

CHAPTER IV

AGRICULTURE AND IRRIGATION*

Agriculture was the mainstay of economy during ancient period, and records right from the days of the Gangas speak of sufficient attention being paid to irrigation by constructing tanks and grants made for their maintenance. When a village is spoken of, the wet land and dry lands (*gadde, beddalu*) fruit and flower gardens (*tota, tudike*), bund and irrigated land (*ane, achchukattu*) etc. are also spoken of as an inseparable part of it in a village grant of 1476 (Cp 158). A record of 1533 speaks *hola* (dry land), *gadde* (wet land) and *tota* (garden) granted to a temple. No doubt, the crops raised were almost the same as now like paddy, ragi, oilseeds, cotton, etc. and Tipu had introduced mulberry during the 18th century in taluks like Ramnageram and Channapatna. The advent of the Portuguese earlier had helped the introduction of groundnut, potato, tomato, chillies, and papaya, though very slowly.

The Hoskote plates of Ganga Avinita dated 6th century A.D. speak of *totakshetra* or garden land where sugarcane was raised. A Chola record of 1014 from Malur speaks of paddy fields granted to the Kailashwara temple from a neighbouring village where a tank had been built to raise the crops. Horticulture was wide spread and fruits and vegetables were also raised. There is reference to *kumri* cultivation in 1050 (Dv 72).

Lot of attention was paid to irrigation right from the days of the Gangas. An inscription from Tippur, Dodballapur tq, speaks of a tank of the place in the days of the Gangas. A feudatory chief of the Gangas called Nagattara fixed a sluice to a tank at Agara (Kn 40). A similar record dated 870 speaks of sluices laid to two tanks, and a third tank being built and *bittuvatta* land being allotted for the

*This chapter also includes Horticulture, Animal husbandry and veterinary services and Fisheries.

maintenance of all the three tanks at Agara, in Bangalore tq (Bn 79). A tank built at Bevur during the 9th century was provided with *bittuvatta* during the 10th century (Cp 210). *Bittuvatta* was a grant to a person or persons who were charged with the responsibility of maintenance of irrigation facility in a place, and later this was called *kattukoduge* in records from Bangalore dt. At Korati village in c 1640, land worth 100 Varahas was granted as *kattukodige manya* to one Subbayya for repairing the damaged Doddakere of the place (Ht 43). A Maratha officer made a *kattukoduge* in 1645 at Siddnahalli (Ht 15).

Water was supplied to some lands at Punganur (Honganur) from a tank from Malurpatna and those who obstructed the flow of water could be fined 50 *kalanju* (a gold coin) as per a Chola record of 1014. The Pattandur tank near Kadugodi was built by a Chola officer and was provided with three sluices in 1043 (Ht 142). For building the Ramasamudra tank in 1340, 3,000 Honnus were spent by a Hoysala officer (Bn 111). Vithalanatha, an officer of Bukka II of Vijayanagara built a tank provided with sluices in 1388 at Kalya (Mg 20). A record of 1338 speaks of three tanks at Budikodigenahalli of Devanahalli tq (Dv 72). In 1400, some stone cutters were granted land for repairing the embankment and cutting sluice for the Mahasamudra tank at Arelalu in Kanakapura tq (Kn 97). Provision of six carts for being used to desilt tanks (and transport the silt) is mentioned in a Vijayanagara record dated 1513 from Kudalur, and of these four carts were for the tank at Kudalur and two for the one at Mogehalli, and for the maintenance of this service, the village Melanahosahalli was donated. This donation was made for the merit of Emperor Krishnadevaraya. A bund across the Arkavati is spoken of in 1533 at Hesarghatta (Shivesamudra) and the existence of a reservoir (N1 31). The bund is called 'Devara Ane'. The place had another tank called Lakshminarasimha Kunte with canals (*kaluve*).

Even during the post-Vijayanagara period, the various feudatories and other potentates paid ample attention to the upkeep of irrigation. Kempegaude III in 1674 granted lands to Dasobhovi, a mason, for the upkeep of a tank in an *agrahara* Kempasagara in Magadi tq is a creation of his family. Some *kattukoduge* grants made during the 17th century have been already noted, and Manukoji, a relation of Ekoji from Bangalore made a *kere kattukoduge* grant in 1667 at Hadekanshalli in Hoskote tq (Ht 46), and another record from Sulibele of the same year speaks of a similar *kattukoduge*. In 1766, in the days of Haider a grant was made to one Hajisaheb for building a tank at Tirumalapura in Nelamangala tq (N1 22). These illustrations indicate how attention was paid to expand irrigation facilities and also for their upkeep by

various royal families that ruled over this region. A record from Dodballapur to dated 1267 while speaking about the trade at Rajaghatta shandy speaks of cotton, turmeric, jaggery, grains, betelnut, betel leaves, pulses etc. as the items sold to indicate the agricultural produce of the area (Db 31).

Buchanan during his journey in 1800 describes Channapatna as full of coconut gardens and sugarcane being grown in the region around the place. He states that the whole area (18 miles from Maddur to Magadi) was full of coconut and betelnut gardens. "All this ground might be cultivated for rice, and has a supply of water from reservoirs; but the plantations are much more valuable", he comments. He also speaks of methods of raising betelnut gardens. Coconut, mango, lime, jack and *amte* trees interspersed the betelnut trees, as they provided shade and also freshness to the soil. Under the trees turmeric and vegetables ("all kinds of fruits and roots that are called t *tarkari*), were raised. Betelnut was sold for ready money by the farmers, but no advance was received by them. He speaks of four varieties of coconuts raised at Channapatna, namely red (apparently *kenda*), red mixed with green, light green and dark green. He also describes the methods of raising a coconut garden. Sugarcane too was raised at Channapatna, and 'Putta Putti' and 'Restali' varieties were raised.

At Ramagiri (near Ramanagaram), he speaks of *donays* and tanks in rocks. "Cattle seem to be the principal object of the people of Ramagiri" and there were considerable number of goats and cows. "The farmers who are in easy circumstances keep from ten to thirty breeding cows". He also informs that the richest man in every village kept a bull or two and these served all the cows of the village for breeding purpose. At Tavarekere, he saw wells from which water was lifted using *capily* (*Kapile*) or "leather bag wrought by two bullocks descending on an inclined plane". Near this village he saw a kind of sugarcane called *Maracabo* being raised and he calls it stick cane, never growing thicker than a finger, and "unproductive of juice", but requiring less water than other varieties. At Dodballapur Buchanan saw many kitchen gardens growing onions, garlic and capsicum. Maize was also raised here, growing seven to eight feet in height, but was not used much for human consumption and radish was raised as second crop in those fields.

While speaking of Shrirangapatna and areas around Mandya, and also of Kolar, Buchanan discusses in detail the crops being raised there and the methods of cultivation, which mostly hold good of the

district under study. While speaking about villages around Shrirangapattana he says thus: "The articles which the *ashtagram* farmers cultivate in wet grounds are rice, sugar-cane, *Udu, Hesaru, Ullu Ellu,* and *Tadaguny*". He lists various types of paddy grown and also three modes of sowing them including *nati* or transplanting. He outlines in full the details of raising paddy. *Coupea (Alasund), sesamum, ragi, jola, chikka kambu, samey, huruli, navane, kadale, castor, safflower,* etc. are other crops mentioned by him. He also mentions betel leaves and vegetable gardens near the old capital city. The orchards and flower gardens are also described. "The cattle chiefly bred in the vicinity of Serirangapatam are cows, buffaloes, sheep, the long-legged goat and asses". He says that farmers around Bangalore city used city garbage as manure for their fields, and while speaking of areas round Shrirangapattana he remarks that "A good deal of attention is here paid to manuring the soil". While speaking of Kolar area he informs that leaves or shoots of trees and plants were used as manure and that "The farmers form their dung hills and litter of their cattle, and of the ashes and soil of their houses, all intermixed".

AGRICULTURAL POPULATION

Bangalore Rural district spans an area of about 5,81,400 ha and has a population of 14,52,044. At the 1981 census, the entire population has been grouped into three categories depending upon the nature of the individual's economic activity during the year preceding the date of census enumeration. Those who have engaged themselves in economically productive work for a period of 183 days or more during the reference years are categorised as main workers. While those who have similarly worked for a lesser period are classified as marginal workers, those who have not at all participated in any economically productive work are designated as non-workers. The total population of the district is composed of these three categories in the following proportions: main workers 31.91 per cent; marginal workers 1.91 per cent and non-workers 66.18 per cent. The taluk-wise figures of total number of workers, cultivators and agricultural labourers are given in the table hereunder.

Taluk	Total main workers	Total marginal workers	Cultiva- tors	Agricultural labourers
Channapatna	77,412 (35.50)	10,249 (4.70)	35,287 (16.18)	18,003 (8.26)
Devanhalli	65,668 (37.31)	3,778 (2.15)	29,802 (16.94)	16,524 (9.39)

1	2	3	4	5
Dodballapur	61,791 (32.30)	16,563 (8.66)	31,986 (16.72)	7,686 (4.02)
Hoskote	71,543 (35.14)	12,151 (5.97)	33,647 (16.53)	16,005 (7.86)
Kanakapura	1,01,852 (37.38)	8,114 (2.98)	59,119 (21.10)	20,181 (7.41)
Magadi	68,242 (33.47)	9,877 (4.84)	46,583 (22.84)	8,558 (4.20)
Nelamangala	52,418 (31.75)	5,966 (3.61)	31,695 (19.20)	8,046 (4.87)
Ramanagaram	64,709 (37.54)	4,001 (2.32)	35,067 (20.35)	10,855 (6.30)
District	5,63,635 (35.16)	70,699 (4.41)	3,01,206 (18.79)	1,05,858 (6.60)

Note:- Figures in the brackets indicate per cent of total population. The data also includes the figures for four hoblies transferred to Bangalore (Urban) district.

Taluk-wise particulars indicate that the proportion of main workers in the total population of different taluks in the district ranges between 31.75 per cent and 37.54 per cent respectively in the case of Nelamangala and Ramanagaram. Approximately, as against a ratio of three to one in the State, in Bangalore district there are five male workers for every female worker. Work participation rate for females is thus quite low in the district. This ratio is 1:6 in Dodballapur; 1:5 in Magadi and Nelamangala; 1:4 in Channapatna, Hoskote and Kanakapura and the other two taluks of Devanahalli and Ramanagaram contain three male workers for every female worker. As compared to the State average of 3.48 per cent, the population of Bangalore district has a very low component of marginal workers, namely 1.91 per cent. The proportion of marginal workers is the highest in Dodballapur taluk (8.66 per cent). Hoskote (5.97 per cent) stands next. This proportion is the least in Devanahalli taluk (2.15 per cent).

LAND UTILIZATION

According to the land utilization data for the year 1987-88, the net area sown stood at 3,00,277 ha and constituted 51.29 per cent of the total reported area of the district. The position regarding the other types of land use stood as follows: forest 13.88 per cent; barren and uncultivable land 6.43 per cent; land put to non-

agricultural uses 7.42 per cent; permanent pastures 8.55 per cent; land under miscellaneous tree crops and groves 2.63 per cent; cultivable waste 1.03 per cent and fallow land including current fallows (8.78 per cent). The gross area sown is 53.58 per cent of the total area and this indicates that about 4.50 per cent of the net area sown is more intensively utilized and is sown more than once. The fallow lands also represent the lands that have been brought under cultivation and when these are also taken into consideration, the proportion of cultivated land to the total geographical area moves upto 62.36 per cent. The extent of land available per head in the district works out to 0.40 hectares which is much below the State average of 0.71 hectares. Table I at the end of the chapter gives particulars of taluk-wise land utilization in the district for the year 1987-88.

LAND HOLDINGS

According to the agricultural census of 1976-77, the holdings with an extent of less than two hectares each constitute as much as 73.6 per cent of the total number of holdings. The holdings together account for just 34.7 per cent of the total land held. Large holdings with an extent of 20 hectares and more each form just 0.2 per cent and the total land held is a meagre 2.9 per cent. As against the State average of three hectares, the average size of a land holding in the district works out to 1.75 hectares. The following table based on the data revealed at the agricultural census of 1971 and 1976-77 provides a comparative idea about the changing pattern of the distribution of agricultural holdings in Bangalore district.

