

CHAPTER IV AGRICULTURE AND IRRIGATION*

In Mandya District, before the irrigation water was made available to farmers, they used to grow crops only under rainfed condition. During those days, the major crops being grown were Ragi, Paddy and Horse gram. The district started glowing with greenery only after the Krishnaraja Sagar water was made available to farmers for irrigation purpose. The major Ragi varieties being grown during those days were Hullubile, Madaiahanagiri, Giddaragi, Karigidda, Jenumudda, Majjige, Gedesanga, Rudrajade, Hasarukambi, Dodda goubile etc. Afterwards, farmers started growing high yielding varieties such as H-22, K-1 and K-2, which occupied five per cent of the total area under Ragi. During the same time, when the farmers started growing another high yielding variety 'Aruna', spreading of awareness regarding high yielding varieties began. This development led to the release of high yielding varieties such as Udaya and Poorna. Farmers used to take up Paddy under irrigated conditions. Before the high yielding varieties became popular, farmers used to cultivate local varieties such as Doddabatta, Karikaalu, Hottekembhatti and Puttabatta.

* *This Chapter also includes sections on Horticulture, Animal Husbandry and Veterinary Services and Fisheries.*

These were long duration varieties and their average yield was only 8 quintals per acre. After the advent of modern farming systems and due to the influence of Green Revolution, the district is on the progressive path. Those areas of the district that were previously barren, have now evolved into green fields. Along with sugarcane and coconut, Sericulturists started growing Mulberry, which transformed the district into a golden land. In order to facilitate the research leading to improvement of crops, Agriculture Research Stations of Agriculture University came into existence. Regional Research station (Irvin/Vishweshwaraiah canal Farm-V.C.Farm), which was established during 1931, was transferred to Agriculture University in 1965. During 1983, another Agriculture Research Station was established at Nagamangala.

Japanese improved method, which became popular during 1953 in Mysore State, was first introduced in Mandya district. Farmers started using varieties, which were high yielding, and selections of Coimbatore sanna such as S-661, 99, 139, 701, 749, 784 and 1092. With this, farmers started understanding the importance of application of nitrogenous fertilisers. With all these improvements, yields were almost doubled. The main sugarcane varieties, which were popular during those days, were Rasadaali (12 months duration) and Pattaapatti (14 months duration). These varieties were suitable for jaggery preparation.

Land Utilisation

The total geographical area of Mandya district is 4.98 lakh hectares, which is 2.62 per cent of geographical area of the state. Out of the total geographical area of the district, Nagamangala taluk ranks first with 20.85 per cent. Shreerangapattana taluk occupies 7.18 per cent of the total geographical area of the district. The area under forest is 0.24 lakh hectares, which is 4.77 per cent of the total geographical area of the district and 0.78 per cent of the states total area under forests. Malavalli and Krishnarajapet taluks possess 71 per cent of the total area under forests in the district. The gross sown area of the district is 2.47 lakh hectares, which is 40.7 per cent of the total geographical area of the district and 2.33 per cent of the state's net sown area. The net area

sown in Nagamangala taluk is 17.59 per cent of the total area sown in the district where as it is 8.88 per cent in Shreerangapattana taluk. Crop details and land utilisation data for the season 1999-2000 has been given in the table 4.1

Table 4.1 Land utilisation details of the districts (in hectares)

Sl No	Particulars	K R Pete	Maddur	Malavalli	Mandya	Nagama ngala	Pandava pura	Shreeran gapatna	Total
1	2	3	4	5	6	7	8	9	10
1	Total geographical Area								
A	As per the review of surveyors	91,551	61,846	80,949	71,512	1,03,885	52,743	35,758	4,98,244
B	As per the records of the villages	91,551	61,846	80,949	71,512	1,03,885	52,743	35,758	4,98,244
2	Forest	5,767	20	12,179	1,507	2,516	2,051	725	24,765
3	Area not available for cultivation								
A	Area utilised for purposes other than Agriculture	8,959	18,527	6,645	8,960	9,272	4,757	3,649	60,779
B	Barren and uncultivable land	3,520	748	1,847	3,933	6,886	2,838	1,812	21,584
4	Uncultivated land other than fallow								
A	Other fallow Land suitable for cultivation	6,513	128	2,420	2,320	26,178	3,914	500	41,973
B	Permanent pastures & other grasslands	15,423	110	8,807	6,815	495	3,661	2,885	38,196
C	Mangroves & other tree crops not recorded in sown area	300	96	483	201	822	975	300	3,177
5	Fallow land								
A	Current Fallows	2,987	2,537	5,754	6,454	14,707	3,951	3,577	39,967
B	Other Fallow land	2,900	146	2,195	2,137	4,477	7,930	1,356	21,141
	Sown Area								
6	Net sown area	45,182	39,524	40,619	39,185	38,532	22,666	20,954	2,46,662
7	Gross sown area	51,675	46,431	45,728	45,808	44,361	25,774	25,610	2,85,387
8	Area sown more than once	6,493	6,907	5,109	6,623	5,829	3,108	4,656	38,725

Source : Mandya District at a Glance 1998-99, Zilla Panchayat, Mandya

Agricultural land holdings

As per the Agriculture census, details of number and area of land holding of the Mandya District, has been presented in the table 4.2

Table 4.2 Particulars of Agricultural Censuses (from 1970-71 to 1995-96)

Year of Agri-census	No. Of Agricultural land holdings (lakhs)	Area of Agricultural land holdings (lakh hectares)	Average area of land holdings (hectares)
1970-71	2.16	295	1.37
1976-77	2.24	276	1.23
1980-81	2.89	3.12	1.08
1990-91	3.93	3.26	0.83
1995-96	4.37	3.34	0.76

As per the Agri-census of 1990-91, the taluk-wise land holding details has been given in the next table 4.3.

