered in 1967-68.

The progress of the high-yielding varieties programme in the district during the Kharif season of 1968-69 is presented below:—

Sl. No.	Target (in acres)	Achievement (in acres)	Percentage of achievement
1	5,714	5,714	57.14
2	10,000	5,000	54.54
3	13,000	13,107	100.6
4	29,500	19,250	65.25
Total	57,500	40,798	71.00

The target in respect of hybrid jowar could not be achieved in full due to untimely and inadequate rains. The performance of maize in black cotton soils was not encouraging due to lack of drainage facilities. Added to it, the prices for maize were not assured in the market. In respect of bajra, the coverage is slightly more than the target. The short-fall in respect of TN-1 and IR-8 paddy may be attributed to the fact that the quality of these grains cannot be compared with that of the superior variety of HR-35 and GEB-24. The year-wise progress in respect of hybrid varieties from 1966-67 to 1968-69 is shown below (including Kharif and Rabi seasons):—

Sl. No.	1966-67	1967-68	1968-69
1. Hybrid jowar	1,944	8,463	10,064
2. Hybrid maize	1,250	5,464	6,843
3. Hybrid bajra	306	6,207	16,212
4. TN-1 and IR-8 paddy	5,465	13,362	49,576
5. Mexican wheat	156	2,461	14,066
6. Cotton	..	..	7,004
Total	9,121	35,957	1,03,765

The increase in the total area under all varieties in 1968-69 had almost been thrice the total area in 1967-68. It is proposed to cover an area of 2,23,000 acres in 1969-70 and 3,50,000 acres in 1970-71 under this programme. These varieties have caught the imagination of the cultivators as the yield from these varieties is large in addition to the short duration required for their growth. If groundnut is popular in Manvi taluk, paddy is so in Gangavati taluk and hybrid jowar in Sindhannur taluk, while hybrid jowar and hybrid bajra are much favoured in Raichur taluk. The

statement given below shows the increase in production in metric tonnes during the Khariff season of 1968-69 due to the introduction of high-yielding varieties :—

Sl. No.	Varieties	Total production	Additional production due to high yielding varieties programme
1	2	3	4
(In metric tonnes)			
1.	Hybrid jowar	5,714.0	2,857.0
2.	Hybrid maize	4,150.5	2,727.0
3.	Hybrid bajra	10,485.5	7,864.2
4.	Taichung Native-1	48,125.0	19,250.0
Total ..		68,475.0	32,698.2

Out of the total production of 68,475 tonnes in 1968-69, the additional increase due to the implementation of the high-yielding varieties programme was of the order of 32,698 tonnes, which was nearly half of the total production. This increased production has undoubtedly helped to improve the economic position of the farmers.

In order to cover more and more areas under these high-yielding varieties, the hybrid seeds, particularly of hybrid jowar and bajra, were sold at subsidised rates so that the poor cultivators could easily purchase them and sow them in their fields. Even selling the seeds at subsidised rates would not help the farmers much unless timely and adequate loans are given to them to pursue the agricultural operations. Hence, in 1968-69, a sum of Rs. 5,77,607 was advanced to the farmers under this programme as against their estimated requirements of Rs. 1,65,73,400.

It is felt that there is need to evolve one or two standard mixtures in respect of the fertiliser dosage required for top dressing of crops, which will increase the yield. It is also considered desirable to draw up a programme for marketing these high-yielding products so that the farmers may readily take to the cultivation of these varieties. However, a large majority of the farmers are aware of the beneficial results of these high-yielding varieties.

**Intensive
Agricultural
District
Programme**

In order to meet all the requirements of the farmers in a package form, an Intensive Agricultural District Programme (or Package Programme as it is popularly called) was introduced in the district in November 1968-69, covering the five taluks of Raichur, Manvi, Sindhanur, Gangavati and Koppal, with an outlay of Rs. 1,30,000 for conducting demonstrations and

Rs. 2,00,000 for the purchase of mist blowers during 1968-69. It is a joint venture of the State and Central Governments and the technical assistance is provided by the Ford Foundation. Under this programme, an improved method of growing the crops has been formulated by combining all the practices which are conducive to increased production in the area. The advantages of adopting this method are demonstrated to the farmers by arranging demonstration plots on their own fields. The required technical know-how is provided to the farmers at various stages of plant growth, starting from the preparatory tillage to the harvesting of the crops, including the marketing of the produce. The important steps that are taken in raising the crops under this programme include proper tillage, use of good and treated seeds of improved variety, judicious application of manures and fertilisers and after-care measures in order to control pests and diseases. It is estimated that the agricultural production will go up by 50 per cent or even more by following the package of practices.

It is interesting to note that a major part of the credit facilities offered to the cultivators under this programme is in kind. In 1968-69, 215 mist blowers, along with their spare parts, were purchased for issue to the farmers on hire basis. It is proposed to popularise the use of threshers and cleaners as also maize shellers among the farmers of the ayacut area. A sum of Rs. 1,30,000 is proposed to be spent during 1969-70 for purposes of supplying agricultural inputs, free of cost, to the demonstration plots. Demonstration plots are also arranged to educate the farmers in the use of fertilisers. In the same way, adequate supplies of other requirements like improved seeds, chemicals for controlling pests and diseases and improved implements and tools are also proposed to be provided. Certain incentives like supply of agricultural requirements at subsidised rates, provision of storage and marketing facilities, etc., are also proposed under the programme for 1969-70. It has been proposed to spend Rs. 1,30,000 for conducting field demonstrations, Rs. 30,000 towards reclamation of acid and alkaline soils, Rs. 40,000 towards publicity and production of films, during the year. In addition, several new schemes like strengthening of soil-testing laboratory, distribution of seeds and plant protection chemicals for the development of horticulture, construction of new market yards, establishment of service centres to train farmers in power-operated chaff cutters, maize shellers, tractors, pest-proof machines, etc., research work on agronomic and plant protection problems, establishment of an independent information unit, preparation of village maps showing the watercourses and field channels, starting of a demonstration and mechanised unit at Sindhanur, construction of rural godowns of 100 tonnes storage capacity with the assistance of the National Co-operative Development Corporation, and construction of godowns for storing plant protection

equipments and insecticides at Koppal and Raichur, etc., have been proposed to be taken up under the programme during 1969-70.

**Intensive
Agricultural
Area
Programme**

An Intensive Agricultural Area Programme was also introduced in the district of Raichur in 1966-67. The cultivation of principal crops such as Khariff jowar, paddy and groundnut in the Khariff season, Rabi jowar and cotton in the Rabi season and paddy and groundnut in summer season are intensified under this programme by adopting all the package of practices. The main object of this programme is to maximise production of improved varieties of crops by using improved seeds, chemicals and fertilisers, etc. In 1968-69, an area of 3,21,935 acres was covered under this programme as against 4,81,363 acres in 1967-68 and 1,58,050 acres in 1966-67. The crop-wise progress achieved under the programme during 1968-69 (during the Khariff season only) is noted below :—

<i>Sl. No.</i>	<i>Variety</i>	<i>Target (in acres)</i>	<i>Achievement (in acres)</i>
(In Acres)			
1.	Khariff jowar	3,52,160	86,917
2.	„ paddy	17,360	16,792
3.	„ groundnut	1,43,720	46,975
Total ..		5,13,250	1,50,684

The shortfall in respect of Khariff jowar and groundnut was due to deficient rainfall during the sowing periods. Insufficient supply of seeds at subsidised rates, inadequate supply of agricultural credit, application of ill-balanced fertilisers, etc., are some of the other reasons attributed for the slow progress in achieving the target. During the Rabi and summer seasons of 1968-69 the programme was to cover an area of 1,50,926 acres under Rabi jowar, 31,000 acres under Rabi cotton, 5,000 acres under groundnut, 6,013 acres under paddy and 10,200 acres under ragi, navane and bajra.

Demonstration, in the process of agriculture, is a device employed by the Department of Agriculture to convince the farmers about the package of practices. Old habits die hard and ordinarily it is difficult to convince the farmers as to the usefulness of improved practices in agriculture. They can be more easily convinced through demonstrations than lectures and publications. So, the Department of Agriculture has undertaken the demonstration method to convince the cultivators about the potentiality of any variety introduced under high-yielding variety and intensive agricultural area programmes. Demonstrations also help to cover large areas under improved varieties at a rapid pace. They are ordinarily laid out on $\frac{1}{2}$ acre to $1\frac{1}{2}$ acre plots

on the fields of the farmers and all the required inputs are given free to them. The Central and State Governments provide the funds required for taking up such demonstration plots. Demonstrations are conducted in the use of improved seeds, use of chemical fertilisers, in preparation of rural and urban compost manures, use of farmyard manure, use of modern agricultural implements, etc. National demonstration plots are also introduced to maximise production per unit area of one acre by taking to double and triple cropping programmes. Demonstrations under the high yielding varieties programme were laid out in respect of hybrid jowar, hybrid bajra, hybrid maize, high-yielding paddy, NPH-1 castor, Mexican wheat, Lakshmi cotton, Hampi cotton, Poorna ragi, etc. The number of demonstration plots laid out in the district under the high-yielding variety and intensive agricultural area programmes between 1966-67 and 1969-70 were as follows :—

<i>Year</i>	<i>No. of demonstrations under H.Y.P.</i>	<i>No. of demonstrations under I.A.A.P.</i>
1966-67 ..	481	278
1967-68 ..	1,324	251
1968-69 ..	1,454	144
1969-70 ..	608	423

In order to find out the suitability of new types of fertilisers, three demonstration plots were laid out in 1968-69. Soil samples were taken from the farmers' fields and the results of the analysis were made known before hand and the fertiliser doses were fixed.