Distribution of land holdings

Size of holdings (ha)	1971		1976-77	
	Land holdings (no)	lands held (ha)	Land holdings (no)	Lands held (ha)
Below 1.0	1,06,991 (44.4)*	55,652 (12.4)	1,22,488 (49.8)	64,310 (14.9)
1.0 to 1.9	64,479 (26.8)	92,545 (20.6)	58,429 (23.8)	84,997 (19.8)
2.0 to 4.9	53,433 (22.2)	1,59,540 (35.6)	49,645 (20.2)	1,51,423 (35.3)

*Figures in the brackets indicate percentage to the total.

1	2	3	4	5
5.0 to 9.9	12,113 (5.0)	80,648 (18.0)	12,083 (4.9)	81,072 (18.9)
10.0 to 19.9	3,014 (1.3)	39,351 (8.8)	2,662 (1.1)	35,065 (8.2)
20.0 and above	678 (0.3)	20,934 (4.6)	434 (0.2)	12,495 (2.9)
Total	2,40,708 (100.0)	4,48,670 (100.0)	2,45,741 (100.0)	4,29,362 (100.0)

The total number of operational holdings for the district showed an increase of 11,035 over 1976-77 i.e., by 4.49 per cent. The total area operated by these 2.57 lakh holdings in 1980-81 was 4.68 lakh hectares as against an estimated area of 4.29 lakh hectares in 1976-77. Taluk-wise distribution of land holdings by size during 1980-81 is given in the table II at the end of this chapter.

SOILS

The soils of Bangalore Rural district consists of red loams, red gravelly sandy loams, lateritic and silty soils. Typical alluvial soils are absent in the district and there are some isolated patches of black soils in the district.

Red loams: Red loam is bright red to pale red, rather sticky when moist, depth varies from few inches to several feet. Drainage is good. Red loams are found in Nelamangala, Kanakapura and parts of Doddballapur tq. The principal dry crops are *ragi*, millets, pulses, oilseeds and the irrigated crops raised are paddy, potato, vegetables, fruits, etc.

Red gravelly sandy loams: The red gravelly soils are shallow in depth, usually underlain by rock strata. Particles of soils are coarse and associated with gravel and pebbles. Drainage is good. This kind of soil is found in parts of Magadi, Kanakapura, Ramanagaram and Nelamangala taluks. Rain-fed crops raised are millets, pulses and oilseeds. Irrigated crops are paddy, fruits, vegetables, etc.

Red sandy loams: These soils are characterised by the presence of high percentage of sand and coarse particles. Drainage is good. Thickness varies from few inches to six feet. Red sandy loams are

noticed in Channapatna, Ramnagaram, Devanahalli and Doddballapur taluks. Rain-fed crops include *ragi*, pulses, mulberry and oilseeds. Irrigated crops include paddy, mulberry, fruits and vegetables.

Laterite soils: Laterite soils are characterised by red to pale yellow colour, friable easy to cultivate when moist. Iron and manganese concretionary materials are present. These soils occur in Hoskote and Devanahalli taluks. The rain-fed crops produced are *ragi* jowar, oilseeds and groundnut.

Aluvium soils: Silty alluvium is characterised by grey colour and fine particles. It is found in all the taluks in the downstream portion of the tanks and on tank beds. The area covered by silty soils forms the irrigated area. Silty soil when wet, it swells and becomes sticky; when dry, it shrinks and develops open cracks.

The soils are generally low in plant nutrients. Soil reaction is chiefly neutral with a tendency to develop alkalinity in the low lying and ill-drained areas. A few acid soils are also found distributed here and there. Soluble salt content is low except in some low lying badly drained places in Ramnagaram, Channapatna, Magadi, and Kanakapura taluks. The organic matter content is low, the available phosphorous content is deficient and the available potassium is present in sufficient quantities. The soils are well drained, poor in lime and bases.

AGRO-CLIMATIC ZONES

Bangalore Rural district has been grouped under Eastern Dry Zone along with Kolar and parts of Tumkur districts. The annual rainfall ranges from 679.1 to 888.9 in the region; the rainfall is received in two peaks, one in May and the other in September-October. Kharif cropping is a major practice. *Ragi* occupies the major dryland area in the zone. About 10 to 12 per cent of the area is covered by groundnut crop. Kharif pulses like horsegram are used for sowing late in the season and this occupies about 10 per cent of the area. Under irrigated conditions, paddy, mulberry and sugarcane crops are raised.

SOIL HEALTH CENTRE

Soil test is well recognised as one of the scientific means for quick characterisation of the fertility status of the soil predicting the nutrient requirement of the crops. The Soil Health Centre at Hebbal and central mobile soil testing unit analyse soil samples and make recommendation to farmers on the use of fertilizers and measures

to be taken to improve soil fertility. Water samples are collected from irrigation wells from November to January to analyse the water samples for its suitability for irrigation. With the introduction of hybrids and high-yielding varieties, the micro-nutrients in the soils are being depleted and the productivity has also been reduced to a considerable extent. So the micro-nutrient laboratory at Bangalore estimates the micro-nutrient deficiencies and recommends the quantum of micro-nutrients required to get maximum production. During 1988-89 it is proposed to analyse 22,000 soil samples in the district.

SOIL SURVEY

Soil survey aims at providing comprehensive information about soils and is an inventory of soil resources of the area. It provides information needed for planning land use development under irrigation and the management of irrigated lands. Under dry land development programme, the soil survey of the watersheds identified is being carried out in a phased manner to suggest suitable soil and moisture conservation practices, based on land capability classes and land use plans. It is programmed to prepare separate soil survey reports of all the district watersheds by interpreting Landsat Imageries coupled with aerial photos.

LOCAL MANURIAL RESOURCES

The Department of Agriculture under the programme of local manurial resources monitors the production of rural and urban compost and also green manuring. The development and use of organic manures assumed great importance in agricultural extension programme due to the increasing cost of chemical fertilizers. The following items of work were undertaken under this programme: Intensification of urban and rural compost production and green manuring in irrigated and assured rainfall areas, training to village leaders in better composting, conservation of nightsoil, improved cattle sheds and manure sheds, intensification of gobar gas production, setting up mechanical compost plants, intensification of blue green algae and azolla use in wet lands and award of prizes to local bodies for preparation of good quality and quantity of urban compost. Under Local Manurial Resources Programme 3,34,227 tonnes of rural compost and 35,625 tonnes of urban compost were prepared and 12 hectares were covered under green manuring crops in the district during 1987-88.

Bio-fertilizers: The Microbiology division of the University of Agricultural Sciences, Bangalore, maintains germ plasm of microbial inoculants and takes up production of Rhizobium on a large scale and

supplies to farmers through the Principal Agricultural Officer. Azolla is a promising bio-fertilizer which fixes atmospheric nitrogen with the help of blue green algae, *Anabaena azollae* symbiotically. This is a low cost input. The seed farm managers multiply Azolla on a large scale and supply it to farmers. Azolla contains four to six per cent nitrogen and several other minor elements. By using Azolla, 35 to 45 kg nitrogen per hectare can be reduced.

SUPPLY AND SERVICE

The Department of Agriculture has an onerous responsibility in planning, co-ordinating and monitoring the supply of inputs through various input supplying agencies to make available to farmers the required quantity of input at right time, at a reasonable price and at a nearest place possible.

Seeds: Though seed is comparatively a low cost input, it forms a very basis for crop production unlike fertilizers and plant protection chemicals. The Department estimates each year the requirement of quality seeds and organises the production of quality seeds through KSSC, NSC and KSSCA. As a part of seed production, the Department maintains one seed farm in the district to produce foundation seeds using the breeder seeds supplied by the University of Agricultural Sciences, Bangalore for further multiplication of certified seeds through the KSSC. Collective efforts are being made by the institutions as well as the private seed dealers to see that the required quantity of quality seeds are made available to the farmers at the right time. Arrangements are being made to distribute the seeds by KSSC, NSC, KAIC, KOF and private seed dealers through the network of respective outlets.

The Seed Act 1966 and Seed Rules 1968 are being effectively enforced in the district to ensure the supply of quality seeds distributed to the farming community. Further, the seeds have now been brought under the Essential Commodities Act and a separate Seed Control Order has been issued by the Government of India from 30.12.1983 and is called as Seed (Control) Order 1983. The Seed Testing Laboratory situated at Hebbal lends support in the maintenance of quality of seeds under the Act in the district by analysing seed samples received from the respective taluks. It has been proposed to collect and analyse about 1,000 samples in the district during 1988-89 to maintain seed standard. The Department is producing foundation seeds in departmental seed farms besides providing technical support to Zilla Parishad to produce foundation seeds in their seed farms and supply these foundation seeds to KSSC and private agencies for

multiplication of certified seeds for further distribution to farmers. Chandurayanahalli seed farm in Magaḍi taluk was started during 1958-59 and has an area of 13.52 ha of which only 1.42 ha has irrigation facilities.

FERTILIZERS

Government of India allots fertilizers from time to time and the same is distributed by the organisations like KAIC, KSCMF and private dealers. It is the policy of the Government to see that the fertilizers are supplied at the doorsteps of the farmers. The villages which are at the interior and are in need of fertilizers were selected throughout the district to store the fertilizers well in advance of the kharif season involving both the institutional agencies and fertilizer manufacturing firms. They were asked to stock minimum of one truck load of different fertilizers in the specified time. Government have provided incentives for the movement of fertilizers to such areas well in advance of the agricultural season.

The fertilizers manufactured by various firms are marketed through their authorised dealers. The quality of fertilizers supplied has to be maintained in accordance with the standard fixed by the Central Government under the Fertilizer (Control) Order 1957. The Fertilizer Quality Control Laboratory at Bangalore aims to analyse the fertilizer samples for their quality. About 240 fertilizers have been included in Fertilizer (Control) Order 1957.

Fertilizer consumption in the district in tonnes.

	N	P ₂ O ₅	K ₂ O	Total	Kg/ha
1981-82	9,637	2,632	4,071	16,340	48
1982-83	10,797	3,998	3,259	18,054	56
1983-84	11,907	4,098	2,691	18,696	57
1984-85	10,605	7,802	3,255	21,662	66
1985-86	9,548	5,481	3,565	18,594	60

Taluk-wise figures for 1985-86.

Channapatna	587	427	244	1,258	38
Devanahalli	2,243	634	461	3,338	120
Dodballapur	905	722	657	2,284	66

1	2	3	4	5	
Hoskote	1,078	649	369	2,096	66
Kanakapura	1,355	745	276	2,376	36
Magadi	1,390	750	777	2,917	61
Nelamangala	809	457	266	1,532	39
Ramanagaram	1,181	1,097	515	2,793	85

PLANT PROTECTION

Soil pests are those which generally live in soil or hide themselves beneath the soil surface and feed on plant materials like root, stem, etc. Polyphagous pests are those which have more than one host plant as a rule. They feed and breed on many host plants. Hence, they are more successful in thriving against natural odds. It has been proposed to extend 50 per cent subsidy on pesticides for the control of *tikka* disease and leaf minor pest which are causing heavy loss to groundnut crop. In order to boost the production of pulses, it is proposed to extend 50 per cent subsidy on pesticides for the control of pests on all pulse crops. The subsidy amount is limited to Rs 50 per ha or 50 per cent of actual cost of pesticides used, whichever is less. The pesticides are supplied through KAIC, KSCMF or co-operative institutions to the farmers by collecting the beneficiaries share on the basis of permits issued by the Department. The pesticide supplying agency will claim reimbursement of the subsidy portion by preferring necessary bills. During 1987-88, against 2.86 lakh hectares targetted under various categories of plant protection measures, an area of 2.97 lakh hectares have been covered, the details are as follows:

Area in ha.