Table 4.3 Number (Thousands) and Area (Thousand hectares) of land holdings as per 1990-91 agricultural Census

Particulars	KR Pete	Maddur	Malavalli	Mandya	Nagamangala	Pandavapura	SR Patna	Total
1. Marginal (<1 hectare land holding)								
1. Number	43.91	48.34	49.81	56.43	41.77	21.18	20.52	287.99
2. Area	16.81	17.15	18.91	19.15	15.17	10.74	8.00	106.40
2. Small (1-2 hectares)								
1. Number	12.25	9.65	11.05	10.37	12.15	7.05	5.29	678.09
2. Area	17.08	13.19	15.28	14.70	17.05	9.82	7.33	94.44
3. Semi Medium (2-4 hectares)								
1. Number	3.36	4.06	4.46	5.03	5.93	3.89	3.12	298.25
2. Area	14.40	10.81	11.87	13.71	16.08	7.69	5.69	80.24
4. Medium (4-10 hectares)								
1. Number	1.32	0.99	1.07	1.10	1.73	0.56	0.46	7.23
2. Area	7.13	5.27	5.88	5.97	9.61	2.97	2.48	393.00
5. Big (> 10 hectares)								
1. Number	0.067	0.054	0.076	0.044	0.087	0.029	0.026	0.383
2. Area	1.08	0.72	1.04	0.84	1.31	0.36	0.33	5.68
6. Total								
1. Number	62.88	63.09	66.48	72.97	61.66	37.70	28.45	393.24
2. Area	56.48	47.15	52.97	54.36	59.76	31.58	23.79	326.10

Table 4.4 Category-wise Agricultural-census details of Mandya district for 1990-91 and 1995-96

Particulars	SC	ST	Others	Total
1. Number of Agriculture land holdings (Thousands)				
1. 1990-91	30	2	361	393
2. 1995-96	34	1	402	437
2. Area of Agriculture land holdings (Thousand hectares)				
1. 1990-91	22	2	302	326
2. 1995-96	25	2	307	334
3. Average area of Agriculture land holdings (Hectares)				
1. 1990-91	0.74	0.9	0.84	0.83
2. 1995-96	0.74	2.0	0.76	0.76

Source : Directorate of Economics and statistics, Bangalore

Soil

Soils of the district can be classified into two main types viz., Red sandy and Red loamy soils. Their details are given hereunder.

Red sandy soil : This soil is acidic and is formed by gneiss and granite. This soil can be further subdivided into three groups. **Up-land soil** : This soil can be seen in high altitudes with a slope of more than 3.5 per cent. This soil is medium deep. Colour of this soil ranges between medium reddish brown to deep red and to brown. The top portion of this soil has gravels, gravely sand where as the bottom comprises of gravely sandy loam. Normally this soil is neutral but in few places soils with lower pH (acidic) is also there. **Midland soil** : This soil can be seen in moderately slopy gneiss areas. This soil is deep reddish brown to blackish brown in its appearance. Topsoil is sandy loam while the bottom soil is sandy clay loam and gravely clay. Though this soil is neutral, in some places it is acidic in nature. This soil has got good water drainage capacity. **Lowland soil** : This type of soil is found in areas with medium slope and in valley areas. Colour of the soil ranges from brown, black to blackish brown. Normally this soil is neutral, but in some places it is alkaline. This soil has very good water holding capacity and can be seen mainly in Mandya, Malavalli, Maddur, Nagamangala, Krishnarajpet and Pandavapura taluks.

Red loams : This kind of soil can be seen in undulating granite rocky areas. Colour of this soil ranges from deep brown to deep red and the top

layers contains sandy loam to clay loam whereas the bottom layers have loam, clay loam and sand mixed with gravels in some places. This soil can be mainly seen in irrigated areas. This soil is distributed in Mandya, Maddur, Shreerangapattana, Malavalli and Pandavapura taluks. Parts of Malavalli taluk have black soils. This soil is less susceptible to erosion because of its clay content.

In canal and tank command areas of the district, clay, clay loam, sandy loam, red sandy loam, gravelly loam and other fertile soils can be seen. In the dry parts of the district, soils like red gravelly, sandy loam and red soils are common.

Soil Health Centre

Soil testing centre, started in Mandya during 1968, has been renamed later as **Soil health centre**. Soil sample analysis being a scientific method and an indicator of soil fertility and availability of nutrients to crops, helps in avoiding the excess utilisation of fertilisers. Further, soil analysis plays a key role in maximising the production by applying the balanced fertilisers to the crops. This centre analyses the soil samples of farmers and those brought by Agriculture Extension Workers and recommends appropriate fertilisers to be used. Mobile soil health centres analyse the soils of farmers on the spot and then recommends the balanced fertilisers. Further, they also analyse the water samples for their suitability for irrigation purpose and provide information regarding optimum usage of water. Lime and gypsum samples are also analysed at this centre.