Under the National Demonstration Programme referred to above, one-acre plots were selected in the district for demonstration purposes. The Government of India are financing these demonstrations at the rate of Rs. 400 for each two-crop demonstration and Rs. 500 for each three-crop demonstration. Nine such demonstrations were laid out in the district during the past three years. In 1968-69, three demonstration plots were laid out one each in Raichur, Sindhanur and Koppal taluks, to show that three crops could be raised on the same piece of land in a year's duration. For this purpose, only short duration crops were selected. These demonstrations, conducted under the high yielding varieties and intensive agricultural area programmes, covered an area of about two hectares.

A multiple crop demonstration scheme was also introduced in the district in April 1968, first in Manvi taluk and then in Sindhanur taluk, in order to convince the farmers that they could raise two or more crops in a year on the same piece of land and get the maximum yield by following the package of practices. In Manvi and Sindhanur blocks, four and eight demonstrations

under high-yielding varieties programme and six and 12 under intensive agricultural area programme were laid out in 1968-69 and 1969-70 respectively.

Whenever new varieties of crops are introduced, they are invariably tried on demonstration plots and the cultivators are convinced about the adoptability of such varieties.

**Integrated
Oilseed
Scheme**

The Integrated Oilseed Scheme aims at increasing the production of oilseeds like groundnut, castor, safflower, sesamum and linseed. It lays greater emphasis on groundnut and castor. Measures like double cropping, multiplication of short duration mutant castor, plant protection measures, etc., have been taken up in the district. The area covered under this package programme in 1968-69 was 49,500 acres of summer crop and 59,900 acres of Khariff crop. During the same year, 782 tons of dust and 1,276 litres of liquid forms of chemicals were distributed at subsidised rates.

**Maximisation of
groundnut
production**

A scheme for maximisation of groundnut production has been sponsored by the Government of India. It is in operation in the irrigated taluks of Raichur, Manvi, Sindhanur, Gangavati and Koppal since July 1967. The area covered under this scheme in 1968-69 was 1,09,500 acres as against the targetted figure of 1,20,000. The progress of the scheme in the district during the Khariff season of 1969-70 is as follows :—

		<i>Target</i>	<i>Achievement</i>
		(In Acres)	
Area under improved seeds	..	70,000	45,000
„ seed treatment	..	35,000	30,000
„ fertilisers	..	70,000	30,000
„ plant protection	..	70,000	10,000

**Sugarcane
Development
Scheme**

The Sugarcane Development Scheme is in operation in Koppal and Gangavati taluks of the district since April 1963. The scheme aims at increasing the sugarcane production by introducing suitable high yielding varieties of seeds and following the package of practices. The yield per acre in the district is low when compared with that of other contiguous districts. In order to find out the reasons for such low production per acre, the University of Agricultural Sciences conducted a survey in the district. The results of the survey and such other details have already been dealt with under crops. The suggestions of the survey team have been scrupulously followed.

In 1968-69, an area of 13,372 acres was covered under the scheme. Under nurseries, 691 acres were covered. Nearly 20 half-field demonstration plots, 692 single item demonstration plots

and 20 free demonstration plots were laid out on the fields of the farmers during the year. In order to encourage the farmers to maximise production, crop competitions were conducted at district and State levels and prizes were awarded to the deserving farmers. The progress achieved under the scheme during 1968-69 was as follows :—

<i>Particulars</i>	<i>Target</i>	<i>Achievement</i>
Compost pits prepared	40,000	4,075
Number of sets distributed	160	336
Area surveyed under plant protection scheme	10,000 acres	14,655.21 acres
Area treated under plant protection scheme	5,000 acres	5,826 acres
Training camps conducted	10	15
Fertilisers distributed .. ..	..	6,415 tons

The scheme for 1969-70 envisages the establishment of seed nurseries, demonstrations on various aspects of sugarcane cultivation, compost drive, supply of improved implements and organising cane competitions.

The Department of Agriculture is publishing information leaflets, booklets, hand bills, etc., to educate the farmers of the district on seasonal conditions, package of practices to be followed, demonstration plots, intensive agricultural district and high yielding-variety programmes, forecasts on pests and diseases, requirements of fertilisers and chemicals and such other season-wise information.

Out of the total number of 1,338 co-operative societies in the district, 634 are agricultural credit societies, 41 are farming societies and 9 are primary land development banks. The total amount of loans advanced to the farmers by the agricultural credit societies during the year 1967-68 (as on 30th June 1968) was Rs. 1,48,50,000. The primary land development banks are also advancing loans to agriculturists for purposes of effecting general improvement to their lands, discharge of prior debts, sinking of wells, purchase of irrigation pump-sets and oil engines, levelling of lands and purchase of tractors and other agricultural implements, etc. The total amount of loans advanced by these banks under their various schemes such as general scheme, well scheme, irrigation pumpsets scheme and Agricultural Refinance Corporation Scheme was Rs. 2,94,85,666, as on 30th June 1969.

**Financial
assistance for
agriculture**

The details regarding the loans made available by the Agricultural Refinance Corporation, the Agro-Industries Corporation and the National Co-operative Development Corporation, etc., have already been dealt with. In addition to the loans advanced by the co-operatives and other agencies, the State Government

also distributed a sum of Rs. 41,52,938 in the form of *taccavi* loans for agricultural production and land improvement in the district during 1966-67.

**Co-operative
Farming
Societies**

As on 30th June 1969, there were 41 co-operative farming societies in the district with a total membership of 918 and a total paid-up share capital, including Government assistance, reserve and other funds, of Rs. 1,46,000. The total working capital of these societies stood at Rs. 12,47,000. These societies have, in all, 4,905 acres of land under their control in the district. Out of this total area, they have so far cultivated 345 acres of land. The Department of Agriculture is offering technical guidance to these societies in respect of control of pests and diseases, cropping programme and the like.

**Tonnage
Club**

A Tonnage Club was established at Sriramanagar, in Ganganavati taluk, in June 1968. It is run on the same lines as the Farmers' Forums. The main object of the club is to step up food production in the district by observing strictly the recommended package of practices. It is, at present, engaged in rendering useful service to the farmers by distributing improved varieties of seeds, undertaking large-scale plant protection campaigns with the assistance of the Department of Agriculture, supplying sprayers and other small agricultural implements to farmers on hire and subsidy basis, arranging training programmes in the use of power-operated and ordinary sprayers and taking samples for soil tests, etc. The Agricultural Department has provided the services of a Field Assistant to correlate the work of the Department with the activities of the club. In 1968-69, the club supplied chemicals and fertilisers on the basis of advance indents, distributed 10 quintals of paddy among the farmers who had taken up cultivation of paddy in alkaline and saline affected lands, undertook large-scale plant protection operations in an area of 2,000 acres, arranged crop competitions at taluk and district levels and instituted various incentive measures to popularise high-yielding varieties of crops like paddy, sugarcane, hybrid maize, hybrid jowar, poorna ragi, etc. An interesting feature of the club is that it provides great scope for participation of farmers in its activities.

HORTICULTURE

The district had not been particularly known for any large-scale activity in the cultivation of fruits and vegetables. Except perhaps the local varieties of papaya, all the other varieties of fruits consumed in the district were brought from outside. During the summer season when the two rivers, the Krishna and the Tungabhadra, ran low, their sandy beds offered good opportunities for growing many varieties of water melon. Bananas were grown as a garden crop in isolated patches. Vegetables of

the English type were not grown but were imported from outside. Though the varieties of chillies grown were small, they were of great pungency and much relished as an ingredient of the spices and other culinary preparations that go to make the average man's meal. The vegetable that is common all over the district is the brinjal, which is of a thorny variety, but at the same time quite nourishing. During the rainy season, one can see the cultivation of other common vegetables like pumpkin, cucumber, gourds and greens of different kinds. All these vegetables are grown in small quantities and at no time had there been any export of these commodities outside the district.

There were some good gardens in the Anegundi area of Gangavati taluk in earlier times. There were also a few good citrus and banana gardens. Consequent on the irrigational potentialities created under the Tungabhadra Project ayacut area, there has been some noticeable improvement in the field of horticulture in recent years. The total area localised for *bagayat* cultivation under the Tungabhadra Left Bank Canal is 30,000 acres. The Public Works Department has created a potentiality upto one cusec for an area of 14,925 acres and water has been made available to 7,606 acres.