Category	Programme	Progress
1. Seed treatment	66,670	66,114
2. Control of field rats	6,670	5,898
3. Control of soil and Polyphagous pests	46,700	44,788
4. Plant protection measures for other pests	1,64,500	1,80,639
5. Chemical Weed control	1,000	75
	2,85,540	2,97,514

MAJOR CROPS

Ragi: Ragi is an important grain crop of Bangalore Rural district. It occupies about more than half of the net area sown in the district. The crop is grown in about 1,47,956 ha during 1987-88. Kanakapura taluk ranks first in Ragi cultivated area followed by Magadi, Nelamangala and Dodballapur taluk. Ragi is mostly a rain-fed crop and it is grown in about 9,500 ha under irrigated conditions. High yields are obtained under irrigation. Purna, Shakti, Indaf-5 and Indaf-7 are the important irrigated ragi varieties while Shakti, Indaf-1, Indaf-3, Indaf-8, ES-11, PR-202 and Purna are suited for rain-fed cultivation. Purna can yield 35 to 40 quintals, whereas Shakti, Indaf-5 and Indaf-7 can yield 50 to 60 quintals grain per hectare under irrigated conditions. About 20 quintals grain per ha can be obtained from an average rain-fed ragi crop. Double cropping of cowpea and ragi is in practice when the early rains are received in April and May. By rotating cowpea with ragi, the soil fertility is likely to be improved. Mixed cropping is very general and pulse crops like field bean, cowpea and fodder jowar are raised as mixed crops in ragi field.

Paddy: Paddy is next important cereal crop of the district. It occupies an area of about 18,140 ha i.e., 6.04 per cent of net area sown during 1987-88. Bulk of the paddy area is under assured rainfall, under canals, tanks and under lift irrigation. Magadi ranks first in paddy cultivation followed by Hoskote, Kanakapura, Nelamangala and Ramenagaram taluks. Jaya, Vani, Sona, Prakash, IR-20, Pushpa, Madhu, Mangala, Pragathi, Raasi and Mandya Vani are the important paddy varieties cultivated in the district. Yield of paddy varies from 50 to 80 quintals per ha depending upon the variety cultivated.

Maize: Maize has been a minor food crop of the district. The total area under maize crop is 4,622 ha i.e., 1.54 per cent of the net area sown, mostly in Dodballapur taluk. Hybrid maize is being successfully grown as a rain-fed crop in an area of about 1,000 ha. Deccan and Deccan-101 are the important hybrid maize varieties raised in the district and their duration is about 110 to 120 days. The best season for sowing hybrid maize is from May to the end of July. Irrigated hybrid maize crop yields upto 60 quintals grain and 25 quintals fodder per one hectare while the rain-fed crop yields upto 35 quintals grain and 15 quintals fodder per hectare.

Other cereal crops cultivated in the district include wheat (109 ha), Jowar (20 ha) and minor millets (4,585 ha).

Redgram: Redgram (*tur*) is the most important pulse crop of the district. It is grown over an area of 6,700 ha during 1987-88. It is also grown as a mixed crop with groundnut and ragi. Kanakapura taluk ranks first in redgram cultivation followed by Magadi. Hyd-3c is an important redgram variety cultivated in the district and the crop yields 15 to 20 quintals per ha from the main crop and 6 to 10 quintals per ha in case of mixed crop.

Field bean: Field bean or *avare* is another important pulse crop of the district. It is grown in an area of 11,305 ha, mostly in Kanakapura, Hoskote, Dodballapur, Magadi, Nelamangala and Devanahalli taluks. It is mostly grown as mixed crop with ragi. It is also cultivated as a vegetable. Hebbal *avare* is grown as pure crop and the crop will be ready to harvest in 90 days. Ten to 12 quintals can be obtained per hectare.

Horsegram: Horsegram is the most extensively grown pulse crop in the district. It is a late season dry crop being sown not earlier than September, and more generally as a single crop of the year, in rotation with the cereals. It is grown in an area of 29,486 ha in the district which forms about 9.82 per cent of net area sown. Kanakapura taluk ranks first followed by Ramnagaram, Magadi, Channapatna and Nelamangala taluks. A good crop of horsegram yields upto four quintals per hectare but yields are generally low due to the poor attention the crop receives and belated sowings.

Bengalgram: Bengalgram is one of the minor pulse crops of the district, occupying an area of about 560 ha during 1987-88. Dodballapur taluk ranks first in Bengalgram cultivation. Annigeri-1 variety of Bengalgram matures in about 90 to 100 days and yields upto 10 quintals per ha under rain-fed condition and 20 to 25 quintals per ha under irrigated conditions.

Other pulse crops cultivated in the district comprise of blackgram (99 ha), greengram (85 ha) and cowpea (470 ha).

Groundnut: Groundnut is an important oilseed crop of the district. The crop is being grown in about 18,008 hectares (1987-88). The crop can be grown both under rain-fed and irrigated conditions. Spanish Improved and TMV-2 groundnut varieties are raised under irrigated conditions, while only TMV-2 groundnut variety is cultivated under rain-fed conditions. Irrigated groundnut crop yields about 35 quintals of pods per hectare while the rain-fed groundnut crop yields about 15 quintal pods per ha. Kanakapura taluk ranks first in groundnut

cultivation followed by Channapatna, Dodballapur, Magadi and Ramanagaram taluks.

Niger: Niger is one of the important minor oilseed crops of the district. This is being grown in about 2,137 ha, mostly in Kanakapura and Magadi taluks. Niger is almost invariably grown as a mixed crop. Ragi is the most important crop with which it is grown in mixture in the main season. The mixture of niger and horsegram which is sown in early September is also popular in the district. Niger crop yields upto five quintals per hectare when grown as a pure crop.

Castor: Castor is another important oilseed crop of the district. It is cultivated in an area of 2,721 ha mostly in Kanakapura and Magadi taluks. The castor crop is grown almost entirely as a dry crop. It occupies the ground for the whole crop season and therefore forms the sole crop of the year although many other crops are grown as mixed crops. As a mixed crop in castor, various pulses like fieldbean, redgram, coupea, horsegram and short-season groundnuts are raised. About 1,000 to 1,500 kg per ha yield is obtained from an average castor crop.

Other oilseed crops raised in the district include sunflower and mustard (1,500 ha).

Sugarcane: Sugarcane is one of the important commercial crops of the district. This crop is being grown in about 1,400 ha, mostly in Kanakapura, Magadi and Ramanagaram taluks. Co-419, Co-62175 and B-37172 are the important sugarcane varieties cultivated in the district. The crop will be ready for harvest in 10 to 14 months depending upon the variety and time of planting, and yield varies from 75 to 200 tonnes per ha. Two to three ratoons can be taken in the district with good management.

The taluk-wise area in hectares and production of principal agricultural crops is given in table III at the end of this chapter.

DEVELOPMENT PROGRAMMES

High-yielding varieties programme: There is a continuous increase in the distribution of quality seeds after the introduction of high-yielding varieties. It is programmed to cover the rain-fed areas with hybrids and high-yielding varieties with more stress on production and productivity. During 1966-67, high yielding and hybrid varieties were introduced. From there onwards, there is consistent increase from year to year. During 1986-87, the area under high yielding varieties

was 1,42,837 ha, i.e., 51.59 per cent of the net area sown. Kanakapura taluk stood first with 27,852 ha followed by Nelamangala (22,870), Magadi (21,982), Dodballapur (20,057), Ramangaram (13,737), Hoskote (13,212), Devanahalli (11,678) and Channarayana (11,449).

Minikit demonstrations are organised to identify and popularise the promising pre-release or newly released varieties or hybrids through farmers participation. These demonstrations aid the extension workers to acquaint with the new varieties or hybrids before they are actually released, and feed back information to the researchers for further improvement of the varieties. During 1988-89, it is programmed to organise 3,430 demonstrations by incurring an expenditure of Rs. 24,210 and 700 minikit trials with an expenditure of Rs. 9,675.

The farm trial is a process of testing the suitability and profitability of a new technology under local conditions. The programme is a new system of extension through which the new technology evolved at research stations is being transmitted to the field. The Principal Agricultural Officer will arrange to layout the trials on farmer fields. About 30 farm trials are laid out at different locations and these trials are of varietal, agronomical, insecticidal, etc.

In Bangalore Rural district, demonstration programme of intensive cultivation of maize in the fields of Scheduled Caste farmers is being implemented for enhancing the yield per unit area from 1986-87. Under this scheme, incentives by way of subsidy on cost of seeds, fertilizers and pesticides will be provided for organising demonstrations with cent per cent Central assistance. During 1988-89, three demonstrations of intensive cultivation of maize are planned with the financial allocation of Rs.2,445.

National Pulses Development Programme: Under this programme, it is contemplated to increase the production of pulses with the adoption of dryland technology, mixed and double cropping systems and by increasing the area under pulses. To popularise inter-cropping and use of short duration varieties for maximising yields, minikit trials are laid out on farmers fields in selected blocks. Promising improved pre-released and newly released specific better yielding varieties are included in the minikits. The size of the area of minikit trial is restricted to 0.2 ha. The following are the pulse crop varieties identified for minikits: Redgram -Hyd-3C, PTB 221, GS-1, Maruthi (ICP 8863); Greengram - Jawahar-45, PS-16, Pusa baisaki; Blackgram - T-9, Khargoan3 (K3); Cowpea - C-152, S-488; and Bengalgram - Annigeri-1. The seed requirements would be met from KSSC/NSC/UAS (University of

Agricultural Sciences, Bangalore) and it is programmed to layout 200 minikits at a total cost of Rs.12,000. Block demonstrations are laid out to popularise the use of certified seeds, fertilizers, rhizobium culture and plant protection chemicals.

Adoptive trials are arranged through the Agricultural Universities in respect of varieties recommended for release or newly released varieties which have not been tested earlier. These trials are laid out with the help of research workers on farmers fields. The scale of finance available is Rs.400 per ha. It is programmed to layout two adoptive trials at a total cost of Rs.800. Plant protection chemicals are supplied to farmers at subsidised cost to control insect pests and diseases on pulse crops. For this purpose, 50 per cent of the cost of plant protection chemicals is met by the State and Central Governments on 50:50 basis and the remaining 50 per cent is met by the beneficiary. The maximum subsidy admissible is Rs.100 per ha. To increase the area under pulses, an incentive of Rs.150 per quintal is being given to the agencies like NSC and KSSC through the Zilla Parishads for production, storage, handling and seed treatment of certified seeds. The subsidy portion is equally shared by the State and Central Governments.

The Department of Agriculture has proposed to launch a project called *Hasiru Kirana* for a period of two years during 1988-89 and 1989-90 to increase the production in the low production taluks. The project is to be implemented with the resources available under the respective schemes being operated by the Department. No separate allocation of funds have been earmarked for the project. Magadi taluk has been earmarked for the project. Magadi taluk has been identified as of low productivity and the principal kharif crop selected for monitoring and evaluation is ragi. The following are the factors contributing for low productivity namely, low and ill distribution of rainfall, low fertility status, low coverage under high yielding varieties and weak extension efforts under training and visit system. Hasiru Kirana scheme has an object of increasing the productivity by 15 to 20 per cent every year by concentrating on the parameters identified. The increase in productivity will be assessed on the basis of the results of the crop cutting experiments.

To ensure the timely availability of fertilizer in interior and inaccessible areas, additional retail outlets are being opened under Central sector schemes from 1988-89. The scheme has one component of opening additional retail outlets at the rate of 100 outlets per district. Preference for opening of sale points is given to low consumption areas where the outlets do not exist within a reasonable range.

The retail outlets are being opened through co-operatives or Agro-Industries Corporation by providing a subsidy upto Rs 1,200 per outlet per annum for advance stocking and transportation beyond the taluk headquarters. Rs 1.2 lakhs has been provided for the district during 1988-89.

Karnataka Tank Irrigation Project: The project aims to prevent soil erosion or sheet erosion of catchment areas to conserve and harvest rainwater, *in situ* moisture conservation, to prevent run-off and reduce velocity of run-off water by taking up suitable soil conservation measures and to prevent the entry of soil and silt into the reservoirs. Six tanks are included from the district and catchment area protection work is taken up. The catchment area protection works are based on the ongoing and proven technology of watershed management. The treatment commences from the areas nearest to the reservoir and move up to the ridge on catchment i.e. from the normal reservoir level and proceeds upwards covering one metre contour interval upto two contours above the full reservoir land. Items of work treatments taken up include bench terracing, gully checks, vegetative checks, *khus* grass planting, diversion channel, nala bunding and contour bunding.

Establishment of Farmers Agro-service Centres for custom hiring:

The Scheme aims at providing necessary technology support in the form of improved agricultural implements, hand tools and machines particularly for small and marginal farmers who constitute the bulk of the farming community, mostly under dry farming. This is a Centrally-sponsored scheme and is being implemented at present through the existing departmental staff. In the district, one farmers Agro-service centre is proposed with the financial allocation of Rs 30,000. About 30 demonstrations are planned at the rate of Rs 200 per demonstration in five centres, repairs to implements at Rs 2,500 per centre in four centres and distribution of improved agricultural implements at 50 per cent subsidy to small and marginal farmers in five centres worth Rs 55,200.