In addition to soil testing, problematic fields of the farmers are also visited and suitable corrective recommendations are given to farmers along with the necessary technical information required to get higher yields. Ninety samples can be analysed per day in the laboratory. From 1999 onwards micronutrients like zinc, copper, manganese and iron are also analysed. In this centre, mainly soil pH, soluble salt content and major nutrients such as nitrogen, phosphorus and potash are analysed. The alkalinity and acidity of the soils are judged by analysing its pH. In order to overcome the problem of acidity of the soil,

farmers are advised to apply 200 kg lime per acre. Similarly providing drainage and applying gypsum are recommended to correct soil alkalinity. Soil can be categorised into normal and problematic types by analysing the soluble salt content. The soils of all the seven taluks of the districts are normal.

Soils are classified into low, medium or highly fertile based on their nitrogen content. If the nitrogen content in the soil sample is less than 0.5 per cent, it is less fertile; if it is between 0.5 and 0.75 per cent, it is medium fertile and if it is more than 0.75 per cent it is highly fertile. Similarly, if the phosphorous content in the sample is less than 9 per cent, it will be treated as low; if it is between 9 and 22 per cent, it is medium and if the phosphorous content is more than 22 per cent it is highly fertile. In the same way, the potash content of the soil is declared low if it is less than 50; medium if it is in the range of 50 to 150 and high if it is more than 150.

In order to decide the suitability of water for irrigation purpose, mainly the pH, soluble salt content, carbonate, bicarbonate, sodium, calcium, magnesium chloride, Sodium absorption rate and residual sodium carbonates will be analysed. To decide the correct proportion of micronutrients in the soil, their critical limits are used. Critical limit for zinc is 1 PPM (parts per million, one in 10 lakh parts), for copper it is 0.2 PPM, 2 PPM for manganese and 4.5 PPM for iron.

Agriculture School

Agriculture school of the district is located in Somanahalli, which is just a few kilometres away from taluk head quarters Maddur, on the Bangalore-Mysore state highway. Agriculture has been considered as a conventional family enterprise. Therefore it includes farmwomen and children. In agricultural production, farmwomen play a key role either directly or indirectly. It is estimated that, farmwomen carry out 60-70 per cent of the farm work. In the Agriculture school of Somanahalli, the modern and improved practices of agriculture are taught to farmwomen and children in a three-months training programme. In each batch there will be twenty-four trainees and in a year there will be three such batches and totally 72 farmers will be trained. Hostel

and boarding facilities are provided to trainees and both theoretical and practical training are provided. Out of the 15.31-hectare area attached to the school, 12.46 hectare is cultivable and according to the requirements of the farmers, seeds of Paddy, Ragi, Pigeon pea, Cowpea etc are produced. Water from Somanahalli tank, Shimsha lift irrigation and the three bore wells of the school is utilised for seed production.

Rural Development Training Centre, Mandya

Rural development training centre has been established about three kilometres away from the main road on Mandya-Melukote road. This centre with the name **Extension Training Centre** was started during 1952 to train the village level workers. In the initial stages training was given to Agriculture graduates and those with a diploma in agriculture. Later, training was also extended to matriculate candidates with agriculture background to serve as community workers till 1959. Later the name of this centre was changed to **Gram Sevak Training Centre** and till 1966 two year pre-service training was provided to newly selected Gram Sevaks. In 1959 itself **Home science** division attached to this training centre was also started and was giving pre-service training to the newly selected Grama Sevikas. From 1960 onwards the centre started giving rejuvenation training of one-month duration to in-service Gram Sevaks and Gram sevikas and also training to Farmwomen, officers of different cadre and other employees under Family nourishment programme.

In 1966, this centre was renamed as **Upgraded Gram Sevak Training Centre** and started giving one year advanced training on animal husbandry and modern technologies to Gram Sevaks with more than 10 years experience. In order for community Development to reach the different strata of the rural life, the centre with the new name **Rural Development Training Centre** is continuing to train young farmers and farmwomen and officers of agriculture department since 1970.

This centre provides training to Agricultural Assistants, farmers, farmwomen, youth leaders and those involved in helping the rural people and life. In order to transfer the agricultural technologies to farmers and to

understand the problems of the farming community, the centre often conducts mobile training camps at village level. Since 1982 the second stage of the grant-in-aid programme of DANIDA to Women and youth training and extension programmes (WYTEP) have been implemented. The major activities of this centre include, under national agricultural extension programme, 1) One year pre-service training to newly appointed Agricultural Assistants, 2) Annually three rejuvenation-training programmes of 30 days duration for the in-service Agricultural Assistants and 3) 75 One day mobile camps, Programmes under DANIDA aided WYTEP include 1) Annually 11 camps of 10 days duration for farmwomen, 2) Annually 11 camps of 14 days duration for Rural youth, 3) Annually Five camps of five days duration for contact workers, 4) Annually eleven pre-season training camps of 2 days duration for farmwomen; 5) Annually five or six pre-institutional training camps and seed production programmes of two days duration in the existing agricultural land for demonstration. The area of the Rural Development Training Centre is 28.46 hectares, out of which total cultivable area is 4.8 ha of dry land, 4.8 ha of irrigated land and 0.8 ha of garden land. This centre is headed by Principal with technical and administrative staff and 59 other employees.

Regional Research Station, V.C.Farm, Mandya.