For the first few years, the Department of Horticulture was engaged in popularising the importance and utility of cultivation of fruits and vegetables and other garden crops to the ayacutdars, by laying out demonstration plots in Sindhanur, Gangavati and Manvi taluks. The area under fruit and vegetable crops during 1968-69 in the district was as given below :—

<i>Taluk</i>	<i>Fruit crop</i>	<i>Vegetable crop</i>
	(in acres and guntas)	
Gangavati ..	288-00	763-00
Sindhanur ...	109-10	763-00
Koppal ..	61-34	572-00

Taccavi loans were issued for growing fruits and vegetables, but the system was discontinued from 1965. A practice of irrigating fruit plants by canals and ring and basin systems in the ayacut area and by lift irrigation in the rainfed area is in vogue.

The following statement shows the potential created by the Public Works Department and the area irrigated and developed

under *bagayat* in the Tungabhadra Project ayacut area (left bank) in 1967-68 :—

(In acres)

Name of taluk	Potential created upto one cusec	Extent of area to which water was made available	Area developed as bagayat	Area actually covered under horticultural plants as on 31-12-1967
Koppal ..	175	34	34	34
Gangavati ..	4,704	4,704	1,113	716
Sindhanur ..	5,190	1,003	970	466
Manvi ..	4,856	1,865	577	389
Total ..	14,925	7,606	2,694	1,605

As against this, in 1968-69, an area of 2,220 acres had been covered under gardens and water was made available to a total area of about 15,646 acres.

In the Tungabhadra Project area, a systematic horticultural activity was noticed with the stationing of an Assistant Director of Horticulture at Munirabad in Koppal taluk. Till then, gardening was unknown and was alien to many of the cultivators in the project area. A programme was drawn up to introduce horticultural crops in an area of nearly 30,000 acres, on a phased programme, in keeping with the extension of irrigational facilities. With that object in view, 20 units, comprising three demonstration plots of one acre each, under mango, coconut and miscellaneous fruit plants and 15 vegetable demonstration plots in selected villages of the Koppal, Gangavati and Sindhanur taluks, were established. More than one lakh of green manure plants and other plants of economic importance were supplied. An orchard and a nursery have been established near Gangavati town for the propagation of fruit plants and for raising seedlings in order to supply them to the cultivators in the Tungabhadra ayacut area.

**Orchard-cum-
Nursery,
Munirabad**

There is an orchard-cum-nursery at Munirabad which is one of the three large-scale orchards established in the district. It is functioning since 1959 with an area of 29 acres, out of which 18 acres are at present under cultivation. The soil in the area covered by the orchard is the chocolate brown sort. Plants like coconut, sapota, guava, lime, mango, mosambi, jack, papaya and pomegranate are raised in the orchard. It is seen that coconut plants thrive well in black cotton soils. The following table

shows the particulars of seedlings and fruit plants of different vegetable and fruit crops supplied from 1960-61 to the end of 1966-67:—

Year	Vegetable	Green	Avenue	Fruit	Cocconi	Banana
	1	2	3	4	5	6
1960-61	76,810	16,262	1,787	11,526	..	..
1961-62	1,16,394	59,578	3,908	5,745	6,142	..
1962-63	3,45,925	57,900	1,353	5,745	1,748	94
1964-65	4,474	8,755	5,023	973	..	..
1965-66	52,396	8,400	172	1,114	2,489	..
1966-67	1,29,702	8,300	..	2,300	..	..

The main objects of the orchard-cum-nursery are to serve as a demonstration plot, to educate the public regarding the cultivation of fruits and vegetables and to impart practical knowledge on the subject to horticultural trainees. A sum of Rs. 3,217-63 was realised by the orchard through sales of the farm produce during 1967-68. Vegetables and other seedlings are raised and distributed to the rayats free of cost under a kitchen garden drive.

The Government Orchard, Odderatti, in Gangavati taluk, Government Orchard, Odderatti

was started in 1961 with an area of 40 acres. The soil type in the orchard is red loam. All varieties of fruit plants have been grown in the orchard. Mosambi, lime, sapota, guava, rasam and peddarasam varieties of mangoes, coconut, etc., are some of the important fruits grown. Banana and pineapple have been newly introduced. Cultivation of potato has also been taken up. Vegetable seedlings like tomato, brinjal, chillies, onion, knol-khol, cabbage, cauliflower, beet-root, etc., have been raised and supplied free of cost to the growers to create an interest in them in regard to vegetable cultivation. A sum of Rs. 5,469-14 was realised through sales of the farm produce in the year 1968-69. Nearly 8,690 coconut seeds have been sown in the orchard.

The Orchard-cum-Nursery, Sindhannur, was started in the year 1965 with an area of 24 acres and 11 guntas. The soil is of deep black cotton variety. Both fruits and vegetables are grown in the orchard. Coconut, mango, sapota and guava are some of the important fruit plants grown. Cucumber and Udipigulla variety of brinjal have been recently introduced. A sum of Rs. 343-03 was realised from the sale of these vegetables during 1968-69. Trials for introducing some new varieties of fruits and vegetables are being conducted. A large number of vegetable

Orchard-cum-Nursery, Sindhannur

seedlings were raised and distributed among the growers free of cost in order to encourage them to grow more and more vegetables.

**Horticultural
Training
School,
Munirabad**

A Horticultural Training School was started at Munirabad in the year 1960, with the main purpose of imparting training to youngsters who are interested in gardening. The duration of the course is one year. In the beginning, the duration of the course was 6 months and subsequently raised to one year according to the intensity and purpose of the training. Each trainee is paid Rs. 50 as stipend, with residential accommodation in the school campus itself. Training is imparted to students both in theory and practice of gardening. Study tours are also arranged so that the trainees would have a comparative picture of the horticultural development in different parts of the State. So far, fifteen batches of students have received training in this school. A sum of Rs. 16,051.72 was spent during 1967-68 towards the training programme.

It is proposed to start another 20-acre orchard in Manvi taluk so as to provide facilities for raising grape and potato plants which would, in the beginning, also serve as a demonstration plot. There is a small garden of 3.4 acres, planted with sapota and guava plants, in the premises of Sirvar Inspection Bungalow in Manvi taluk. Under the intensive agricultural district programme, a sum of Rs. 25,000 was allotted for the year 1969-70 for purposes of conducting demonstrations in raising fruits and vegetables. It is proposed to lay out 59 demonstration plots in grape, coconut, sapota, guava, mosambi and banana cultivation on the lands of the progressive farmers. Exhibitions and flower shows are arranged by the Tungabhadra Project authorities and the best exhibits are awarded suitable prizes. These exhibitions and shows are being conducted, on a large scale, both under the intensive agricultural district programme and the high-yielding varieties programme.

**Fruit
cultivation**

Fruit cultivation is gradually becoming popular in the irrigated tracts of the district where the supply of water is assured throughout the year. In 1967-68, the Department of Horticulture distributed 14,225 coconut seedlings, 14,095 different kinds of fruit plants and 86,303 banana suckers to ayacutdars. As a result of this distribution, coconut seedlings have been planted in an area of 296 acres and 10 guntas and fruit plants in an area of 242 acres and 20 guntas in the district. The soils in the taluks of Gangavati, Manvi, Sindhanur and parts of Raichur are ideally suited for the cultivation of fruits like banana, guava, sapota, grape and mango. On the other hand, citrus fruits and grapes thrive well in the soils of Deodurg, Raichur, Lingsugur and Kushtagi taluks. Very good citrus gardens are found in Hanumapur, Mudgal, Jalhalli and Kadlur villages of Deodurg

taluk. The total area covered under important fruit crops in different parts of the taluk in 1968 was as detailed below:—

Mango	688	acres
Sapota	147	"
Guava	247	"
Citrus	769	"
Pomegranate	8.28	"
Fig	11.28	"
Banana	1,011.2	"

All possible efforts are being made by the Department to popularise fruit cultivation in the district. A new scheme called the Citrus Fruit Cultivation Scheme has been introduced in the district recently. It is expected to cover an area of 200 acres under this scheme for growing citrus fruit plants. In order to meet the demand for fruits and vegetables from the urban area, a new scheme called the Quick-growing Vegetables and Fruits Scheme has also been introduced in the district. Under this scheme, quick-growing variety of seeds and seedlings of fruits like banana, guava, papaya, which are in great demand, are being distributed among those cultivators who have taken up vegetable and fruit cultivation within a radius of five miles from the limits of the towns at 50 per cent subsidised rates. Added to these effective measures, the Department of Horticulture has, on hand, yet another scheme called the Fruit Development Scheme, the main object of which is to establish new fruit gardens where irrigation facilities are available and rejuvenate the old ones by resorting to improved cultivation practices. Under this scheme, all the available facilities at the disposal of the Department have been made available to the cultivators. Technical knowledge as to the proper lay-out of new gardens, methods of sowing fruit seeds and planting fruit seedlings and protecting the plants against pests and diseases, etc., is freely made available to the cultivators at all stages of cultivation. As a result of all these measures, the cultivators in the district have now begun to feel the importance of growing fruits.