NATIONAL AGRICULTURAL EXTENSION PROJECT

The world bank assisted National Agricultural Extension Project which was introduced in the district as a second phase of the Composite Agricultural Extension Project under the training and visit system of Agricultural Extension during 1985, is in its fourth year of operation in the district during 1988-89. The training and visit system with the co-operation of Agricultural University Scientists had provided a dynamic mechanism through the monthly and fortnightly work-

shops and fixed schedules of visits by field functionaries for an accelerated transfer of technology to all sections of the farmers with different socio-economic background. The main emphasis is on the use of quality seeds, chemical fertilizers and adoption of need based plant protection measures. The minimum technology package approach has been introduced during 1988-89 and is being insisted on all contact farmers and they are educated and persuaded to adopt this approach. The farm information unit set up under the Department has undergone a big change after the introduction of the Agricultural Extension Project. The extension literature issued by the information unit consists of all printed materials like hand bills, posters, leaflets, pamphlets, folders, booklets, etc. to provide information support to the various extension programmes. Daily tips to farmers 'Raitharige Salahe', are sent to Akashavani for arranging broadcast and these tips are on current topics, useful to farmers. Cassette tapes are being utilized for recording the farmers opinion, experiences on their adoption of new technology and interview with contact farmers etc. and they are played back during group meetings of farmers and other functions.

SOIL CONSERVATION

Soil conservation is a means to prevent the erosion of fertile top soil and to conserve the soil moisture which helps in maintaining the soil fertility. The soil conservation works are taken up in accordance with the provision made under the Karnataka Land Improvement Act 1961. At present, the stress is on the development of land on watershed basis. Under this programme, the Department undertakes the construction of farm ponds, graded bunds, terracing, gully plugging, etc. Based on the rainfall probabilities and moisture availability index with different degrees of waterstress and periods of droughts of various intensities, the periods and duration of crop growth have been worked out. In the district, the period of crop growth is 217 days ie. from 2nd May to 12th June and 27th June to 18th December. But the drought period during the growing season is more in the district. In Bangalore Rural district, it is estimated that 1.13 lakh hectares could be brought under contour bunding. The taluk-wise details are given in the following table.

Taluk	Total area that could be brought under contour bunding	Total area contour bunded at the end of March	
		1975	1985
Channapatna	11,000	125	2,027.28
Devanshalli	13,000	-	567.32

1	2	3	4
Dodballapur	25,000	2,392	8,918.41
Hoskote	14,000	28	1,203.40
Kanakapura	23,000	290	6,500.42
Magadi	20,000	29	1,155.71
Nelamangala	20,000	67	2,189.44
Ramanagaram	12,000	373	2,110.27
District	1,38,000	3,304	24,672.25

DRY FARMING

Bangalore Rural district has been grouped under Dry Zone and this zone is suitable for mixed cropping since it is predominantly kharif area. However, sequential cropping for two crops can be followed in certain pockets of soil types having favourable moisture holding capacities. Though the monsoon sets in earlier, the dependability of rainfall gets reduced during the second and third week of June. Hence, crops and cropping programmes are required to be managed carefully so as to overcome this low dependability rainfall period. The programme of laying out large scale demonstrations of 500 ha in each of the selected taluks where the rainfall is less than 700 mm was taken up in 1982-83, and later extended to 1,000 ha per taluk from 1983-83 onwards to cover all taluks both under dry land as well as rain-fed farming. Crop production in the dry land area is largely determined by climatic factors. Dry land/rain-fed farming in 100 hectares block around rain-gauge stations is in operation in the district from 1985-86. It envisages the study and recommendations of location specific technology, based on rainfall probability analysis and having contingent plans to meet out aberrant weather conditions. Successful crop production in dry farming area contemplates soil and water conservation and change in the choice of crops, varieties and management practices based on yearly changes in rainfall pattern.

DRY LAND DEVELOPMENT

The main objective of Dry Land Development Board is to minimise risk in rain-fed farming and induce investments in the use of inputs such as improved seeds, fertilizers, pesticides, improved implements and life saving irrigation either from runoff, open drainage or ground water exploitation leading to a significant increase in the yield levels which in turn encourages higher investment. At present, the main emphasis will be on dry land development on watershed basis.

Kabbalnala watershed: The world bank has provided assistance for development of Kabbalnala watershed located in the areas of Kanankapura and Malavalli taluks of Bangalore Rural and Mandya district respectively. It has an area of 29,803 ha of which 16,482 ha are privately owned lands, covering 110 villages. The Department of Agriculture undertakes the soil and water conservation works in the watershed, the Forest Department looks after afforestation and farm forestry programmes while the University of Agricultural Sciences, Bangalore takes up research and on farm trials programme in the watershed area. The achievements under this watershed from 1983-84 to 1987-88 were as follows. Strengthening of existing bunds 5,058 ha, gully plugs, 3,305 nos., farm ponds 13 nos., land smoothening 1,215 ha, water ways 70,000 metres, diversion channels 900 metres, nala bunding one and ravine control structure five.

It is proposed to select a block of 200 to 250 ha per taluk for implementing dry land farming technology. In this model micro watershed all the land treatments like land smoothening, small section bunds, contour cultivation and sowing to improve *in situ* moisture conservation are taken up besides constructing farm ponds as water harvesting measures. An amount of one lakh rupees for land development and Rs.0.5 lakhs for supply of input kits under Centrally-sponsored scheme for assisting small and marginal farmers has been utilized for this model micro watershed.

Karnataka Pradesh Krishik Samaj: A district branch of the Krishika Samaj is functioning in the district. The main objectives of the Samaj are to study the problems of the farmers, to educate and train the farmers with the co-operation of Government departments and other agencies and to bring about improvements in the living standards of the farmers.

Agricultural Implements: Agricultural implements are categorised as hand operated implements like seed drill, seed-cum-fertilizer drill, chaff cutter, wheel hoe, sprayer, duster, etc.; animal operated implements like wooden plough, steel plough, blade harrow, disc harrow, seed drill, seed-cum-fertilizer drill, carts, sugarcane crushers, etc.; plant protection equipments and engines like power operated sprayer/duster, diesel engine pumpsets, electric pumpsets, etc. and tractors and their implements. Table IV gives the taluk-wise number of different agricultural implements and machinery used in the district as per 1983 livestock census.

IRRIGATION

As large scale irrigation works could not be undertaken in the district during the pre-20th century, achievements in this area were not substantial. The development of irrigation facilities and arrangements made for their upkeep and maintenance has been discussed at the beginning of this chapter. Irrigation during this period was mostly tank and well irrigation. Bunds were raised against some rivers and rivulets, but their capacity was limited. The only notable irrigation work undertaken in the district and completed was that of Cauvery *anecut* channel. The Cauvery *anecut* channel had been in operation even prior to 1900 A.D. and the irrigation was confined mostly to a narrow stretch hugging the bank of the river Suvarnamukhi. An area of about 332 ha (170 ha from the left bank canal and 162 ha from right bank canal) is presently being irrigated by an *anecut* channel taking off from masonry *anecut* constructed across the Suvarnamukhi river, a tributary of the Arkavati river in the district. The rivers that flow through the district are too small to evoke any hopes about the feasibility of putting up any major irrigation works within the district. The irrigation potential is indeed quite low. The Kanva reservoir which was built in 1946 is the only irrigation project that deserves mention as an important source of irrigation with a network of canals. Mention may also be made about the Manchanabele Project in Magadi taluk and Iggalur Project in Channapatna taluk each of which when completed are likely to provide irrigation facilities to about 3,800 hectares of land. Byramangala reservoir project provides irrigation benefits to about 1,600 hectares of land in Kanakapura taluk and it was built in 1971.

A classification of the irrigated area by sources of irrigation shows that while tanks and wells account for 39 per cent and 54.5 per cent respectively, canals account for just 4.5 per cent of the total area under irrigation and the irrigated area amounts to about 15.6 per cent of the net area sown, the total irrigated area being 35,248 ha. Bangalore Rural district has about 152 major tanks and 1,084 minor tanks and most of these have, since decades, been providing irrigation facilities to small patches of lands that come under their respective atchkats. These tanks are widely dispersed and are of various dimensions. The usefulness of these tanks depends largely on the adequacy of the rainfall in the catchment area of each tank. Consequently, the area actually irrigated varies from year to year. The total irrigable area under tanks adds upto about 31,444 ha. Well irrigation is also quite popular since quite a long time in the district. In recent years, there has been remarkable increase in the number of irrigation wells. The traditional devices such as *yeta* and

kapile for lifting water from the wells as also the more recent device of diesel engine pumps have yielded place to electrically operated pumpsets. At the end of March 1987, the total number of energised pumpsets stood at 48,629 and among the eight taluks of the district, Devanahalli topped the list with a tally of 11,178 while Nelamangala held the bottom place with 2,938. The number of diesel engine pumpsets was 1,368 in the district.

KANVA RESERVOIR PROJECT

The Kanva reservoir project comprises of a storage reservoir across the river Kanva near Kannamangala village in Channapatna taluk. The 1,423 metres long and 18 metres high earthen dam with a spillway has been constructed to store 22.73 million cubic metres of water. Two canals on either bank provide irrigation benefits for over 2,024 ha in Channapatna taluk. The catchment area of the dam site is about 340 sq km with an annual average yield of about 396 million cubic metres. An area of 445 ha and five villages namely, Kannamangala, Kanva, Chamahally, Kyasapura and Annamahalli got submerged under the reservoir. The project was started in 1940 and completed in 1946 with an expenditure of about 39 lakhs of rupees. The left bank canal runs for a length of 16 km to command an area of 1,013 ha. The right bank canal runs for a length of 24 km to command an area of 1,011 ha. The proposed gross utilization is about 34 million cubic metres.

BYRAMANGALA RESERVOIR PROJECT

The Byramangala reservoir project consist of a storage reservoir across the river Arkavati, a tributary to the Cauvery, near Byramangala village in Ramnagar taluk with canals on both banks to irrigate 1,619 ha in Kanakapura taluk. The utilization proposed under this project is about 28 million cubic metres. The 22.86 metres long and 23 metres high earthen dam has a gated spillway on right flank with the storage capacity of 21.14 million cubic metres. The left bank canal with a command of 1,214 ha run for a length of 32 km. The right bank canal runs for a length of 10 km and commands an irrigable area of 405 ha. The work on the project was commenced in 1940 and the project was completed in 1971, with an expenditure of Rs 12 lakhs. An area of about 437 ha has been submerged under the reservoir without affecting any village. The catchment area of the damsite is about 376 sq km with an annual average yield of about 230 million cubic metres.

MANCHANABELE PROJECT

The Manchanabele reservoir project comprises a reservoir across the river Arkavati, a tributary to the river Cauvery, near Manchanabele

bele village in Magadi taluk, with canals on both banks to irrigate 3,845 ha in Bangalore Rural district. The total utilization proposed under this project is about 22 million cubic metres. The catchment area of the dam site is about 1,590 sq km (1,438 sq km intercepted and 152 sq km independent) with an average annual yield of 36 million cubic metres. The 354 metres long and 28.75 metres high dam comprises a central masonry spillway section, with a masonry non-overflow section on the right flank and earth dam on the left flank. The impounding capacity is about 36 million cubic metres. Due to the construction of this reservoir, 365 ha of land and three village namely Averahally, Veerapura and Vaderahalli come under submersion displacing about 1,350 persons. Manchanable left bank canal runs for a length of 53 km and commands an irrigable area of 1,767 ha. The right bank canal runs for a length of 63 km with an irrigable command of 2,078 ha. Both the canals run in rugged terrain in initial reaches and cross Bangalore-Mysore State highway and railway line. Administrative approval to the project costing Rs 500 lakhs at 1976-77 level of rates has been accorded in 1977. The revised cost of the project, at 1985-86 level of rates was about Rs 1850 lakhs.

Though the preliminary work on the project was started in 1970, work on the main dam was started only in 1976. The project is expected to be completed during the year 1989. The displaced persons of Veerapura and Vaderahalli are shifted to Kadabagere village in Nelamangala taluk and the villagers of Averahalli are shifted to an elevated place near Averahalli village itself. The expenditure incurred on this project from inception to the end of March 1987 is about 1,244 lakhs of Rupees. Out of the total irrigable area of 3,845 ha, only 69 ha (18 ha under the left bank canal and 51 ha under the right bank canal) lies in Magadi taluk and the remaining area in Ramanageram taluk.