Irvin/Vishveshvaraiah Nala Farm was established in 1931 on Mandya-Melukote road under the leadership of the then Director of Agriculture Department of Mysore state, Mr Lesli Coleman in the jurisdiction of Ganadalu village. The previous name of this farm was Government Ganadalu farm. This farm was also called as Irvin Nala farm for some time when it came under Krishnaraja Sagar reservoir irrigation limits. In the honour of the architect of Krishnaraja Sagar dam, this farm has been renamed as Vishveshvaraiah Nala Farm. The area of this farm is 263 hectares. This centre has been developed as a multipurpose Agricultural Research Station after the Agricultural University came into existence in 1965. This station is located on 12° North latitude and 76° west longitudes and is 695 meters above mean sea level. The centre's maximum and minimum temperatures are 34 and 15 degree Celsius, respectively and the average annual rainfall is 765 mm. The soil is basically red sandy

loam with moderate drainage capacity. The pH of the soil is 5.5 to 10.6 and the fertility status comprises of very low nitrogen, medium phosphorous and medium to high potash content.

In this research station, there are many departments related to Agriculture. In each department, there are experienced researchers who continuously strive to solve the problems of farmers. The major crops of the station include Sugarcane, Paddy and Ragi and the station has achieved special progress in these crops. High yielding varieties of Paddy, Sugarcane, Maize and Ragi which have contributed considerably to state's food production have been released by this station and it shows the great efforts put in by the station towards the progress of agriculture. Due to huge demand for quality seeds from farmers, this station has taken up seed production of Paddy, Ragi, Sugarcane, Pulses, Maize and coconut successfully. In addition, the research related to fodder legumes, horticultural crops, dairy, fishery and forestry have also been taken up in this station.

The centre conducts training programmes for officers belonging to different cadres of the State Agriculture Department, in which the scientists of the centre take active participation. The scientists of the different departments not only provide necessary information in time to farmers through radio talk programmes, but also provide the necessary information to the farmers who visit this research station. The Extension department is playing a key role in transferring the technologies developed in the centre, such as high yielding varieties, improved agricultural practices and so on to farmers and providing feed back to scientists regarding the technical problems faced by farmers. Apart from the regular research of the Agricultural University, the centre also takes up collaborative research with esteemed research organizations like Indian Council of Agricultural Research, Central Food Technology Research Institute etc in order to develop and improve major crops. Under the aegis of Command Area Development Authority, the centre also works on the research related to water requirement of different crops. The Department of Extension is carrying out the task of transferring the technologies and improved varieties to the farmers and persuading them to adopt the same and also giving feed

back on farmers' problem needing technical solutions to the scientists. The jurisdiction of the centre includes 13 taluks of Mandya and Mysore districts.

In order to transfer the technologies to farmers, lab to land programmes have been launched with the active participation of experienced scientists. Breeder seeds of Paddy, Ragi, Sugarcane and Groundnut are produced and supplied to Agriculture Department and other state institutions. The root slips of fodder grasses, bio fertilisers and Coconut seedlings are also supplied to farmers.

Varietal improvement : After the establishment of Agricultural University, the responsibility of developing high yielding varieties suitable to various regions of the state was assigned to this centre by transferring paddy research from Nagenahalli farm to Mandya farm. During the same period testing and recommending the imported Tai Chung Native 1 and IR-8 varieties to various regions of the State was done by this centre. The Jaya variety developed at Hyderabad was identified as a good variety and released for the first time in 1968 for cultivation in the State.

The factors such as soil, climate, insects, diseases and rice quality parameters were considered while developing new varieties through hybridisation using high yielding varieties. In the first stage, varieties with different durations suitable to irrigated conditions were released. During that period blast resistant Intan variety from Indonesia, Annapurna variety of Kerala and GMR-17 variety of Andhra Pradesh, which were leaf folder insect resistant, were imported, tested and recommended for Ghat regions and coastal areas, respectively. During the same period, Vikram, a variety resistant to leaf folder insect was released for the first time in the country for coastal areas. In the second stage, more importance was given to pest, disease and drought resistance and rice quality improvement attributes while developing paddy varieties. IET-7575 which was resistant to brown plant hopper was developed and recommended to such places where the insect was a menace. For Ghat regions, blast resistant IET-7191 was developed. Details of varieties released so far are given in table 4.5.

Table 4.5 Details of Paddy Varieties

Paddy Varieties	Duration (In days)	Rice Quality	Sowing time	Transplanting time	Yield in tons per hectare
Canal Irrigated Areas			Kharif		
Jaya	140 - 145	Thick	By June end	By July 3 rd week	5.5 to 6.0
Mandya Vijay	140 - 145	Fine	By June end	By July 3 rd week	5.0 to 5.5
Prakash	140 -146	Fine	By June end	By July 3 rd week	5.0 to 5.6
IET 8116	135 - 140	Medium Fine	By July First week	By July end	4.5 to 5.0
IET 7575	130 - 135	Medium Fine	By July Second week	By August 1 st week	4.5 to 5.0
IR 20	130 -135	Medium Fine	By July Second week	By August 1 st week	4.5 to 5.0
Raashi	120 -125	Medium Fine	By July end	By August 3 rd week	4.0 to 4.5
Karnataka Hybrid rice (KRH1)	120 - 126	Medium Fine	By July Second week	By August 3 rd week	5.5 to 6.0
Karnataka Hybrid rice (KRH2)	130 - 135	Medium Fine	By July end	By August 1 st week	5.5 to 6.0
Mangala	115 - 120	Medium Fine	By August second week	By September 1 st week	3.5 to 4.0
			Summer		
Short durational varieties	-	-	By January third week	By February 2 nd week	
Saline soil areas			Kharif		
Prakash	140 - 145	Fine	By June end	By July 1 st week	4.0 to 4.5
Pragati	130 -135	Medium Fine	By July second week	By August 1 st week	3.0 to 3.5
IR 30864	130 -135	Medium Fine	By July second week	By August 1 st week	3.5 to 4.0
Tella Hamsa	120 -125	Medium Fine	By July end	By August 3 rd week	3.0 to 3.5
Mangala	115 - 120	Medium Fine	By August second week	By September 3 rd week	3.0 to 3.5
			Summer		
Raashi	120 - 125	Medium Fine	By January third week	By February 2 nd week	3.5 to 4.0
Mangala	115 - 120	Medium Fine	By January third week	By February 2 nd week	3.5 to 4.0