Vegetables are ordinarily grown as mixed crops. Vegetables like knol-khol, cabbage, cauliflower, carrot, beet-root, radish, beans and tomato thrive well in the district. Local indigenous varieties like brinjal, lady's finger, cluster beans and chillies are also grown. Improved seeds, both of the local indigenous varieties and the improved varieties, are being supplied by the Department at the rate of 100 to 200 kgs. every year. The area under vegetable cultivation in the district, in 1966-67, was 1,044.96 acres as against 852.89 acres in 1963-64. During the past ten years or so, new varieties like beans, cabbage, knol-khol, cauliflower and tomato have been introduced and are gaining popularity. Trials have shown that vegetables like cabbage and

cauliflower come up well if planted in September. Under the Quick-growing Vegetables and Fruits Scheme, the cultivators are supplied with seedlings, fertilisers and insecticides at 50 per cent subsidised rates. This benefit is extended only to those who grow vegetables and fruits within a radius of five miles from the town. Sweet potato is grown in Kushtagi and Yelburga taluks, while onion is grown as a commercial crop in parts of Raichur, Gangavati, Deodurg and Lingsugur taluks. There is a programme for developing the cultivation of chillies in Kushtagi, Koppal and Yelburga taluks.

A Kitchen Garden Scheme has been in operation in the district since 1967-68. The main purpose of this scheme is also to increase the production of vegetables in urban areas where the demand for vegetables is great. This scheme has been intensified in a few villages of Sindhanur, Gangavati and Manvi taluks. In 1967-68, nearly 1,740 kitchen gardens were taken up in the district, as demonstration gardens, in front of houses and vacant places where water was easily available. The purpose of having so many demonstration plots is to show clearly that the inhabitants of the towns can themselves take up the cultivation of vegetables in front of their houses.

Coconut cultivation was practically unknown to the people of this area in the past. It has been introduced only recently. It can thrive well in the black soils of the ayacut area under irrigated conditions. At the end of 1968, there were 18,155 coconut plants in the district. Most of these plants are planted along the bunds and borders of the lands of the cultivators. There is a great demand for coconut seedlings in spite of the fact that the Department of Horticulture is supplying 30,000 seedlings every year. Coconut seedlings are raised in all the four nurseries located in the district under the coconut development programme.

Horticultural Societies

Branches of the Mysore Horticultural Society have been started in Raichur, Manvi, Sindhanur, Gangavati and Koppal taluks. There is a proposal to start such branches in Kushtagi and Lingsugur taluks also. These branches supply seeds and plants, arrange lectures on horticultural topics, conduct fruit, vegetable and flower shows, hold field days, conduct training programmes and offer technical advice and guidance in laying out gardens. It has been proposed to organise Horticultural Produce Co-operative Societies in the Tungabhadra ayacut area.

Ornamental gardening

A scheme for the maintenance of existing parks and gardens and for development of new ones is in operation in the district since August 1960. It is a measure taken up by the Department of Horticulture for beautifying the area by planting ornamental and avenue trees. For this purpose, the Department is maintaining garden nurseries and supplying seedlings of ornamental

and avenue trees. There is a proposal to have such nurseries in each taluk. A large number of ornamental, economic and shade-tree plants are raised in these nurseries. Ornamental trees like cassia, tabaia, 'pride of India', etc., have also been propagated. There are several big ornamental gardens at the Tungabhadra dam site, the Kailas Guest House and Indrayan hill slopes. The circular pond near the dam is a main attraction to the tourists. It is proposed to raise ornamental nurseries at the hollow block in the project area over an area of 45 acres and river-side gardens between the left bank canal and the main river in about six acres.

The Japanese-type garden at Munnirabad, which is a novel

feature among ornamental gardens, is the first of its kind in the

State of Mysore. It is, on the whole, unlike any other gardens

in the State though there are a few similarities. It is slowly

coming up on the slopes of the Kailas Guest House adjacent to

the composite dam site at Munnirabad. It is being developed

without altering the topography of the area. It is to represent

deep valleys, streams, hill tops, lakes, ponds and such other

physical features of the land as are visible along the hill slopes

where rainfall is more. The garden resembles in all respects

Japan gardens, where levelling of lands is almost an impossible

task. A sum of Rs. 4.5 lakhs has been sanctioned by the

Government for its development and the work was started in the

year 1967. Out of the total allotted amount, a sum of Rs. 3.5

lakhs was to be spent by the Public Works Department for cons-

tructing five pavilions, two lanterns, 50 cement-concrete benches,

Japanese-type arch-shaped gates, five ponds, two artificial water-

falls, pagodas, bridges, circular ponds, etc., all representing

the features of a park in Japan and the balance of one lakh of

rupees by the Horticultural Department for raising the required

nurseries and planting them. Most of the civil works have been

completed and the work of the Department of Horticulture is in

its initial stage. It will be a great centre of attraction for the

tourists when fully developed.

Demonstration plots have been laid out by the Department of Horticulture in order to convince the cultivators about the use of green manure crops in improving the fertility of the soil and increasing the yield. Under the Intensive Agricultural District Programme, a sum of Rs. 25,000 has been allotted for the purpose of laying out horticultural demonstration plots. It is proposed to have 59 demonstration plots in respect of crops like grape, coconut, sapota, guava, mosambi and banana, at a cost of Rs. 22,000 during the year 1969-70.

As per the general survey conducted by the departmental authorities to assess the incidence of pests and diseases of fruit plants and vegetable crops in the ayacut area, it is seen that the effect of these pests and diseases are greatly felt by the cultiva-

Pests and diseases

Demonstration plots

Japanese-type Garden, Munnirabad

tors. A scheme for protecting the horticultural plants against insect pests and controlling their spread is in operation. Mango crop is ordinarily attacked by pests like mango-hopper, borer and fruit flies. In order to control these pests, D.D.T. is sprayed for two to three times at the time of blossom. In certain cases, spraying of Endrin is recommended.

Shooty-mould, an insect pest, attacks sapota. These insects are killed by spraying copper fungicide. Citrus plants generally get diseases like cancer scab and diabac. The branches of the infected plants are dried in sunshine and the twigs are removed and burnt. The common pests of citrus plants are mites, scales, borers and mildew. The standing crops are sprayed with Bordeaux mixture. They are controlled by spraying Parathion and later on by Malathion. Guava plants are infected by diseases like root-rot and scab. Spraying of Matacide 0.2 per cent is taken up as a measure to control the spread of these diseases to other plants.

The common diseases infecting the coconut plants in the district are *anabe-roga*, bud-rot and blight. It has been recommended to spray one per cent Bordeaux mixture over the infected plants in order to control the spread of the diseases. The insect pests like mites and beetles also attack the plants, which are harmful to their growth. In order to overcome these pests it is recommended to spray Malathion and dust D.D.T. at frequent intervals. Sulphur is applied to the soil around the base of the palm tree. The fig plants get a disease called leaf-rust and the spread of this disease is controlled by spraying fungicide.

There is a special squad of spraying attenders, stationed in different circles, to attend to spraying work and educate the public about the various pests and diseases of fruit plants.

The talukwise distribution of the area under fruit plants like mango, banana, citrus, guava, papaya, sapota, grape, etc., for the years 1963-64 to 1967-68 was as detailed below:—

Under Fruits					
<i>Taluk</i>	1963-64	1964-65	1965-66	1966-67	1967-68
(in acres and guntas)					
Raichur ..	61.15	63.20	63.15	70.20	70.31
Kushtagi ..	26.27	27.14	43.10	40.05	50.00
Yelburga ..	35.07	42.01	50.25	51.00	44.17
Lingsugur ..	28.02	36.14	42.34	47.09	58.13
Koppal ..	23.35	29.21	31.02	33.17	41.06
Deodurg ..	37.03	30.08	39.03	44.00	46.12
Total for Fruits ..	212.09	228.38	280.09	286.11	310.39

Under Vegetables

<i>Taluk</i>	1963-64	1964-65	1965-66	1966-67	1967-68
Raichur ..	158.13	168.38	182.08	184.15	228.14
Kushtagi ..	168.10	158.08	157.23	177.02	178.37
Yelburga ..	185.10	191.16	216.25	107.37	241.01
Lingsugur ..	194.37	197.06	202.14	199.02	214.30
Deodurg ..	147.19	171.35	161.00	179.33	183.14
Total for Vegetables*	854.09	887.23	819.30	984.09	1,046.16
Grand Total ..	1,066.18	1,115.61	1,099.39	1,270.20	1,356.55

ANIMAL HUSBANDRY

A farmer ordinarily keeps at least a pair of bullocks and a few cows, sheep and goats in order to carry on the agricultural operations and provide himself and his family members with milk. The dependence on cattle for agricultural operations is still great, despite some mechanisation of agriculture. Considering the size of the district, which occupies the third place among the nineteen districts of the State from the point of view of area, the number of livestock as revealed by the livestock census of 1966 is not large. But it must be remembered that the arid and dry nature of the district, which is frequently threatened by drought, and the excessive heat, are not ideal for a planned development of its livestock wealth. Even so, the Krishna valley breed of cattle, a medium-sized, spirited and virile breed, thrived in the district; but it is not now quite popular with the cultivators, both from the point of view of usefulness for agricultural purposes and yield of milk. The cultivators have all praise for the Khillar breed of cattle. With the extension of agricultural activities under the Tungabhadra Project, there is great scope for introducing the Khillar breed of cattle, and increasing attention is now being paid by the Department of Animal Husbandry and Veterinary Services to this aspect of its work. Care is being taken to see that only such breeds which are suitable to the soil, climate and other environmental conditions of the district are introduced or upgraded.