ARKAVATI RESERVOIR PROJECT

The Arkavati reservoir project envisages the construction of a storage reservoir across the river Arkavati near Harobele village in Kanakapura taluk, with a flow and lift canals on either bank to provide irrigation over an area of 8,560 ha lying entirely in Kanakapura taluk. Total cropped area contemplated under the project is 8,560 ha and the utilization proposed under the project is about 89 million cubic metres. It is proposed to construct a central spillway and masonry non-overflow section on right bank with earth dam on left bank. The length of the dam would be 716 metres and the height of the dam above river bed would be 24.68 metres to create a storage reservoir with 45 million cubic metres capacity. Three villages namely Honganahalli, Marigoudanadoddi and Margadethayyanagundi with an area

of 697 ha will get submerged by this dam, affecting a population of about 600.

The project envisages flow canal and lift canal on either bank. The left bank flow canal runs for 23 km with an irrigable command of 3,238 ha, while the left bank lift canal runs for 22 km for commanding an irrigable area of 1,457 ha. The right bank flow canal runs for the length of 23 km to command an irrigable area of 2,125 ha while the right bank lift canal runs for 34 km for commanding an irrigable area of 1,740 ha. The sanctioned cost of the project is Rs 2,225 lakhs at 1983-84 level of rates and administrative approval has been accorded in 1984. The revised cost of the project at 1985-86 level of rates is Rs 2,470 lakhs. The work on the project was started in 1975 and the project is expected to be completed during VIII plan. Preliminary works like formation of approach roads, colony buildings, dam seat clearance, excavation for chute, stilling basin, over-flow and non-over-flow are in progress. Rehabilitation and the works on the canals are yet to be taken up. Expenditure on the project from inception upto the end of March 1987 is about Rs 432 lakhs. The dam has the catchment area of 1,970 sq km with an average yield of about 1,770 million cubic metres per annum.

IGGALUR PROJECT

The Iggalur project envisages the construction of a barrage across the river Shimsha, a tributary to the river Cauvery, near Iggalur village in Channapstna taluk, for providing irrigation over an area of 4,047 ha in Channapstna taluk of Bangalore Rural district and Maddur and Malavelly taluks of Mandya district. The proposed cropped area is about 5,500 ha and the utilization proposed is about 50.50 million cubic metres. The *anicut* proposed to be constructed will be 1,234 metres long and eight metres high, with a central masonry over-flow and non-overflow sections and earthen embankment on either banks. This is only a diversion work, the storage being only 0.85 million cubic metres. However it submerges about 171 ha of land without affecting any village.

The left bank flow canal runs for a length of 35 km to have an irrigable command of 1,477 ha. This canal crosses Kanva and Bhima rivers through aqueducts. One lift irrigation scheme is envisaged on the left bank canal to command an area of 765 ha on the upper margin of the flow canal. Three more lift irrigation schemes are contemplated on left bank foreshore having commands of 892, 508 and 405 ha respectively. Out of the proposed total irrigable command of 4,047 ha only 1,377 ha of irrigable area lies in Channapstna taluk (left bank

flow canal - 246 ha and lift canals -1132 ha). Administrative approval to the project costing Rs.342 lakhs at 1977-78 level of rates has been accorded in 1977. The revised cost of the project at 1984-85 level of rates is Rs.1,075 lakhs. The work on the project was started during 1979 and the project is expected to be completed during 1990. The work on the barrage as per modified proposals was started during August 1985. The work on the lift canal is completed over a length of 180 metres of the main canal. An irrigation potential of 520 ha was created by June 1985 in Channapatna taluk. The total catchment area of the dam site is 7,050 sq km with an average yield of 63 million cubic metres per annum.

The following table gives the taluk-wise net area sown and the area irrigated by canals, tanks, wells and other sources during 1985-86.

Taluk	Net area sown	Net area irrigated during 1985-86					Total
		Canals	Tanks	Wells	Tube wells	Others	
1. Channapatna	32,418	12	4,151	2,319	44	-	6,526
2. Devanahalli	21,091	-	1,382	4,026	442	-	5,850
3. Dodballapur	33,802	-	2,778	2,387	362	10	5,517
4. Hoskote	23,719	-	191	1,328	3,264	41	4,814
5. Kanakapura	63,673	1,106	870	4,005	262	325	6,568
6. Magadi	40,754	-	3,714	1,497	8	212	5,427
7. Nelamangala	28,819	-	2,391	957	387	45	3,780
8. Ramnageram	32,616	803	1,390	2,333	8	223	4,757
District	2,76,892	1,921	16,857	18,848	4,757	856	43,239

The Taluk-wise total irrigation potential in the district is as follows:

Taluk	Irrigation potential (ha)			Net area irrigated in 1985-86
	Surface	Ground	Total	
Channapatna	6,021	3,016	9,037	6,526
Devanahalli	3,626	6,715	10,341	5,850

1	2	3	4	5
Dodballapur	4,581	4,015	8,596	5,517
Hoskote	5,661	9,239	14,900	4,814
Kanakapura	5,400	4,979	10,379	6,568
Magadi	3,853	4,642	8,495	5,427
Nelamangala	3,832	3,059	6,891	3,780
Ramanagaram	5,081	3,374	8,455	4,757
District	38,055	39,039	77,094	43,239

MINOR IRRIGATION

As per Planning Commission, all irrigation works having an atchkat of 2,000 hectares and less are included under minor irrigation which include tanks, streams, pickup channels and lift irrigation schemes. More stress is laid on those works as they require less time for construction. In Bangalore Rural district, there are 382 tanks maintained by Taluk Development Boards with an atchkat area of 2,500 ha and 1,078 tanks coming under minor irrigation zone with an area of 31,444 ha. The atchkat area under ground water resources is about 40,000 ha. The total surface and ground water resources in the district is about 77,000 ha in 1987. The percentage of surface irrigation to the net area sown is 12.66 and the percentage of ground water irrigation to the net area sown is 13.32. The total surface and ground water irrigated area forms about 26 per cent of net area sown and this forms the ultimate irrigation potential of Bangalore Rural district. The taluk-wise minor irrigation details are given in the following table for the year 1986-87.

HORTICULTURE

The Department of Horticulture deals with various aspects of horticulture connected with the extension, research and technology regarding the cultivation of fruits, vegetables, plantation crops, spices and commercial flowers. It is charged with the responsibility of development and maintenance of public parks and gardens. Organised introduction, acclimatization and multiplication of all the horticultural plants, the development of organised nurseries and nursery trade, starting and organising horticultural societies, etc. also come within the purview of the department. Horticulture received much impetus after the establishment of Agri-Horticultural society at Bangalore in 1839 and afterwards, by the formation of Lalbagh as horticultural and botanical gardens in 1856. The large concentration of population in Bangalore city has created a very good and perennial demand for vegetables and fruits. As a result, production of vegetables in garden lands that are being irrigated by wells and tanks,

Minor Irrigation Statistics at a Glance, Bangalore Rural District as on 1-4-1987.
Atchkat in Hectares

Taluk	Tanks		Anecuts		Lift irrigation schemes		Other M.I. Works		All sources	
	No	Atchkat	No.	Atchkat	No.	Atchkat	No.	Atchkat	No.	Atchkat
Channarayana	93	3,779	24	482	-	-	-	-	117	4,261
Devanahalli	103	3,525	-	-	-	-	-	-	103	3,525
Dodballapur	145	5,048	11	145	1	12	1	7	158	5,212
Hoskote	167	4,935	4	203	3	265	-	-	174	5,393
Kanakapura	140	3,906	31	857	6	678	-	-	177	5,441
Megadi	175	4,050	33	357	1	50	1	8	210	4,465
Nelamangala	185	4,196	6	67	-	-	-	-	191	4,263
Ramanageram	70	2,015	67	605	1	60	-	-	138	2,688
District	1,078	31,444	176	2,716	12	1,065	2	15	1,268	35,248
Percent of										
State total	4.74	5.00	7.7	2.98	2.66	1.18	0.28	0.02	4.77	3.81

has now become a characteristic feature of the district. This is so particularly in view of the relative ease with which these perishable items can be transported to Bangalore city for quick disposal. The contribution of horticulture to the economy of the district is quite substantial. The development of horticulture during the historical times has been discussed at the beginning of this chapter.

HORTICULTURAL PLANTS

Plantation and spices crops: Coconut, arecanut, betel vine, onion and chillies are important plants of this category. Coconut (*Cocos nucifera*) is one of the important commercial crops of the district and it is cultivated in an area of 10,453 ha. Channapatna, Kanakapura, Magadi, Nelamangala, Dodballapur and Ramanagaram are the major coconut cultivating taluks. Coconut palms start yielding from six to seven years after planting. Dwarf varieties and hybrids start bearing in about four to five years. Coconuts are harvested throughout the year as and when they mature. The main harvesting season is summer. Average yield is about 80 to 100 nuts per plant per year. Cereal crops, leguminous crops or pine apple or banana are grown as intercrops in the initial years and afterwards mulberry, banana or pine apple are suitable as intercrops. Fodder grasses such as hybrid napier or guinea grass along with leguminous fodder crops are also raised in coconut gardens to overcome the scarcity of fodder. It has been found that raising these crops in one hectare of coconut garden can support four dairy animals. The cattle manure is useful for improving the soil fertility and the yield of palm is also increased.

Areca nut (*Areca catechu*) is grown in an area of 425 hectares, the major areca nut growing taluks being Magadi followed by Dodballapur. Generally areca nut is harvested from November to March and tender nuts are cured by cutting toe kernel, boiling and drying them. The normal yield of tender cured kernel is about 1,000 kg per ha. Banana, betelvine, pineapple or guinea grass are suitable as inter-crops.

Betel vine is cultivated over an area of 370 hectares and Magadi taluk is the chief betel vine growing taluk in the district with an area of 192 hectares. Betel vine is a delicious creeper and its leaves are used for chewing purpose with arecanut and lime. Picking of leaves from the vine begins from third year onwards and leaves are picked four times per year per vine on rotational basis. Onion (*Allium cepa*) is one of the important commercial crops of the district with an area of 172 ha, Devanahalli taluk being the principal onion producing taluk. An average onion crop yield is upto 20,000 kg per hectare. Chillies (*Capsicum annum*) represents the important spice crops of the district and is grown both under rain-fed and irrigated conditions. It is cultivated in an area of 862 ha in the district, chief chilli pro-

ducing taluks being Kanakapura followed by Magadi with 500 and 700 hectares of cultivated area respectively. Cashewnut (*Anacardium occidentale*) (163 ha), coriander (32 ha), ginger (*Zingiber officinale*) (37 ha), turmeric (*Curcuma domestica*) (18 ha) and garlic (*Allium sativum*) (31 ha) are the minor plantation and spice crops of the district.

Tomato (*Lycopersicum esculentum*) is a popular vegetable extensively grown over the district and it is cultivated in an area of about 1,200 ha, Kanakapura, Nelamangala, Magadi, Hoskote, Devanahalli and Dodballapura being the principal tomato cultivating taluks. Harvesting starts from 10 to 12 weeks depending upon the variety and season. About 20,000 kg fruits can be obtained per ha. The ideal months for planting tomato in the district are October and November. Brinjal (*Solanum melongena*) is the second popular vegetable in the district with an area of 618 ha, the major brinjal producing taluks being Kanakapura and Magadi. An average brinjal crop yield is about 25,000 kg per ha.

French bean (*Phaseolus vulgaris*) is one of the most important legume pod vegetable grown in the district. It is a short duration crop and can be harvested within 60 days. French bean is being grown successfully from June to October and January to March. Three to four pickings are made in case of bush bean and about 6,000 kg green pods can be obtained per ha crop. French bean is cultivated over an area of 516 ha. Dodballapura and Devanahalli are the prominent French bean cultivating taluks in the district.