Sl. No.	Paddy Variety	Year of release	Duration (In days)	Yield potential (Tons/hectare)	Special Characteristics
1.	Jaya	1968	140 - 145	8.0 - 8.5	Suitable to many areas
2.	Sona.	1974	145 - 150	7.0 - 7.5	Fine rice, compact ear head
3.	Vani	1976	145 - 150	7.5 - 8.0	Fine rice
4.	Prakash	1977	140 - 145	7.5 - 8.0	Fine rice
5.	IR 20	1972	130 - 135	6.0 - 6.5	Suitable to many areas
6.	Pushpa	1976	125 - 130	6.0 - 6.5	Fine rice
7.	Pragati	1972	130 - 135	5.8 - 6.0	Good quality rice
8.	Madhu	1972	120 - 125	5.8 - 6.4	Good quality rice
9.	Rashi	1977	120 - 125	5.8 - 6.4	Drought resistant
10.	Mangala	1975	115 - 120	5.0 - 5.5	Salinity resistant
11.	Intan	1975	155 - 160	4.5 - 5.0	High fodder yield variety
12.	Vikram	1974	135 - 140	5.0 - 5.5	Resistant to Leaf folder insect
13.	Shakti	1978	130 - 135	5.0 - 5.5	Resistant to Leaf folder insect
14.	GMR 17	1976	110 - 115	4.0 - 4.5	Resistant to Leaf folder insect
15.	Annapurna	1977	100 - 115	4.0 - 4.5	Boiled rice
16.	Phalguna	1976	145 - 150	5.5 - 6.0	Resistant to Leaf folder insect
17.	Mandya Vani	1982	130 - 135	6.0 - 6.5	Super fine rice
18.	Karana	1985	130 - 135	5.5 - 6.0	High yielding
19.	Mahaveera	1985	130 - 135	4.5 - 5.0	Resistant to Leaf folder insect
20.	Avinash	1985	140 - 145	4.5 - 5.5	Drought resistant
21.	Abhilash	1985	155 - 160	5.5 - 6.0	Drought resistant
22.	IET 7191	1987	145 - 150	4.5 - 5.0	Blast resistant
23.	IET 7575	1988	130 - 135	6.0 - 6.5	Brown plant hopper resistant

Ragi Variety Development

Ragi variety development programme has been taken up in three stages in this centre. In the first stage, during the period from 1931 to 1951, collection and selection of local varieties was done. During that time, the average yield of Ragi was 7.5 quintals per hectare under rainfed and 15 quintals per hectare under irrigated conditions. In the second stage of Ragi development, during 1951-1964, hybridisation of local varieties was taken up. As a result, the yield

levels of both rainfed and irrigated Ragi were increased to 22 and 37 quintals per hectare, respectively. The third stage is very important and has covered activities right from the establishment of Agricultural University. During this stage, the local varieties of South Africa were utilised in hybridisation programme, which provided a new dimension to Ragi development programme. Varieties suitable to different regions, seasons and resistant to Pests and diseases were developed. Since these varieties were developed by hybridisation of Indian and African varieties, they were named as Indaf varieties. Indaf-1, 3, 5, 7, 8 and 9 varieties have been released which is a major achievement of the Agricultural University. Due to the development of these hybrids, the yield levels of rainfed and irrigated Ragi have increased from 25 to 30 per hectare under rain fed and 45 to 50 quintals per hectare under irrigated conditions.

Ragi Lakshmanaiah is a major name in the development of Ragi varieties. He has played a key role in developing Aruna, Annapoorna, Udaya, Poorna, Kaveri, Shakthi and Indaf varieties. Release of Indaf varieties made it possible to obtain maximum yield and achieve self-sufficiency. These varieties are high yielding, highly responsive to factors of production and suitable to different agricultural zones. Before these varieties were released, Ragi was mainly grown in Kharif and Summer. Now, with the development of above-mentioned varieties, it is possible to take up Ragi cultivation in all the three seasons. New white Ragi varieties such as Indaf-6, 10, 15, MR-1, MR-2 and Indaf-11 have been developed through the recent research work. These are useful to prepare roti, Ragi ball, and malt and baby nutritious food.