Animal
Husbandry

Finding fodder for cattle had been a major difficulty of the agriculturists. The kinds of grass grown were not of a nutritious type and the livestock had to depend upon silage. The harvest season, such as it is, is a good time for cattle since appreciable quantities of green fodder are available; at other times, they have to depend on stored fodder and the coarse varieties of grass.

*The area under vegetables includes the area sown more than once.

growing in patches. With the extension of irrigational facilities under the Tungabhadra Project, fodder cultivation has engaged the attention of the Department. A number of demonstration plots have been laid out in order to educate and encourage the farmers to grow fodder for cattle. The Goshala at Raichur has cultivated 15 acres of napier grass.

The following tables indicate the livestock population of the district as enumerated in the 1956 and 1966 livestock census :

1956 Census

<i>Sl. No.</i>	<i>Name of taluk</i>	<i>Cattle</i>	<i>Buffaloes</i>	<i>Sheep</i>	<i>Goats</i>	<i>Other live-stock</i>	<i>Poultry</i>
1	2	3	4	5	6	7	8
1.	Deolurg ..	58,076	12,140	27,614	20,816	2,118	27,862
2.	Gangavati	45,617	9,774	22,088	11,337	1,158	18,858
3.	Koppal ..	38,255	13,286	2,0988	10,971	725	17,193
4.	Kushtagi	62,662	14,066	18,865	13,847	1,179	19,146
5.	Lingsugur	74,420	16,543	41,369	27,011	1,500	22,415
6.	Manvi ..	46,430	11,513	23,855	13,840	2,043	19,012
7.	Raichur ..	40,771	11,693	19,569	9,573	2,002	16,855
8.	Sindhanur	38,365	8,760	14,321	10,209	974	10,820
9.	Yelburga ..	57,358	14,789	15,896	9,442	659	11,755
Total ..		4,61,954	1,12,564	2,04,565	1,27,046	12,358	1,63,916

1966 Census

<i>Sl. No.</i>	<i>Name of taluk</i>	<i>Cattle</i>	<i>Buffaloes</i>	<i>Sheep</i>	<i>Goats</i>	<i>Other live-stock</i>	<i>Poultry</i>
1	2	3	4	5	6	7	8
1.	Deolurg ..	54,950	11,241	28,218	16,765	1,988	16,813
2.	Gangavati	57,120	17,513	24,092	16,817	1,692	20,521
3.	Koppal ..	49,927	15,432	17,371	15,638	602	17,732
4.	Kushtagi	56,839	14,650	17,813	18,658	791	17,627
5.	Lingsugur	67,814	21,184	33,742	24,399	999	26,127
6.	Manvi ...	49,265	14,436	27,885	14,749	1,775	18,703
7.	Raichur ..	44,199	12,765	37,572	15,740	848	11,810
8.	Sindhanur	22,874	18,310	23,146	18,081	712	14,627
9.	Yelburga	39,666	12,073	15,842	13,471	1,366	13,401
Total ..		4,42,354	1,37,694	2,25,681	1,54,318	10,773	1,57,361

From the above tables, it can be seen that there has been no remarkable increase in the livestock population of the district over a period of ten years. The number of cattle and buffaloes per 1,000 persons in the district as per the 1966 mid-year livestock census was 366 and 114 respectively, while for every 100 hectares of net area sown there were 246 cattle and 790 buffaloes. As between the livestock population figures of 1956 and 1966, it can be seen that the cattle and poultry population show a downward trend while that of buffaloes, sheep and goats is on the increase. The low population in respect of cattle and poultry may be attributed to the meagre fodder resources and the hot climate, as also the increased use of mechanical implements. The increase in buffalo population may be due to the awareness on the part of the farmers, of the necessity to keep productive animals. With the advent of large-scale irrigation under the Tungabhadra Project, there is considerable scope for livestock development.

Bullocks are mainly used, as in other parts of the State, for heavier agricultural work on the farm. Whereas the cows and she-buffaloes are reared mainly for purposes of milk, they are sometimes used for lighter work on the fields. A majority of the livestock are of non-descript nature and the rest are of the Krishna valley and Khillar breeds. Among buffaloes, the Murrah buffaloes have become popular. Haryana cows have also been introduced. While a Khillar cow costs more than Rs. 500, the cost of a pair of bullocks of the same variety varies between Rs. 2,000 and 2,500. The farmers' preference is for the Khillar breed of cattle, both for their yield of milk and for their usefulness in agricultural operations. 'Deccani' breed of sheep and goats is popular in the district. The breeds of poultry, which are gaining popularity, are the white leghorn and hyline (hybrid).

The main sources of cattle supply in the rural areas are the weekly shandies and cattle fairs held in each taluk. These shandies are either managed by the municipal authorities or the Taluk Development Boards. The details of some of the largely attended cattle fairs in the district are as given below:—

<i>Sl. No.</i>	<i>Place</i>	<i>Taluk</i>	<i>Number of animals brought</i>	<i>Month when held</i>
1.	Jalhalli	Deodurg	8,000	April
2.	Naradagadde	Raichur	3,000	February—March
3.	Amaroshwar	Lingsugur	10,000	March
4.	Mansgal	Deodurg	5,000	May
5.	Neermanvi	Manvi	4,000	February

A cattle fair at Neermanvi has been newly started for a better supply of cattle to the farmers of the ayacut area and the entire expenditure, in this connection, is being met by the Department of Animal Husbandry and Veterinary Services. In order to attract a large number of healthy and well-built animals to the fairs, a system of awarding prizes has been instituted. Particulars of the two competitions held so far are given below :—

<i>Sl. No.</i>	<i>Particulars</i>	1967-68	1968-69
1.	Number of animals competed	200	300
2.	Number of prizes awarded	35	59
3.	Value of prizes	Rs. 2,900	Rs. 2,775
4.	Total amount spent	Rs. 5,499	Rs. 4,604

Veterinary Hospitals

In 1957-58, at the headquarters of the taluks of Raichur, Manvi, Sindhanur, Koppal and Gangavati, there were stationary veterinary hospitals, while at Deodurg and Kushtagi, there were touring billets, manned by graduates in veterinary science. At certain other places too, there were touring billets manned by locally trained personnel. Now, there are full-fledged veterinary dispensaries at all the taluk headquarters. There are three veterinary hospitals at Raichur, Sindhanur and Gangavati and seven veterinary dispensaries at Deodurg, Manvi, Lingsugur, Kushtagi, Yelburga, Koppal and Kanakgiri (Gangavati taluk). In addition to the above, there are 19 rural veterinary dispensaries at different places, *viz.*, Gunjalli and Gillesugur in Raichur taluk, Jalhalli in Deodurg taluk, Athanur, Sirvar, Kavital, Biagwat and Kurdi in Manvi taluk, Salgunda in Sindhanur taluk, Karatgi in Gangavati taluk, Erkalgad and Alawandi in Koppal taluk, Kuknur and Mangalur in Yelburga taluk, Hanamsagar and Malgitti in Kushtagi taluk and Maski, Gajjalagatta and Eachnal in Lingsugur taluk. Livestock from all over the district are brought to these hospitals and dispensaries for medical treatment.

There were not many professional cattle-breeders of importance in this district. The requirements of the agriculturists, both for milk and draught purposes, were met from the local cattle fairs or from those held in the neighbouring districts of Andhra Pradesh and also, to a certain extent, from the fairs held in the districts of Bellary and Chitradurga. Besides, the nomadic breeders from the contiguous areas have been paying periodical visits to some places in this district with bull-calves which they sell sometimes on an instalment basis.