Potato (*Solanum tuberosum*) is another popular vegetable grown in the district under irrigated conditions. This is essentially a winter crop and thrives well in cool climate. It is cultivated over an area of 500 ha, Kanakapura and Devanahalli taluks being the chief potato growing taluks with an area of 260 and 120 ha respectively. An average irrigated crop yield about 15 to 20,000 kg per hectare. The crop is started during November-December and is ready for harvest from February onwards depending upon the duration of the variety. Carrot (*Daucus carota*) is an important root vegetable grown in the district over an area of 300 ha, mostly in Devanahalli and Hoskote taluks. The crop can be harvested in about three months and about 20,000 kg tubers per hectare can be obtained from an average crop. Beet root (*Beta vulgaris*) is grown over an area of 286 ha in the district, mostly in Devanahalli taluk. An average beetroot crop yield is about 18,000 kg roots in one hectare.

Bhendi (*Hibiscus esculentus*) is another popular vegetable grown over an area of 273 ha, mostly in Dodballapur taluk. The crop can be harvested in about six weeks after sowing and harvesting continues for another six to eight weeks. About 7,500 to 10,000 kg pods can be

obtained from one hectare crop of Bhendi. Cabbage (*Brassica oleracea* var *capitata*) is another major vegetable grown over an area of 247 ha in the district, mostly in Dodballapura and Nelamangala taluks. An average cabbage crop can yield upto 25,000 kg per hectare.

Cucumber (*Cucumis sativus*) is cultivated over an area of 240 ha in the district mostly in Magadi taluk. An yield of 15,000 kg cucumber can be obtained per hectare. Knol khol (*Brassica oleracea* var *caulorapa*) is cultivated mostly in Devanahalli taluk and yields about 20,000 kg knol khol heads per hectare. Radish (*Raphanus sativus*) is another popular root vegetable grown over an area of 150 ha in the district, mostly in Dodballapur and Magadi taluks. Other vegetable crops cultivated in the district include Cauliflower (*Brassica oleracea* var *botrytis*) 55 ha, peas (*Pisum sativum*) 77 ha, tapioca 55 ha, sweet potato 75 ha and leafy vegetables 83 ha.

FRUIT CROPS

Mango (*Mangifera indica*) is an important fruit crop in the district. It occupies about 4,531 ha in the district, mostly in Ramanagaram, Channapatna, Devanahalli, Magadi, Nelamangala and Kanakapura taluks. The number of fruits harvested varies with the age of the tree. A tree aged between 11 to 20 years yields about 500 to 1,500 fruits per plant. Guava (*Psidium guajava*) is becoming increasingly popular in the district. It is cultivated over an area of 800 hectares in the district, mostly in Devanahalli and Nelamangala taluks.

Grapes (*Vitis vinifera*) the most delicious, and nourishing among fruits are cultivated over an area of 1,363 ha. Bangalore blue variety grapes occupy an area of 545 ha and the fruit has round berry with thick skin. The thick skin easily slips from the pulp. The juice is thick, purple in colour and is good for bottling. The bunch is medium sized and compact. Anab-e-shahi variety is cultivated over an area of 675 ha. The fruit is white, oval, thick skinned, sweet and of excellent eating quality. The bunch is medium to large and moderately compact. Grape bunches do not ripe after harvest. Anab-e-Shahi develops a golden colour when fully ripe while Bangalore blue variety usually gets dark and uniform colour. Bangalore blue variety yields about 20,000 to 25,000 kg per hectare while Anab-e-Shahi yields about 30,000 to 35,000 kg per hectare. Devanahalli, Hoskote and Nelamangala taluks are the principal grape cultivating taluks in the district.

Banana (*Musa paradisiaca*) is one of the major fruit crop of the district, occupying more than 600 ha of cultivated area, mostly in Channapatna and Magadi taluks. *Pacchabale*, *yelakkibale*, *boodbale* and

rasabale are the chief banana varieties grown in the district. *Pach-chabale* variety is grown over an area of 400 ha and it yields about 37,000 kg per hectare. The average yield of other varieties ranges between 20 to 30,000 kg per hectare. Improved types of jack fruit are cultivated in the district over an area of about 450 ha, mostly in Magadi taluk. The jack fruit tree starts yielding from 8 to 12 years after planting and the yield ranges from 50 to 250 fruits per tree per annum.

Sapota (*Achras sapota*) is one of the important tropical fruits and it is becoming more popular in the district. It is cultivated over an area of about 600 ha, mostly in Devanahalli and Nelamangala taluks. The economical yields from sapota can be obtained only from 7th year onwards and the average yield per plant of about 10 years old is around 1,000 to 1,500 fruits. Papaya (*Carica papaya*) is a quick growing fruit crop and it is cultivated over an area of 132 ha, mostly in Ramanagaram and Nelamangala taluks. Papaya fruits are ready for harvest by about 9 to 10 months after planting. Fruits are borne throughout the year. Yield varies from 75 to 100 tonnes per hectare. The economical life of papaya is only three years. Watermelon (*Citrus vulgaris*) is one of the important summer vegetable grown in the district over an area of 250 ha, mostly in Channapatna taluk. About 35,000 to 50,000 kg fruits can be obtained per hectare. Other fruit crops cultivated in the district are pomegranate (*Punica granatum*) 115 ha, limes and lemons (*Citrus spp*) 230 ha and pineapple (*Ananas sativus*) 75 ha.

COMMERCIAL FLOWERS

Jasmine (*Jasminum spp*) is an important commercial crop grown for its attractive flowers and it is grown over an area of 117 ha, mostly in Kanakapura, Nelamangala and Dodballapura taluks. The different varieties of Jasmine include Kakada (*Jasminum pubescens*), gundumallige (*Jasminum sambbae*) *vasantha mallige* (*Jasminum auriculatum*) and *jaji mallige* (*Jasminum grandiflorum*). Kakada variety yields flowers throughout the year except from March to May, gundumallige variety flowers from March to October and *vasantha mallige* variety flowers from April to October and *jaji mallige* flowers from June to September. The economic yield of Jasmine is generally about 10 to 15 years under usual management. An average crop of Jasmine produces about 10,000 to 15,000 kg flowers per hectare.

Roses are grown for their cut flowers and they occupy an area of about 100 hectares in the district, particularly in Devanahalli taluk. About two to two and a half lakh flowers per hectare can be obtained

from a well maintained rose garden. Tuberose (*Polianthus tuberosa*) or *sugandharaja* is another important flower crop of the district. It is grown for its sweet scented flowers which are used for preparing garlands and bouquets. It occupies an area of 80 ha in the district mostly in Devanahalli taluk. About eight tonnes of flowers can be obtained per ha from a well maintained garden.

Crossandra (*Crossandra undulaefolia*) or *kanakambara* is grown for its cut flowers. The yellow flowers of the plant have a very good market. The crop is cultivated over an area of about 40 ha in the district mostly in Nelamangala, Devanahalli and Hoskote taluks. One hectare crossandra crop yields about five tonnes of flowers. Marygold (*Tagetes erecta*) or *chandu hu* is another popular flower crop in the district. It is cultivated over an area of about 40 ha, mostly in Ramanagaram, Devanahalli and Nelamangala taluks. One hectare of marygold yields about eight to 10,000 kg of flowers. Aster (*Aster amellus*) occupies an area of about 35 ha in the district mostly in Magadi and Nelamangala taluks. One hectare of aster crop yields about 12,000 kg flowers. Chrysanthemum (*Chrysanthemum indicum*) or *sevantige* is cultivated over an area of 35 ha, mostly in Magadi and Nelamangala taluks. The average crop yields about 15,000 kg flowers per hectare. Other flower crops cultivated in the district include Champaka (*Michelia champaka*), *Spatika* (*Barleria chistata*), *Dasavala* (*Hibiscus rosasinensis*), *Bettadavare* (*Hibiscus mutabilis*), Croton, Bougainvillea and *kanigalu* (*Nerium odorum*).

DEVELOPMENT PROGRAMMES

Doddaballapura and Byrapatna horticultural farms of Bangalore Rural district are to be developed as regional farms for dry orchards under the development of dry orchards. A large variety of horticultural crops like sapots, tamarind, jack, etc. are suitable for dry orchards. Dry orchards development is taken up as a part of dry land development and development of watershed basins. The development of dry orchards is being done in a phased manner to maintain the existing horticultural wealth, grafting operations and planting of new varieties. A regional centre for vegetable seed production at K. Poojenahalli in the district is contemplated under the National Seed Project III. Under the programme of training to farmers, 67 farmers are to be trained in fruits and vegetables processing and preservation during 1988-89 in the research institutions. An amount of 13,500 rupees has been provided for this programme. Best methods of packing, storage and transport after proper harvesting of horticultural crops are given in these courses. There is an increasing demand for planting material and seeds by the farmers interested in horticulture. The

departmental farms and nurseries are unable to meet the requirements of farmers. So, under the assistance for development of private nurseries, educated rural youths trained in horticulture are assisted to set up horticultural nurseries in their own lands. The qualified and selected individuals are paid Rs 5,000 each to establish horticultural nurseries. The department is executing the horticultural programmes in the watershed area by establishing fruit/coconut orchards. In addition, special schemes to promote horticulture under NREP, RLEGP and DPAP are also implemented in the district. Farmers of the district are getting loans and subsidies for cultivating horticultural crops like coconut, grapes and betelvine.

The area, year of establishment and important plants in the various horticultural farms and nurseries in the district are given hereunder:

Name of the Horticultural Farm/Nursery	Extent of Farm in hectares	Year of establishment	Important Plants
<u>I. Devanahalli sub-division</u>			
1. Devanahalli Farm	0.4	1966-67	Coconut, Pomegranate
2. Poojanshalli Farm	21.2	1977-78	Coconut, Papaya
3. Dodballapur Farm	8.0	1968-69	Coconut, Pomegranate, Guava, mango, sapota, papaya.
4. Nelamangala Nursery	0.4	1965-66	Coconut, Pomegranate, sapota, guava.
5. Hoskote Farm	1.0	1983-84	Coconut, Mango, guava, sapota
6. T.G. Halli Farm	15.0	1965-66	Guava, sapota, mango, coconut

1	2	3	4
II. Ramenagaram Sub-Division			
1. Ramenagaram Nursery	1.5	1965	Sapota, mango, Pomegranate, Guava, Coconut
2. Byramangala	2.0	1965	Coconut, Sapota, Mango, Guava, Pomegranate.
3. Kanakapura	4.5	1971-72	Guava, Sapota, Mango, Coconut, Pomegranate, ornamental plants.
4. Kanva Vana	0.5	1970	Ornamental Plants
5. Harohalli Farm	10.0	1966	Guava Sapota, Mango, Coconut, pomegranate
6. B.G. Kaval Farm	72.0	1970	Sapota, guava, mango
7. Channapatna Nursery	1.0	1966-67	Sapota, guava, pomegranate, coconut
8. Byrapatna Farm	16.0	1968-69	Sapota, guava, coconut
9. Vanderaguppe Farm	9.0	1974-75	Sapota, guava, mango, coconut, pomegranate

ANIMAL HUSBANDRY

Animal husbandry is being practiced as an adjunct to agriculture since generations. Livestock development has been undergoing revolutionary changes in recent years. In recent decades, dairying and poultry keeping has assumed considerable economic importance. Since the agricultural holdings are small and mechanization has not made

much headway, even now agriculture is largely dependant upon the draught power supplied by the bullocks. The value of the farmyard manure consisting mainly of the animal refuse is also very much appreciated by the farmers even though they are by now quite familiar with the use of chemical fertilizers. Thus possession of land and livestock are very much inter-linked and one hardly finds a land holder of any substance without a pair of bullocks and at least one or two cows and buffaloes. The adoption of modern techniques of breeding, feeding, management and disease control has contributed to the enhancement of the productivity of livestock. The approach to cattle development is intensive cross breeding of indigenous cattle, using superior germ-plasm of exotic sires to bring about improvement in genetic potential for increasing milk production and for draught purposes.

LIVESTOCK WEALTH

The cattle found in the district are mainly of the popular Hallikar breed. Animals of Amrit Mahal breed are also found in substantial numbers. The Hallikar cattle formed the nucleus of famous breeds of draught cattle. The breeding of this type is undertaken throughout the district by individuals on a small scale from early times. These are good draught cattle but poor milkers. The Amrit Mahal breed is very active and famous for their power of endurance. These bullocks are specially suited for trotting and quick transport. This breed is generally poor in milk yields. Murrah buffalo breed is massive, black with infrequent white markings. They are used as milch animals in the district. Surti buffalo breed is medium sized, well shaped, with straight back and sickle-shaped horns. This breed is a good milker. Improved breeds like Holstein friesian, Jersey and Red dane are quite popular especially in the urban areas. The taluk-wise figures of various species of livestock is given in the table V.