Table 4.6 Details of Ragi varieties grown in the district

Sl.No.	Variety	Duration (Days)	Yield (tons/ha)
1	H - 22	150	1.3 - 1.6
2	K - 1	120 - 125	1.1 - 1.3
3	R - 0870	130-155	1.6 - 2.2 (Irrigated)
4	ES - 11	110-120	1.1 - 1.3
5	CO-1	120	0.9-1.3
6	ES-13	115-120	1.1-1.6 (Irrigated)
7	H-1	120-130	2.4-2.7
			1.6-1.7
			2.2

1	2	3	4
8	Aruna	65	2.5
9	Poorna	105	4.0
10	Udaya	90	3.0
11	Annapoorna	110	4.0
12	Kaveri	120	4.0
13	Shakthi	120	3.0-4.5
14	5-6	92	3.0
15	In daf-1	120-125	3.6-3.8
16	In daf-3	130-135	3.6-4.0
17	In daf-5	105-115	4.5-5.0
18	In daf-7	115-125	5.0-6.0
19	In daf-8	120-125	3.0-4.0
20	In daf-9	95-105	3.0-4.0
21	In daf-6	115-120	3.5-4.0
22	In daf-10	120-125	4.0-5.0
23	In daf-11	115-120	3.5-4.0
24	In daf-15	125-135	4.0-4.5
25	MR-1	120-125	3.5-4.5
26	MR-2	120-125	2.5-3.0 (Irrigated)
27	MR-3	125-130	3.0-3.5
28	PR-202	115-120	2.0 -2.5
29	HR-911	115-125	4.5-5.0
30	GPU-28	105-115	5.5-6.0 (Irrigated)
31	GPU-26	95-105	2.0-2.5
32	L-5	120-125	3.0-3.5
			2.5-3.0 (Irrigated)
			3.5-4.0
			2.5-3.0 (Irrigated)
			3.0 - 3.5
			2.5 - 3.0
			2.5-3.0

Development of Downy Mildew disease resistant variety of Maize was started during 1981 under the national variety development programme at V C Farm. Till that time, there were very few varieties, which were resistant to Downy Mildew and Leaf Blight diseases. Due to the sustained efforts of the scientists of Mandya and Nagenahalli, a hybrid variety by name Ganga-11 has been released. This hybrid is resistant to all the disease mentioned-above and has become very popular in the country.

Sugarcane variety Development

From this research station, apart from the basic production technologies, many cultural operations suitable for sugarcane cultivation in the southern parts of the State, especially for Cauvery Command Area, are developed and recommended by keeping in view the recent problems and difficulties of farmers. Use of suitable varieties is important to not only increase the sugarcane and sugar yield, but also to feed the sugar factories throughout the year, to plant and harvest at different times of the year. As a result of the research conducted in this direction the following varieties have been released. C.O.419 variety has been recommended as a suitable variety for the southern parts of the State as a medium to long durational variety of 12 to 14 months. This variety has high sugar content and gives an average yield of 60-70 tons per acre from June-August planted crop. This variety is found suitable for both jaggery preparation and ratooning. This has the ability to give satisfactory yields even in dry conditions. CO-62175, a medium duration variety, which comes to harvest in 12-13 months, has been recommended for the southern parts of the state. This variety contains the same sugar content as that of CO-419, but 25-30 % higher cane yields than CO-419 and CO-62125 and is popular as a high yielding variety. This variety is also suitable for jaggery preparation. B-37172 variety is recommended for summer transplanting and late harvesting situations. This variety gives 25 % higher yield than CO-419 and has good sugar content. This is found suitable for jaggery preparation and ratooning. For the northern parts of the state, early varieties with better yield than CO-740 i.e., CO-6415 was released during 1976. During 1986, another variety, CO-7216 (Sanjeevini), which gives higher yield and contains more sugar content than CO-740 was also released.

Hybrid Rice

Research on hybrid rice was started in Karnataka during eighties. Dr. M Mahadevappa, rice breeder, started the basic work on hybrid rice along with his co-workers in 1981. V C Farm, Mandya is the major hybrid rice research station in India. The team lead by B Vidyachandra has continued this research. During the first phase, hybrid varieties from China were imported and were

found not suitable to local areas after they were tested here. They did not possess resistance to any of the pests and diseases. The hybrid varieties developed during the second phase using parents of Chinese hybrid rice varieties, also lacked the above-mentioned traits. During the third phase, good results were obtained when the local varieties were crossed with some parent seeds from International Rice Research Institute, Philippines. As a result, Karnataka also joined the areas of hybrid rice cultivation in the world.

Farmers need to purchase hybrid seeds every time they intend to grow them. Every time they have to be produced by crossing male and female parent varieties. The resultant hybrids possess qualities of both the parents and they produce good crops and higher yields with greater vigour. The mixed traits will be segregated if the grains harvested from the hybrid crop are used as seeds, which leads to variations in plant height, grain size, duration and other traits, that would reduce the yields drastically. Since seed production of costlier hybrid varieties requires large areas, this is also done through only trained farmers.

As a result of research efforts of VC Farm, two hybrids have been released. The first one is Karnataka Rice Hybrid-1 (KRH-1). It is a medium tall variety, which grows to a height of 85-90 cm. This variety is of 120-125 days duration. The grains are long and small and 1000 grains weigh 23 grams. Its disease resistance is as good as that of Jaya. The average yield of this hybrid is 6.15 tons per hectare as compared to 4.36 tons per hectare of Mangala Rashi varieties as confirmed by the research. This hybrid was released in 1994 for the irrigated areas of Karnataka.

Another variety, Karnataka Rice Hybrid-2 (KRH-2) was released for the irrigated areas in 1996. This hybrid is of 130-135 days duration which is similar to that of IR-20 variety. This hybrid is little taller than Jaya and other medium height varieties and it grows to a height of 100-105 cm. This variety is resistant to blast to some extent. The grains are long and small. Average yield is 7.5 tonnes per hectare as compared to 5.9 tonnes per hectare of Jaya variety, as revealed by research. The cultural practices for these hybrids are slightly different from that of other varieties.