A Cattle-cum-Sheep Breeding Farm has been established at Munirabad in the Koppal taluk in September 1953, with the specific object of upgrading and developing the breeds. The farm has an area of 565 acres and it has been put to use for various purposes, such as grazing—440 acres, for perennial crops—40 acres, for seasonal crops—5 acres, for roads and buildings—15 acres and for reclamation—65 acres. A provision of Rs. 1,80,200 was made for the development of this farm in 1968-69 as against Rs. 1,75,500 in 1966-67. A foundation stock of the Krishna valley breed of 45 cows and 2 bulls were first brought from the Cattle Breeding and Dairy Farm, Rajendranagar, Hyderabad, in the year 1955, and ten buffaloes and one bull were purchased in 1960 and sixteen buffaloes in 1962. In respect of the foundation stock of local variety of Bellary sheep, eleven rams, 85 ewes, 20 male lambs and 28 female lambs were purchased in 1956. A poultry unit, located at Allannagar, consisting of 35 hens, 3 cocks and 11 country hens was transferred to this farm in 1958. The number of livestock maintained in the farm is as follows :—

Cattle-cum-Sheep Breeding Farm, Munirabad

Sl. No.	Livestock	1966-67	1967-68	1968-69
1.	Cattle	185	200	213
2.	Buffaloes	84	81	80
3.	Sheep	198	140	167
4.	Poultry	5,015	1,216	1,503

The daily average yield of cows' milk in the farm now (1969) is 834.5 kgs. as against 723.7 kgs. in 1966-67, whereas the total production of cows' milk in 1968-69 was 3,00,042 kgs. as against 25,930.2 kgs. in 1966-67. But, in respect of buffaloes' milk, the average milk production fell from 1,783 kgs. in 1966-67 to 1,192.3 kgs. in 1968-69. The total production of milk in the farm has been gradually increasing.

The average yield of wool per sheep is estimated at 450 to 640 grams and the total production of wool in 1968-69 was 94.53 kgs. The average number of eggs laid per bird per year was 106 in 1967-68 as against 182 in 1966-67, and the total egg production was 19,696 (numbers) in 1968-69 upto the end of May. In 1967-68, 3,372 birds and 172 day-old chicks were sold in the farm as against 2,627 birds and 198 day-old chicks in 1966-67. In 1968-69, only 792 birds and 6 day-old chicks were sold. The farm is cultivating an area of 44.35 acres, under irrigation facilities, for the

production of fodder and other crops that are used as food for the farm animals. In 1968-69, upto the end of May, 3,20,796 kgs. of napier grass and 3,34,690 kgs. of hybrid napier and 15,043 kgs. of maize were produced. The farm has supplied 12 breeding bulls, 8 buffaloes and 74 rams during the past three years to *bona fide* breeders.

The total income of the farm from all these sources was Rs. 1,22,325.24 during 1967-68 as against an expenditure of Rs. 1,68,225.11, leaving a difference of expenditure over income of Rs. 45,899.47; the difference of expenditure over income in 1966-67 was only Rs. 3,565.36 and in 1968-69 Rs. 52,262.42. The increase in expenditure over the income may be attributed to the developmental activities undertaken in the farm.

**Centralised
Semen
Collection
Centre**

A Centralised Semen Collection Centre was established at Munirabad in 1968-69, with the main object of increasing the milk yield of the local cattle through artificial insemination with semen of exotic milch breeds and Murrah buffaloes of India. In addition, it also aims at preventing malnutrition of cattle and cattle diseases, and also at improving the local herd to yield more. It also aims at taking the work of fodder development and eradication of liver-fluke diseases. As the centre is in its initial stages, it is at present making use of the land and equipment of the Cattle-cum-Breeding Centre, Munirabad. The activities of the centre covers the entire ayacut area.

**Artificial
Insemination
Centres**

Greater importance is being attached to improvement of the breed of cattle by replacing the local variety. For this purpose, two main Artificial Insemination Centres have been established, one at Raichur and another at Gangavati, where Krishna valley and Sindhi bulls and Murrah buffaloes are kept for stud purposes. There are also four Artificial Insemination Sub-Centres at Raichur, Gangavati, Koppal and Sindhanur and three more have been opened recently at Manvi, Kanakgiri and Gajjala-ghatta. There is a proposal to start six more Artificial Insemination Sub-Centres in the ayacut area in order to strengthen the Centralised Semen Collection Centre, Munirabad, and ten more sub-centres in the rural veterinary dispensaries under the Fourth Five-Year Plan. Semen of cross-breed bulls and Murrah buffalo bulls is being used at all the existing centres.

**Free-Bull
Scheme**

A Free-Bull Scheme has been in operation in the district with the main purpose of developing the breed of cattle and to provide facilities to *bona fide* local and poor breeders to own high quality cattle. Under this scheme, which was introduced during the Second Five-Year Plan period, the Krishna valley and Khillar breeds and Murrah buffalo bulls are being distributed. During the Third Five-Year Plan period, 23 breeding bulls were distributed as against the targetted figure of 24. In 1966-67,

seven bulls were distributed as against the target of 10. The number of cows so far covered under this scheme by these bulls is 4,978.

A Cattle Development Unit was started in the district at Jawalgera in Sindhanur taluk in the year 1968. The unit is still in its initial stages. However, a total number of 928 animals were treated at this unit during 1968-69, the number of animals inseminated, animals castrated and animals inoculated being three, 65 and 2,029 respectively.

**Cattle
Development
Unit,
Jawalgera**

The total population of sheep and goats in the district was just over 3,30,000 in 1956, but in 1966 it had increased to over 4,19,000. These belong to what is popularly known as the 'Deccani' breed. They are of a medium size and are not particularly rich either in wool or in mutton. At the Munirabad farm, selective cross-breeding is being undertaken with imported Bikaner rams, and stud rams are also being supplied to the private breeders. There are two Sheep and Wool Extension Centres in the district, one at Ginigera and another at Koppal. They are under the control of the Superintendent, Sheep and Wool Development Scheme, Hospet. Under an Intensive Sheep Development Scheme, 899 Deccani ewes and 44 Deccani rams were supplied to 45 shepherds on the basis of 50 per cent subsidy and 50 per cent loan, at a total cost of Rs. 76,741, in 1965-66. During the same period, 273 Marwari cross and Deccani rams were also given to the shepherds in order to upgrade the local sheep.

**Sheep
development**

The total population of poultry in the district in 1966 was 1,57,361, as against 1,63,966 in 1956. The poultry development work is gradually gaining momentum as it can be taken up in a small way with a very limited investment. For maintaining and rearing of healthy and profitable stocks of poultry birds, the Government started a Poultry Extension Centre at Raichur in 1962-63 with a capacity of 250 layers. On an average, the centre is maintaining 125 layers, producing 54,358 eggs and 2,539 chicks and selling 1,844 birds. There is also a Regional Poultry Farm at Gangavati, established in 1965-66, with a capacity for maintaining 1,000 layers. On an average, the farm is maintaining 600 layers, producing 2,65,794 eggs and 12,527 chicks and selling 8,224 birds. In order to meet the increased demand for improved birds in the Gulbarga Division, the capacity of the farm has now been increased to 1,600 layers under a new breeding programme. These farms are also imparting training in poultry development to villagers, and so far 80 persons have received such training.

**Poultry
development**

**Applied
Nutrition
Programme**

There are four Applied Nutrition Programme Blocks in the district located in Gangavati, Kushtagi, Lingsugur and Yelburga taluks. The Applied Nutrition Programme Block at Gangavati was started in 1964-65 and at Kushtagi in 1967-68. At the Gangavati Block, 42 poultry units have been started as per the sanctioned strength, whereas at Kushtagi five out of the ten sanctioned units have been started and the rest are to be started in 1969-70. The number of eggs so far produced at the Gangavati Centre is 11,63,751 and at the Kushtagi Centre 15,356, out of which 28,345 and 1,140 eggs have been given free, for the feeding programme, from the two units respectively. These blocks also offer training to interested persons in poultry keeping. So far, eight villagers at Gangavati Block and 14 at Kushtagi Block have received training. The other two blocks, viz., Lingsugur and Yelburga, are proposed to be strengthened with poultry units shortly.

**Development
through
Co-operatives**

There are three Milk Producers' Co-operative Societies in the district, one each in Lingsugur, Raichur and Gangavati taluks. A Taluk Poultry Farmers' Co-operative Society has been established at Gangavati in 1964. It is preparing poultry mashes and rearing hyline sexed day-old chicks. It has a feed-mix plant donated by OXFOM, which is used for preparing poultry mashes for sale to the poultry breeders in Raichur, Gulbarga and Bellary districts. The average quantity of poultry mashes sold in a year is about 450 tons. The Society also sold poultry feed valued at Rs. 1,86,021 in the year 1967-68. The Society gets hyline sexed day-old chicks and rears them for a period of 2½ months and then sells them to the members of the Society and others. The average daily production of eggs is about 1,100 and the Society sells them to its members and other poultry units located in and around the district. The total value of chicks sold by the Society in 1967-68 was Rs. 15,522, as against Rs. 11,362 in 1966-67. In order to strengthen the financial position of the Society, the Tungabhadra Project Board has sanctioned a loan of Rs. 10,000 towards the working capital of the former. The Animal Husbandry Department has disbursed a sum of Rs. 3,900 through the Society to the poultry breeders under the crash programme.