VETERINARY SERVICES

In order to protect the livestock population against contagious diseases, there are 103 veterinary institutions consisting of 24 veterinary dispensaries, 36 rural veterinary dispensaries and 43 artificial insemination centres. There is a key village centre at Kanakapura which serves a group of about ten villages and it takes up intensive animal husbandry activities in a concentrated area. The activities include artificial insemination of cows and buffaloes, castration of scrub bulls, identification and marking of animals by tattooing, milk recording, fodder cultivation and prevention and control of animal diseases. There are eight mobile veterinary clinics in the district at taluk headquarters to provide timely veterinary

services to rural areas. Regional laboratories are located at Dodballapura and Byrapatna in Channapatna taluk and 15 artificial insemination sub-centres are under the control of regional laboratories.

CATTLE FAIRS

The cattle fairs are held almost invariably as adjuncts to the annual festivities (*Jatras*) connected with the various local deities, from three to ten days duration. Further to encourage the best animals to gather, medals and certificates are awarded at these shows on the day the religious festivities come to close. Facilities for drinking water and veterinary aid are provided at these fairs. The incentives offered during cattle fairs have succeeded in producing a large class of professional cattle breeders. It is a pleasant sight to watch the breeders tending their cattle with utmost care and tenderness. The important cattle fairs, their duration and number of cattle gathered are as follows. The Ghati Subramanya fair in Dodballapura tq 30 days, 20,000; the Madduramma fair in Hoskote tq 20 days, 10,000; the Gangadhara swamy fair in Nelamangala tq 15 days 20,000; the Bheemeshvara fair in Nelamangala tq, 10 days 10,000; the Kengal Anjaneya fair in Channapatna tq 15 days 10,000; the Veerabhadraswamy fair in Kanakapura taluk in 15 days, 10,000; the Kabbamma fair in Kanakapura tq 10 days, 8,000; the Mahima Rangaswamy fair in Nelamangala tq 8 days, 10,000; the Lakshminarasimha Swamy fair in Magadi tq 10 days, 10,000; the Ramadevaru fair in Kanakapura tq 8 days, 8,000; the Pandurangaswamy fair in Magadi tq 10 days, 12,000; Devarahosahalli fair in Nelamangala tq 10 days, 10,000; and Honnamma Devi fair in Nelamangala tq 10 days, 15,000.

DAIRYING

A high degree of urbanisation, namely a very large concentration of people in and around Bangalore city, has enhanced the economic importance of dairying all over the district. Bangalore Milk Supply Scheme which was started during 1959-60 with the assistance of the UNICEF marked the beginning of an earnest attempt to organise what was till then a purely private enterprise carried on at household level on a small scale. The steady demand for milk and milk products soon transformed dairying into a booming commercial activity and the unscrupulous middlemen entered the scene. In order to protect the interests of the urban resident consumers on the one hand and those of the milk producers on the other, government intervention too became necessary. Bangalore Dairy which was inaugurated in 1965, over the years has built up a very good network for the procurement of milk even from

far off villages and has also simultaneously developed a good market for milk and milk products like curds, butter, ghee, *peda*, *lassi*, flavoured milk etc. through a network of agents operating all over the city and its neighbourhood. Bangalore is among the eight districts of the state that have been chosen for implementing the World Bank aided Dairy Development Programme. The functioning of the Karnataka Dairy Development Corporation which began in 1974 with its headquarters at Bangalore has provided a further boost to the Dairy farming activity. All over the Bangalore Rural District, as in 1987, it is reported, there are 424 Dairy Co-operative Societies of which only 388 are in working condition. Dairy co-operative societies help farmers to market their milk efficiently avoiding the depredations of traditional middlemen. The producers are paid for their milk on the basis of fat content of the milk.

Bangalore Urban and Rural District Co-operative Milk Producers Societies Union Limited was started in 1976 under the Karnataka Dairy Development Corporation with the assistance of World Bank. The union covers Bangalore Rural and Bangalore (Urban) districts. As per the Government Order of June 1988, sanction was accorded for the transfer of Bangalore dairy and the chilling centres to the Bangalore Urban and Rural Co-operative Milk Producers Societies Union along with staff, assets and liabilities with effect from 1.8.1988. The Union plans procurement, scheduling, processing, manufacturing and marketing of all its liquid milk and dairy products, organisation of Dairy Co-operative Societies, formation of procurement routes, determination of the standard and quality of milk as per the directives of the Karnataka Co-operative Milk Producers Federation. The Union under its Animal Health Care Programme provides health care facility to all animals of the farmers who are the members of Dairy Co-operative Societies.

POULTRY DEVELOPMENT

Poultry keeping has been taken up as an important subsidiary occupation by several people due to the heavy demand for eggs and poultry birds in Bangalore all through the year and numerous private poultry farms have come up in the district. The State Poultry Farm at Hesaraghatta in Bangalore (Urban) district is a pioneer institution functioning since 1948. This poultry farm maintains the breeding stock, carries out scientific breeding programme and supplies a day-old chicks to several Government Institutions and private poultry farmers. It also produces a high yielding variety 'Mychic' which stood first in the random sample lying test conducted by the Government of India. In Bangalore Rural district, poultry rearing centre is located at Ramanagaram. The achievement of the centre is given hereunder.

Particulars	1983-84	1984-85	1985-86	1986-87	1987-88
1	2	3	4	5	6
No. of birds	950	950	950	950	950
No. of birds sold for rearing purpose	3,262	3,916	995	894	845
No. of birds sold for table purpose	703	887	341	48	134
Expenditure (Rs.)	36,507	45,407	16,417	8,868	7,589
Income (Rs.)	40,526	67,022	26,566	12,077	15,714

Quality control for the manufacture of poultry feeds as per Karnataka Poultry Feed Act was introduced during 1976 in order to enable the poultry farmers to obtain quality poultry feed at reasonable rates.

SHEEP REARING

Rearing of sheep and goats is also an activity of considerable importance in most of the villages of the district. Bannur sheep is an important sheep variety reared in the district and is prized for its meat. One exotic sheep breed namely UAS developed at Dharwad has the characters of Deccani, Bannur and Southdown sheep varieties. It is prized for its wool as well as its meat. There is a sheep breeders association at Bangalore to extend extension services in the form of sheep dipping, dosing, vaccination and treatments for day-to-day ailments in sheep and to work as liaison between members and government agencies for the benefit of sheep breeders.

ANIMAL DISEASES

Non-contagious diseases do not pose a serious problem and are easily tackled by qualified personnel of the department in the veterinary institutions. Contagious diseases are controlled both by preventive and curative methods. The number of cases treated in various veterinary institutions in the district are as follows.

Particulars	1983-84	1984-85	1985-86	1986-87	1987-88
Inpatients and outpatients treated	3,26,696	3,56,179	3,72,851	3,74,655	1,20,450
Artificial inseminations	85,091	1,02,969	2,25,644	1,94,863	55,047
Castrations performed	28,529	26,777	32,198	38,462	26,884
Calves born	25,485	39,412	56,349	52,138	19,591
No. of inoculations against:					
Rinderpest	2,56,527	3,29,467	4,34,951	5,87,673	3,19,594
Black quarter	1,79,344	58,147	62,318	68,328	44,398
Foot-and-mouth	14,649	48,026	57,687	53,437	1,089
Rabies	40,348	43,600	52,314	58,632	262
Haemorrhagic septicaemia	39,201	67,541	82,132	80,926	13,689

DEVELOPMENT PROGRAMMES

The main object of cattle development programme is to increase milk production through upgrading the stock by intensive cross breeding. The livestock farm and red dane cattle project at Hesara-ghatta (Bangalore urban) provides pure breeding bulls required for supporting a large network of artificial insemination centres. As a part of cattle development programme, a fodder development programme has also been taken up. Cultivation of certain crops exclusively for fodder alone is gaining importance in the recent years. The following are the two high-yielding grass varieties, fodder jowar and a maize variety and also a perennial legume variety recommended as fodder crops for the district.

Varieties	Duration	Rooted slips/ seeds per hectare	Yield in tonnes per ha
1. N B 21 grass	Perennial	19,600 nos.	170-185
2. Para grass	Perennial	27,250 nos.	125-150
3. J-Sett-3 fodder jowar	70 to 75 days	25 kg	50
4. South African maize	80 days	40 kg	75
5. Subabul	Perennial	19,900 nos.	100

Leguminous fodder crops include centrocema, coupea, calopogonium, sesbania, desmodium, Bersem and Soyabean.

Animal husbandry activities are taken up under the Special Component Plan, Special Livestock Development Programme and Watershed Development Programmes. Assistance for construction of house shed and animal feed is also made available. The assistance is by way of subsidy to an extent of 60 per cent and the remaining 40 per cent is by way of loan from commercial banks.

FISHERIES

Bangalore Rural district is not well developed in the field of fisheries. Development activities under inland fisheries include construction of fish tanks for seed production and rearing, development of tanks, reservoirs and riverine fisheries, providing financial assistance to fishermen for purchase of fishery requisites and share capital and managerial subsidy to fisheries co-operatives and demonstration of improved methods of fishing. Bangalore Rural district has more than 1,000 tanks of varying sizes suitable for fisheries. Fish farmers development agency undertakes development of tank fisheries in about 693 tanks and the Fisheries Department in 419 tanks. These tanks have an inland waterspread area of about 23,000 ha. There are three small reservoirs in the district at Kanva, Byramangala and Nelligudda with waterspread area of 454, 414 and 140 hectares respectively. The inland fish seed production was only 9.50 lakhs during 1986-87. During 1986-87, the estimated inland fish production

was 3,080 tonnes. The taluk-wise (figures for 1986-87) is as follows: Channapatna 380 tonnes, Devanahalli 325, Dodballapura 310, Hoskote 385, Kanakapura 310, Magadi 440, Nelamangala 520 and Ramnagar 410 tonnes. The catch for the year 1987-88 was 3,900 tonnes for the district.

FISH FARMS

There is a fish seed production farm at Byramangala in Ramnagar taluk with gross land area and net water spread areas of 1.22 and 0.22 hectares respectively. The fish seed rearing farm at Kanva in Channapatna taluk maintained by Karnataka Fisheries Development Corporation has a gross land area of 1.22 ha and net water spread area of 0.10 ha. The fish Seed Rearing Farm at Nelligudde has a gross land area of 2.42 ha. Fish farm is a demarcated fertile plot situated nearby a perennial source of water on which are raised ponds or nurseries for production and rearing purpose. The object of establishing fish farm is to maintain the breeders, to undertake breeding programme and to rear the hatchlings to fry and fingerlings stage before they are transported and planted in suitable body of waters. The establishment of fish farms has given a fillip for the development of the inland water fisheries. The total fish seed produced at the Kanva fish farm is 1.65 lakhs and at Byramangala fish farm is about 7.85 lakhs during 1986-87. The main object of Fish Farmers Development Agency is to involve private agencies in intensives development of fisheries in their tanks by providing incentives like loan, subsidy, training, etc. Many of the Mandal Panchayats have readily come forward both for development of tank and to construct their own fish ponds in swampy and derilict tanks.

There are six Inland Fisheries Co-operative Societies in Bangalore Rural district with the total membership of 950 and the total share capital is about 57,890 rupees. The activities of these co-operatives include taking leases of fisheries tanks, rivers and channels for exploitation, procurement and supply of fisheries requirement of members, etc. The number of men engaged in fishing activities in the district-75, Number of gillnetters-946, trawlers-16, dragnets-4, Castnets-8 and others-55 (in 1986-87). During summer months when the village ponds and tanks are on the verge of drying up it is a customary practise at several places for the villagers to indulge in fishing as a group activity and to catch fish using plunge baskets (traps).

FISH FAUNA

Common carps are the important exotic fishes introduced in the district and the exotic carps comprised of *Cyprinus carpio communis*.

Cyprinus specularis, *Cyprinus nudus*, *Osphronemus goramy*, *Tilapia mossambica*, *Carrasius carrasiurs*, *Ctenopharyngodon idella* and *Hypophthalmichthys molitrix*. The common carps are the most popular owing to their easy acclimatization, fast growth and self-sustenance in lentic environment. The indigenous species of fresh water fish were *bale minu*, *avu minu*, *Korama*, *kuchchu minu*, *ane minu*, *marali minu*, *gende minu*, *giralu minu*, *goddale minu*, *pakke minu*, *shigadi minu*, *handi gorava*, *hu minu*, *murave*, *domme*, *kallu korava*, etc.