Parasite Laboratory

Parasite laboratory was established in 1935 at Mandya. In order to control the menace of Sugarcane shoot borer, *Trichogramma* parasite can be released. This parasite is like a small wasp and since it is not available in nature in sufficient numbers, it is mass-produced in the laboratory and then used to manage the shoot borer in sugarcane. This parasite has to be released at the rate of 15,000 numbers per hectare per week for 5 weeks in order to destroy the shoot borer in its egg stage itself to get the expected yield.

Comprehensive Crop Insurance Scheme

Since the crops are exposed to the natural calamities, farmers incur loss every season. In order to compensate this loss and to help the farmers to maintain the eligibility to obtain the crop loan for the succeeding season, State and Central governments launched the comprehensive crop insurance scheme extensively during Kharif 1985. Under this scheme, crop insurance is made compulsory for all the farmers who avail crop loans from cooperative, commercial and regional rural banks. The crop loss will be decided based on the crop cutting experiments in the designated areas every season. The indemnity amount will be borne by General Insurance Corporation of India and the State governments in 2:1 proportion. Under this programme, currently, the loss is estimated at Taluka level and it has been decided to estimate the loss at hobli level in future. The subsidy of 50 per cent on the insurance premium provided to small and marginal farmers is shared by the state and central governments in equal proportion. This scheme is on in operation in all the taluks of the district.

Farmer's Educational Tour

The Agriculture research organisations are exhibiting the technologies developed through recent research at district; State and national level exhibition and *melas*. Recent technological developments are also implemented in the fields of progressive farmers. The agriculture related subsidiary enterprises are also introduced to farmers. In order to create awareness on recent research highlights among farmers, 50 farmers of the district are sent on educational tours to other districts and other States.

Agriculture Award

The agriculture production has been substantially increased in the last three decades due to intensive efforts and active participation of farmers. In order to recognise such outstanding farmers, awards are being given at State, district and taluk levels. Under this scheme, for every selected crop, three awards are being given. Details of the cash awards are as follows.

Stages	State level	District level	Taluk level
First prize	1,00,000	50,000	25,000
Second prize	50,000	25,000	10,000
Third prize	25,000	10,000	5,000

Details of Different Agricultural Crops Grown in the District

Sugarcane, Ragi, Paddy and Pulses are the major crops grown in the district. In terms of area, Ragi is grown in 39.7 %, paddy in 34.5 % and pulses in 15.3 % of the total area sown. Details of estimated area; production and yield of crops grown during 1998-99 are given in the table 4.7.

Table 4.7 Estimated Area, production and yield of major agricultural crops grown in Mandya District during 1998-99.

Sl No	Name of the Crop	Season	Area (ha)	Production (Tons)	Yield per hectare (kg)
1	Paddy	Kharif	60,785	268,317	4,647
		Summer	19,107	99,979	5,508
		Annual	79,892	368,296	4,853
		Irrigated	79,492	367,361	4,865
2	Jowar	Annual	3,536	3,618	1,077
3	Ragi	Kharif	80,593	156,027	2,038
		Rabi	2,401	3,488	1,529
		Summer	2,473	5,244	2,232
		Annual	85,467	164,759	2,029
4	Total cereals	Irrigated	8,660	17,519	2,129
		Kharif	144,941	338,698	2,460
		Rabi	2,401	3,488	1,529
		Summer	21,850	71,933	3,509
		Annual	168,922	414,119	2,581
		Irrigated	88,257	262,814	3,135

1	2	3	4	5	6
5	Pigeon pea	Annual	2,060	959	490
6	Black gram	Annual	544	227	439
7	Horse gram	Annual	27,052	15,785	614
8	Green gram	Annual	793	185	246
9	Field bean	Annual	4,722	973	206
10	Total pulses	Annual	41,678	21,047	532
11	Total food grains	Annual	210,670	435,209	2,175
12	Groundnut	Annual	8,982	7805	915
13	Castor	Annual	2,069	1765	898
14	Sesame	Annual	4,127	2348	599
15	Niger	Annual	3,079	579	190
16	Sunflower	Annual	97	28	304
17	Total oil seeds	Annual	18,398	12,572	719
18	Cotton	Annual	44	65	264
19	Sugarcane	Annual	30,630	40,15,593	138

Source : Fully Revised estimates of Principal crops of Karnataka, Directorate of Economics and statistics, Bangalore 2001, D E S No. 18/2001

Agriculture related statistics of selected years from 1970 to 2000 is presented in table 4.8

Table 4.8 Agriculture related statistics of the district

Sl. No.	Particulars	1970-71	80-81	90-91	95-96	99-2000
1	Percentage wise area in the total geographical area					
a	Forest	4.86	4.76	4.77	4.77	4.97
b	Other than agriculture	10.74	12.02	12.16	12.18	12.20
c	Barren & land not suitable for cultivation	2.99	4.35	4.35	4.34	4.33
d	Permanent pasture and other grass land	11.19	9.14	8.29	7.63	7.67
e	Land with different trees and mangroves	0.34	0.39	0.65	0.63	0.64
f	Fallow land suitable for Cultivation	10.37	8.63	7.97	7.84	8.42
g	Other Fallow land	1.40	1.65	4.81	3.96	4.24
h	Current Fallows	3.84	10.44	8.68	7.89	8.02
i	Net area sown	54.28	48.62	48.33	50.76	49.51
2	Crop density	110.84	124.67	114.95	123.06	115.70
	Percentage of area sown more than once in the net sown area	10.84	24.66	14.95	23.06	15.70
3	Percentage of net irrigated area in the net sown area	31.60	40.20	41.40	44.43	43.79