**Rinderpest
Eradication
Scheme**

A Rinderpest Eradication Scheme, sponsored by the Government of India in March 1968, was implemented in the district by a special staff of the Animal Husbandry Department and the work was completed by the end of July 1968. As a result of this programme, it is stated that the district is now free from Rinderpest. Particulars of the number of villages visited and the percentage of coverage under the scheme were as noted below :—

<i>Taluk</i>	<i>No. of villages visited</i>	<i>No. of animals vaccinated</i>	<i>Percentage covered</i>
Deodurg ..	165	36,891	61
Raichur ..	155	34,463	64
Manvi ..	160	46,386	77
Lingsugur ..	175	63,482	74
Yalburga ..	140	62,026	85
Kushtagi ..	166	68,569	91
Sindhaur ..	134	45,567	82.9
Koppal ..	143	54,689	84
Gangavati ..	145	50,465	70
Total ..	1,383	4,62,538	76.9

The most common animal diseases in Raichur district are **Animal haemorrhagic septicaemia, black-quarter and foot and mouth diseases** among cattle, haemorrhagic septicaemia and sheep-pox among sheep and ranikhet and leucosis among poultry. Round-worm is the most common and frequent parasitic disease found among all the species. Occasionally, tape-worm infestation is also found. In order to combat liver fluke disease, a separate unit has been started at Munirabad.

The Animal Husbandry Department has been vigilant in the matter of taking preventive measures against animal diseases. Timely inoculations are carried out in all the areas affected and every effort is made to see that the diseases do not spread. It was reported that during 1957-58, the inoculations against haemorrhagic septicaemia in the district numbered 22,381, against black-quarter 12,587, against sheep-pox 6,270 and against ranikhet disease 6,983. Now all these infectious and parasitic diseases are controlled by timely preventive inoculations and dosing. In 1968-69, in all, 94,763 cases were treated, 2,783 animals were castrated and 925 villages were visited by the staff of the Department as against 77,316 cases, 3,100 castrations and 801 villages respectively in 1967-68. It is reported that during 1968-69, the number of animals inoculated for haemorrhagic septicaemia in the district numbered 38,577, for black-quarter 29,296, for sheep-pox 11,480 and for ranikhet disease 6,494. With all these preventive measures undertaken by the Department, it is stated that the mortality from these diseases over a period of ten years had never been more than 0.2 per cent on an average. All types of constitutional diseases of animals and birds are being treated and surgical operations conducted in the veterinary institutions located in different parts of the district.

**Goshala,
Raichur**

The Goshala at Raichur, established in 1943, is being managed by the Goshala Committee, Maliyabad, and financed by donations from philanthropists. There are two units under the management of the committee; the main unit is located at Raichur and the other at Maliyabad. The dry and non-productive cows are kept at the Maliyabad dry-farm. It has 1,100 acres of waste land, which is at present used as pasture land, where cattle are allowed to graze. Out of the total area of waste land, nearly 30 acres are cultivated for growing crops like jowar, bajra and maize, and another 15 acres are under hybrid napier grass. The Goshala aims at improving the breed of cows and maintaining only high milk-yielding cows by gradually replacing the local breed. The Central Gosamvardhan Council of New Delhi has sanctioned a loan of Rs. 20,000 to this institution for purposes of purchasing 39 Gir cows from Gujarat, which are reputed as high milk-yielding cows. The milk produced at the Goshala is being sold to the inhabitants of Raichur town. The average daily milk production is about 170 litres.

**Fodder
development**

Fodder development is a pre-requisite for the development of cattle. There is vast scope for fodder development in the district, especially in the irrigated tracts. Improved grasses like hybrid napier and leguminous varieties have been introduced in the irrigated tracts. In order to popularise fodder cultivation among the cultivators, particularly in respect of hybrid varieties, the Department of Animal Husbandry laid out 17 demonstration plots on the fields of the farmers at a cost of Rs. 2,600 between 1966-67 and 1968-69, in the ayacut taluks of Raichur, Manvi, Sindhanur, Gangavati and Koppal. The result of these plots convinced the farmers of the usefulness of taking to the cultivation of hybrid variety grasses on their own fields. As a further incentive to such farmers, the Department supplied 40,000 root slips at subsidised rates in 1968-69. The hybrid napier grass has become popular among the agriculturists of the district. Hybrid maize is also grown in the district in a large area, which supplies fodder to the cattle.

FISHERIES

Situated in a dry zone, with not many perennial sheets of water, Raichur district cannot lay claim to any great wealth in fisheries. Most of the fisheries are confined to the Krishna and the Tungabhadra rivers and the Tungabhadra Left Bank Canal; a few of the tanks of the district have small quantities of fish. There are about 900 tanks with a water-spread area of about 15,060 acres in the district, of which 10 tanks with a water-spread of about 6,094 acres provide perennial sources of water to the fish. Of these 10 tanks, 7 are fed by the Tungabhadra Left Bank Canal.

Among the important varieties of fish found are the carp, the cat fish, murels and eels. Among the carp, the *Kemmeenu* (*Labeo fimbriatus*) and the *Kagemeenu* (*Labeo calbasu*) are prized commercially on account of their size and succulent flesh. Major carps like Catla, Rohu and Mrigal and the common carp (*Cyrinus carpio*) have been introduced and they are thriving well in the district. Fingerlings of these two varieties occur abundantly in the rivers and canals during the period from July to September. Other varieties found are the *Hetteparki* (*Barbus sarana*), *Hellu* (*Barbus tor*), *Bele-meenu* (*Cirrihina reba*) and *Arja* (*Cirrihina fulungee*). Among the cat fishes, which are in good demand in the market, are the *Thoravi* (*Mystus seenghala*), the *Balemeenu* (*Wallago attu*) which grows to a size of nearly six feet and is commonly called the fresh water shark, the *Kurdimeenu* (*Bagarius bagarius*) commonly called the blind fish on account of its small eyes compared to its large body, and the *Arasinaguggarige* (*Rita hestata*). Among the murels, the most common are the *Kutchu* (*Ophiocephalus striatus*), the *Hoomeenu* (*Ophiocephalus marulius*), and the *Korava* (*Ophiocephalus gachua*). The two important kinds of eels found in the district are the *Malagu* and the *Havumeenu*.

The fishing is done by means of cast nets, gill nets, hooks, long line and fish traps. Leather coracles are chiefly used for fishing in deep waters.

Cast nets.—These are the most common in the district. The diameter of the net and the size of the mesh vary considerably depending upon the water area. The diameter of the net varies from 15 to 20 feet and the size of the mesh from $\frac{1}{4}$ " to $1\frac{1}{2}$ ". The large-sized mesh nets are used for catching big fish. The net is made of yarn. It has a circular shape with a hauling-in-cord, passing through an aperture in the centre. From the upper end of the cord, about fifteen subsidiary cords radiate towards the margin of the net where they are all tied to a thick marginal cord termed foot-rope. On the foot rope, iron sinkers are inserted at intervals. The net is operated by one man. The sinkers drag the net to the bottom, trapping the fish underneath. The fisherman slowly drags up the hauling-in-cord, and the margin of the net comes closer and closer towards the centre, when he finally takes the net out of the water.

Gill nets.—These are commonly used for fishing in river pools and in reservoirs. In this net, the fish get caught in the mesh of the net when trying to swim through; the fish is able to get its head through a mesh, but not its body and when it attempts to free itself the twine slips under the gill cover and the fish becomes gilled. The nets are rectangular in shape, being made of hemp or yarn. Nets made of nylon are also now used by the fishermen.

The length of the net varies from 50 to 200 feet and breadth from 3 to 10 feet. The mesh size varies from 1" to 3". The net, when cast in water, stands more or less vertically like a wall. It is laid either in the night or in the early morning and is collected after the sun rise. The fishermen go into the deeper waters for operating gill nets.

Drag nets.—These are nets used both in rivers and tanks. The mesh size varies from $\frac{1}{2}$ " to 1" and the length of the net from 80 to 100 feet, and breadth 8 to 10 feet. The nets are made of thick thread of cotton or hemp.

Long line.—The line consists of a coir cord, varying from 200 to 300 feet in length. Short and strong cotton threads, to the free ends of which hooks are tied, are attached to the coir cord at intervals of about two to three feet. The baits offered are mostly frogs, small live fish, prawns and earthworms. Long lines are operated both in shallow and deep waters.

Fish traps.—These are basket-traps made out of bamboos with special design. They are fixed against small channels and streams and they catch mostly small fish.

The main fishing communities in the district are the Besthas, Bhovis and the Ambigas. But fishermen as such number only about 2,500 in the district. The fishing season is not spread throughout the year and, therefore, the fishermen have perforce to work as labourers in the fields during the season when there is no fishing. In order to encourage pisciculture among these persons, the Department is supplying fish fingerlings for wells and tanks in the vicinity. In 1968-69, nearly 1,600 fish fingerlings were supplied, and stocked in three irrigation wells in Deodurg taluk and ten wells in Kushtagi taluk. During the same year, one hundred common carp fingerlings were supplied to pisciculturists to be stocked in two irrigation wells selected by the Department of Fisheries.