DEVELOPMENT PROGRAMMES

The I phase of the World Bank aided project covering Bangalore Rural district is going to be funded by the National Co-operative Development Corporation instead of the World Bank. The project is yet to be taken up. There are facilities to train rural youths in inland fisheries at K.R. Sagar in Mandya district. For implementing Special Component Plan Programmes in the district for giving economic benefits to Scheduled Castes, special Central assistance has been provided. Scheduled Caste candidates are to be trained in inland fish culture and are assisted to take up fish culture in tanks by supplying fish seed and fishery requisites. State sector Drought Prone Area Programme is under implementation in the district. The Karnataka Inland Fisheries bill 1988, has been formulated for conservation development, exploitation, marketing and disposal of inland fish and fisheries in the State. A comprehensive lease policy for major tanks has been delineated along with fixing up of priorities to be followed in the matter of leasing major tanks to various institutions and unemployed fisheries graduate, as per Government Order dated August 1987. The notable features of the lease policy are that (i) the beneficiary institutions have to compulsorily sponsor a minimum of four candidates for undergoing training in fish culture practices (ii) Fish crop insurance is compulsory and (iii) marketing is to be done through the local Fishermens' Co-operatives.

FAMINES AND FLOODS

Bangalore Rural district has suffered from deficit and capricious rainfall conditions and the resultant phenomenon of crop failure. By and large the district enjoys comparatively good seasonal conditions. The information about famines due to drought previous to the very serious famine of the years 1876-78 is very scanty. As per the Report on the Mysore Famine of 1876-78 "No record exists of any considerable famine due to drought having visited the province of Mysore though there were references in Buchanan to the dreadful famines which followed on the devastation committed by the armies in the invasion of Parashuram Bhae and of Lord Cornwallis at the end of 18th Century". In

the 19th century, periods of scarcity have occurred in 1824, 1866, 1876-78 and 1884 but Bangalore Rural district seems only to have shared the sufferings in a limited degree. After 1891-92, there has been no famine declared of a serious nature. In 1891-92, the district did not get any of the early rains. A few showers which came later on permitted the sowing of dry crops and these began to fade from insufficient moisture. In 1891, the Government resolved to make advances for the sinking of irrigation wells at a normal rate of interest, repayable by easy instalments in a long series of years; no further security was demanded than the well and the land it irrigated. According to the working of the scheme in 1892, Bangalore district was entrusted to a special officer under the Deputy Commissioner. Government loans were also advanced for the construction and repair of Saguvalli kattes. In 1907-08 the north-east monsoon proved most disappointing in the district and there was insufficient supply of water in the tanks. South-west monsoon of 1923 was very feeble and north-east monsoon that followed was a complete failure in some parts of district. The district suffered from drought, want of cattle fodder and want of employment for the labouring class. In recent years, due to improvements in transport and communications, sufferings from famine or scarcity conditions have been mitigated since foodgrains can be speedily brought and sent to even remote areas. If scarcity occurs, relief works are started according to the needs of the tract and gruel centres are immediately set up to feed the hungry. Sinking of irrigation wells is one of the permanent measures undertaken to relieve scarcity.

During 1971-72 all the eight taluks were affected by scarcity conditions and the kharif crop was a total failure. About 2.94 lakh people from 668 villages were affected by the scarcity conditions during 1972-73. In the scarcity affected areas, relief works were started to provide employment to the agricultural workers and arrangements were made for the supply of drinking water by deepening of the existing wells, sinking of temporary wells, sinking of bore wells and transport of drinking water by tankers. Loans were granted for the purchase of fodder and subsidy was sanctioned for the transport of fodder. Loans were also granted for the purchase of agricultural inputs and food grains were distributed through fair price shops.

Bangalore Rural District is facing severe drought since 1980. During 1980-81, 735 villages and 9.18 lakh population were affected by drought. During 1984-85, about 1,885 villages comprising of 12.5 lakh population and 7.5 lakh cattle were affected. A few particulars about relief measures taken up in the district during 1984-85 and 1985-86 are given below.

(All Statistics including those in the table include figures of four hoblis now transferred to Bangalore Urban District).

Taluk	No. of works	No. of persons employed daily	Expenditure in lakh Rs	No. of works	No. of persons employed daily	Expenditure in lakh Rs
Channapatna	145	1,791	50	113	3,213	66
Devanahalli	58	665	23	85	624	53
Dodballapur	73	1,533	27	58	1,142	69
Hoskote	76	1,223	24	60	1,100	82
Kanakapura	56	925	52	397	1,126	83
Magadi	77	5,956	27	94	533	62
Nelamangala	57	280	29	165	1,492	50
Ramangaram	44	461	27	147	1,156	43
District	586	12,834	259	1,119	10,386	508

During 1984-85, a cattle camp was established at Hoskote town on the National Highway towards Kolar in the open yard choultry to accommodate 500 cattle at an estimated cost of Rs 2.8 lakhs. During 1985-86 there were 370 cattle in the camp and expenditure incurred amounted to RS 22,000. Fifteen fodder banks were set up and fodder was procured by way of donations and purchase. There were 6,300 borewells in the district and PHE Department was responsible to take up repairs and deepening of borewells. During 1985-86, 102 borewells were sanctioned and 99 borewells were completed. Rs 75,000 was spent for transporting 248 lorry loads of fodder and Rs 64,000 was incurred for transporting drinking water to eight villages. Remission of land revenue was sanctioned for 1,228 villages, full suspension for 404 villages and half suspension for 236 villages, 1986-87 was a year of slow recovery from the trauma of severe droughts. During 1987-88 the hopes of complete recovery and satisfactory progress of development programmes was again jeopardised by persisting drought conditions. The rainfall conditions during 1987-88 were characterised by scarce pre-monsoon showers, delayed onset of south-west monsoon and long dry spells during crucial periods of crop growth.

There is no threat of floods in the district. The streams and rivers which may be full in rainy season, get dry for the other several months.

Table I

Land utilization in Bangalore Rural district during 1987-88 - Area in hectares

Taluk	Geographical area according to village papers	Forests	Area under non-agricultural use	Barren and uncultivable land	Permanent pastures and other grazing lands	Land under misc. tree crops & groves	Cultivable waste land	Fallow lands other than current fallows	Current fallows	Net area sown
Channarayana	53,587	6,131	5,375	1,482	3,522	214	188	4,948	269	31,458
Devanahalli	44,935	2,275	4,253	1,477	2,615	3,269	2,001	3,788	523	24,734
Dodballapur	78,760	3,895	6,812	5,064	4,806	4,141	952	15,425	2,576	35,089
Hoskote	54,857	3,444	8,871	1,049	562	1,917	868	2,446	2,165	33,535
Kanakapura	1,59,426	45,262	6,219	14,422	22,120	138	504	849	750	69,162
Megadi	79,969	6,598	4,142	5,345	9,755	371	564	6,967	1,889	44,338
Nelamangala	50,967	1,708	4,723	2,940	1,095	5,154	677	1,370	2,701	30,599
Ramanagara	62,930	11,954	3,061	5,883	5,584	139	219	4,510	218	31,362
District	5,85,431	81,267	43,456	37,662	50,059	15,343	5,973	40,303	11,091	3,00,277
Percentage of total geographical area	100	13.88	7.42	6.43	8.55	2.63	1.03	6.88	1.89	51.29

Source: District Statistical Officer, Bangalore Rural District.

Table II

Distribution of Landholdings in Bangalore Rural District (1980-81)

Taluk	Marginal holdings 1 ha		Small holdings 1-2 ha		Semi medium holdings 2-4 ha		Medium holdings 4-10 ha		Large holdings 10 ha	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Channapatna	16,131	7,157	5,491	7,819	3,032	8,310	1,157	6,626	178	2,663
Devanhalli	9,697	4,921	5,073	7,305	3,367	9,308	1,568	9,008	300	4,979
Dodballapur	10,766	6,250	6,676	9,644	4,941	13,961	2,378	13,644	297	4,312
Hoskote	11,814	5,856	5,961	8,565	4,324	11,864	2,131	12,452	371	5,426
Kanekapura	18,158	9,438	9,259	13,619	6,592	18,092	3,086	17,754	549	8,629
Magedi	13,328	6,889	7,804	11,311	6,103	16,924	3,089	17,756	408	5,835
Nelamangala	9,147	4,679	5,370	7,760	4,756	13,290	2,999	18,056	805	12,033
Ramanageram	7,329	3,830	4,506	6,633	3,455	9,563	1,854	10,808	314	4,604
District	96,370	49,020	50,140	72,656	36,570	1,01,042	18,262	1,06,104	3,222	48,481
Per cent of State Total	6.47	6.69	4.74	4.71	3.99	3.93	2.76	2.64	1.75	1.68

Table III

Area (ha) and Production (tonnes) of Important Crops in the district - 1985-86.

	Paddy		Ragi		Total Cereals		Total Pulses	
	A	P	A	P	A	P	A	P
Chennapatna	1,572	3,438	10,536	16,763	12,208	21,095	5,398	1,689
Devanhelli	1,261	2,758	11,264	17,921	14,831	25,628	4,682	1,465
Dodballapur	2,133	4,665	19,268	30,655	24,299	41,989	3,714	1,162
Hoskote	1,105	2,417	16,310	25,949	18,231	31,503	4,735	1,482
Kanekapura	1,763	3,856	36,164	54,355	36,640	63,314	10,727	3,358
Magadi	3,480	7,611	28,810	45,837	33,297	57,537	5,844	1,830
Nelamangala	1,862	4,072	23,844	37,936	27,943	48,286	6,379	1,997
Ramenageram	739	1,616	16,563	26,352	18,008	31,118	4,956	1,551
District	13,915	30,433	1,60,759	2,55,768	1,85,457	3,20,471	46,435	14,534

Source: District Statistical Officer.

Table IV

Agricultural Implements and Machinery in the district - 1983.

Taluk	Wooden ploughs	Steel ploughs	Seed-cum fertilizer drill	Seed drill	Carts	Pumpssets		Tractor	Power tiller
						Diesel	Electric		
Channarayana	15,885	10,272	407	1,324	2,885	820	1,977	21	19
Devanahalli	12,338	8,955	1,294	1,717	3,754	153	6,844	156	140
Dodballapur	16,139	5,553	669	1,940	3,841	143	2,001	33	20
Hoskote	3,079	4,186	401	766	1,551	71	1,015	85	29
Kanakapura	32,474	12,158	2,023	3,729	4,270	726	3,284	13	172
Megadi	29,477	5,571	829	1,988	5,198	388	1,164	13	17
Nelamangala	17,847	4,439	1,521	2,640	4,156	238	895	37	35
Ramanageram	12,569	8,938	547	747	1,902	149	1,741	20	13
Total	1,39,808	60,072	7,691	14,851	27,557	2,688	18,921	378	445

Note: Data also includes the figures of Jala, Bidarhalli, Dasanapura and Tavarekere hoblies of Bangalore District

Table VI

Taluk-wise Cattle Population as in 1983

Taluk	Cattle	Buffaloes	Sheep	Goats	Pigs	Dogs	Other live-stock	Total poultry
Channarayana	46,828	20,812	28,845	21,270	1,551	4,378	558	1,54,003
Devanahalli	45,417	21,475	41,093	14,114	1,784	9,893	435	2,48,087
Dodballapur	78,234	13,626	32,695	26,353	1,915	9,195	311	1,08,190
Hoskote	45,783	19,969	41,964	21,107	1,315	11,811	324	2,16,357
Kanakapura	1,25,471	10,673	49,845	68,064	911	6,278	758	2,03,049
Magadi	95,671	14,988	40,643	40,047	1,588	9,616	751	1,72,577
Nelamangala	69,377	8,943	27,578	21,332	1,032	7,587	168	87,928
Ramanagara	54,092	9,899	24,855	17,058	500	4,091	421	91,510
Total for 1983	5,60,873	1,20,385	2,87,518	2,29,345	10,596	62,849	3,726	12,81,701

Note: Data also includes the figures of Jala, Bidarahalli, Tavarekere and Dasanapura Hoblies of Bangalore Urban district.