**Fish Farm,
Munirabad**

The Tungabhadra Reservoir promises immense scope for the development of fisheries in Raichur district. The reservoir and the channels will be ideal for this development. A fish farm is established at Munirabad near the Tungabhadra Reservoir. The farm has an area of five acres for breeding and stocking fish. There are five nursery ponds, four stock ponds, one square cement plastered pond and one round pond where fish seeds are reared and stocked. During 1968-69, a set of cement cisterns with four partitions were constructed at a total cost of Rs. 9,968 and in the year 1969-70, another set of cement cisterns with two partitions is proposed to be constructed. According to a comprehensive

scheme, which envisages intensive stocking and exploitation as also exploring new avenues of marketing, fifty lakhs of major carp fry were imported from Calcutta for stocking in the reservoir. They were reared in the nursery ponds for a period of two to three months till they attained the size of fingerlings, and later they were lifted from the ponds and taken to tanks and wells where they are stocked. During the year 1967-68, good yearlings were purchased for breeding purposes. During 1968-69, some ornamental fish, like gold fish, etc., were imported from Kurnool and stocked in the nursery ponds for purposes of breeding. It is stated that natural breeding among these fish has now commenced. Besides this, indigenous varieties are being annually collected and released in the reservoir. The requisite number of fish fry are reared to the fingerling stage in the Munirabad and Hospet fish farms before being stocked in the reservoir.

Efforts are being made by the Department of Fisheries for taking up breeding work in the district. In 1968-69, good yearlings were purchased and controlled breeding work was conducted and 5,350 hatchings were produced. Induced breeding of major carps has been taken up in close association with the Assistant Superintendent of Fisheries, Gulbarga; 10,000 major carp fry were produced upto the end of June 1969. Mostly, Rohu and Mrigal breeds were successfully multiplied under this scheme. The breeding work will be continued for some time more.

An Applied Nutrition Programme is in operation in Gangavati, Kushtagi, Lingsugur and Yelburga taluks. This scheme is being executed by the Assistant Director of Fisheries, Gulbarga. Under this scheme, three panchayats in Gangavati Block and five panchayats in Kushtagi Block have been taken up for development of fisheries. Three fish feeding centres have been started at Yerdona, Kanakgiri and Rampur villages for feeding school-going children and pregnant women.

For development of fisheries in the ayacut area, an amount of Rs. 5,000 per year was sanctioned for over a period of six years commencing from 1961-62 to 1966-67. In 1968-69, the amount was raised to Rs. 14,750. In that year, nearly 6,400 common carp fish fingerlings, 300 grass carps and ornamental fish worth Rs. 876.56 were purchased and stocked in Shivapur and Sanapur reservoirs and tanks. Six tanks that are within the ayacut area have been stocked with quality fish seeds. It is proposed to start a nursery at Gangavati for rearing fish. The system of issuing licences for catching fish was dispensed with in the year 1967-68. The right of catching fish is given to the highest bidder in public auction for a period of one year. Fishing near Talavarghat in the Tungabhadra river has been prohibited.

There are at present no fish markets as such in the district, the fish that is landed being sold immediately in the vicinity. There is a good demand for fish, but the supply is very limited. The sale proceeds of fish in the district during 1968-69 amounted to Rs. 3,212 as against Rs. 7,777 in 1965-66 and Rs. 3,702 in 1964-65. There seems to be ample scope for trade in fish, since the number of people eating fish is quite considerable.

TABLE 1

Number of sample households engaged in cultivation by interest on land and size of land cultivated in each taluk of Raichur district, as per the 1961 census figures (based on 20 per cent sample)

St. No.	Taluk	Households engaged in cultivation by size of land in acres										Total No. of cultivating households
		Less than 1	1.2-2.4	2.5-4.9	5.0-7.4	7.5-9.9	10.0-12.4	12.5-14.9	15.0-29.9	30.0-49.9	50 and above	
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Deodurg	11	150	410	368	374	377	158	704	192	124	2,868
2.	Gangavati	16	218	305	339	295	423	102	656	237	81	2,672
3.	Koppal	19	242	383	388	311	412	105	634	201	118	2,813
4.	Kusthagi	4	173	438	382	402	472	126	859	247	95	3,198
5.	Lingsugur	5	91	357	328	434	504	141	997	394	142	3,393
6.	Manvi	7	118	320	264	309	370	103	930	443	202	3,066
7.	Raichur	35	330	468	410	353	344	131	645	252	138	3,106
8.	Sindhanur	1	79	205	218	230	327	87	785	475	187	2,594
9.	Yelburga	9	301	481	474	385	550	162	936	317	165	3,780
District Total		107	1,702	3,367	3,171	3,093	3,779	1,115	7,146	2,758	1,252	27,490

Note :—The total number of persons engaged in cultivation includes those who owned lands or held from Government, held from private persons or institutions for payment in money, kind or share and partly held from Government and partly from private persons for payment in money, kind or share.

TABLE 2

Statement showing the area localised in each taluk under Tungabhadra Project Left Bank Canal in Raichur district from
Distributary No. 1 to 106 (miles 141) as in 1969

(In Acres and Guntas)

Sl. No.	Taluk	Heavy irrigation		Light irrigation		Cotton A. G.	Total light irrigation A. G.	Garden A. G.	Grand Total A. G.
		Paddy A. G.	Sugarcane A. G.	Khariff A. G.	Rabi A. G.				
1	2	3	4	5	6	7	8	9	10
1.	Koppal ..	..	4,694—15	155—32	..	..	155—32	203—07	5,053—14
2.	Gangavati ..	16,585—00	15,771—35	18,808—16	17,604—06	7,463—04	43,875—26	5,582—33	81,815—15
3.	Sindhaur ..	9,059—26	..	82,845—18	87,800—32	38,845—25	2,09,491—35	6,613—28	2,25,165—09
4.	Manvi ..	20,432—25	..	84,127—03	77,820—31	27,286—06	1,89,234—00	3,249—26	2,12,916—11
5.	Decdurg ..	..	..	1,474—25	1,468—04	35—05	2,977—34	..	2,977—34
6.	Raichur ..	6,289—19	..	31,034—22	32,539—01	802—11	64,375—34	..	70,665—53
Total ..		52,336—30	20,466—10	2,18,415—35	2,17,232—34	74,432—11	5,10,111—01	15,649—14	5,98,593—16

TABLE 3

Statement showing the village-wise and distributary-wise localised area under Rajolibanda Diversion Scheme

(in acres and guntas)

Sl. No.	Name of Village	Distributary Number	Gross Command	Net Command	Paddy	Light Irrigation	Garden	Total
1	2	3	4	5	6	7	8	9
1.	Hanmapur	1	53—33	47—28	64—19	..	..	64—19
2.	Do	2	..	..	35—01	..	..	35—01
3.	Edlapur	3	..	..	34—30	..	..	34—30
4.	Do	4	..	..	..	13—25	..	13—25
5.	Bichal	3	..	..	43—10	125—14	..	168—24
6.	Do	4	..	..	..	430—31	..	430—31
7.	Gillesugur	5	163—01	83—10	..	59—01	23—00	82—01
8.	Tungabhadra	5	1,119—35	808—35	..	730—33	75—22	806—15
9.	Do	6	671—15	354—12	171—24	..	..	171—24
10.	Bullapur	6	338—22	166—22	166—22	..	..	166—22
11.	Do	7	321—38	244—35	..	235—18	..	235—18
12.	Do	8	8—27	8—22	8—22	..	..	8—22

RAICHUR DISTRICT

253

Table-3 (Contd.)

1	2	3	4	5	6	7	8	9
13.	Chik-Manchal	8	726—25	643—16	169—30	281—25	149—21	600—36
14.	Gandhal	8	95—37	77—08	49—18	..	27—30	77—08
15.	Do	9	139—35	133—32	135—32	..	..	135—32
16.	Gundervalli	9	..	..	100—31	..	..	100—31
17.	Budinni	10	..	..	..	..	60—19	60—19
18.	Malkapur	10	..	..	131—36	..	..	131—36
19.	Gangwar	10A	..	..	53—04	96—08	14—37	164—09
10.	Talmari	10A	..	..	616—07	118—21	111—23	846—11
21.	Do	11	512—08	417—24	..	376—17	..	376—17
22.	Do	12	1,052—33	656—20	..	570—02	78—08	648—10
23.	Idapnur	10A	..	..	20—20	..	..	20—20
24.	Do	10B	41—11	41—11	41—01	..	..	41—01
25.	Mirzapur	10B	169—32	130—14	129—34	298—03	..	129—34
26.	Do	11	563—05	391—28	89—29	45—00	..	387—32
Total ..					2,062—10	3,335—38	541—00	5,939—08