5	Percentage of Gross irrigated area in the Gross area sown	34.20	43.05	46.40	44.21	49.42
6	Net irrigated area in Percentage					
a	Canals	73.07	83.40	83.16	82.73	79.94
b	Tanks	17.00	6.34	7.48	7.39	7.55
c	Wells	7.00	9.00	4.00	8.77	11.63
d	Other sources	2.00	3.00	1.00	1.11	0.88
7	Percentage in the total area sown					
a	Paddy	21.22	21.64	24.52	23.14	27.65
b	Ragi	29.09	22.67	27.53	31.66	23.74
c	Jowar	5.97	1.24	1.71	1.91	1.02
d	Total cereals	57.96	47.14	53.82	56.79	52.25
e	Total pulses	21.18	29.57	17.35	13.87	17.48
f	Sugarcane	5.84	8.35	10.83	10.85	10.99
g	Oil seeds	3.93	3.63	7.20	7.55	4.88
8	Average production (kgs per hectare)					
a	Paddy	2354	2963	2953	3360	3286
b	Jowar	975	1256	559	675	1039
c	Ragi	907	1480	740	1916	1732
d	Pigeon pea	528	333	416	283	600
e	Sugarcane (tons/ha)	89	106	116	119	138
f	Groundnut	1127	1059	730	987	837
9	District's contribution to total food grain production of the State in percentage	4.38	4.98	4.12	5.00	3.90
10	Per capita availability of cultivable land (hectares)	0.26	0.22	0.27	0.25	-

Table 4.9 Estimated Area, production and yield of major crops grown in Mandya district during 1999-2000

Sl No	Crop	Season	Area (ha)	Production (Tons)	Yield (kg/ha)
1	Paddy	Kharif - Irrigated (I)	59,144	2,78,914	4,964
		Rabi (I)	289	923	3,361
		Summer - (I)	19,487	89,546	4,837
		Total	78,920	3,69,383	4,927
2	Jowar	Kharif - (I)	43	100	2,445
		Kharif - Rainfed	2,354	2,265	1,013
3	Maize	Total	45	127	2,971

4	Ragi	Kharif - (I)	3,584	7,834	2,301
		Kharif - Rainfed	56,515	90,961	1,694
		Rabi (I)	3,693	4,785	1,364
		Rabi - Rainfed	1,138	1,148	1,062
		Summer- (I)	2,823	6,748	2,516
		Total	67,753	1,11,476	1,732
		5	Total cereals	Kharif- (I)	62,796
Kharif-Rainfed	58,889			93,272	1,667
Rabi (I)	3,982			5,401	1,428
Rabi-Rainfed	1,138			1,148	1,062
Summer- (I)	22,310			66,470	3,136
Total (I)	89,088			2,65,903	3,142
Total- rainfed	60,027			94,420	1,656
6	Total cereals & minor millets	Kharif Total	1,21,691	2,87,308	2,485
		Annual	1,49,121	3,60,327	2,544
7	Pigeon pea	Kharif	1,220	695	600
8	Black gram	Annual	640	219	360
9	Horse gram	Kharif	9,085	4,445	515
		Rabi/Summer	28,624	15,010	552
		Annual	37,709	19,455	543
10	Green gram	Kharif	436	151	364
		Rabi/Summer	264	66	262
		Annual	700	217	326
11	Field bean	Annual	3,263	672	206
12	Other pulses	Kharif	4,837	2,543	531
		Rabi/Summer	2,678	239	90
		Annual	7,515	2,782	374
13	Bengal gram	Annual	213	117	578
14	Total pulses	Kharif	19,248	8,639	472
		Rabi/Summer	32,012	15,518	510
		Annual	51,260	24,157	496
15	Groundnut	Kharif	6,443	5,086	831
		Rabi/Summer	131	144	1156
		Annual	6,574	5,230	837
16	Castor	Kharif	1,678	1,294	812
17	Sesame	Kharif	3,399	1,259	390
18	Soya bean	Kharif	48	44	963
19	Niger	Kharif	2,168	408	190
20	Sunflower	Annual	49	29	623
21	Total Oilseeds	Annual	13,916	8,264	625
22	Cotton	Annual	109	121	199
23	Sugarcane	Annual- (I)	31,377	41,13,525	138
Horticultural crops					
24	Potato	Kharif	11	134	12,169
		Rabi	47	946	20,130
		Annual	58	1,080	18,621

25	Onion	Kharif	80	469	5,865
		Rabi	133	1,335	10,037
		Summer	58	616	10,628
		Annual	271	2,420	8,930
26	Tomato	Kharif	718	11,077	15,427
		Rabi	402	5,034	12,522
		Summer	329	1,875	5,700
		Annual	1,449	17,986	12,413
27	French bean	Kharif	118	1,146	9,710
		Rabi	123	1,258	10,230
		Summer	66	666	10,088
		Total	307	3,070	10,000
28	Brinjal	Kharif	366	3,891	10,632
		Rabi	189	2,346	12,413
		Summer	174	2,029	11,659
		Annual	729	8,266	11,339
29	Banana	Annual	1,211	23,788	19,643
30	Sweet potato	Annual	10	63	6,314
31	Mango	Annual	3,775	14,311	3,791
32	Cashew	Annual	162	56	349
33	Guava	Annual	181	992	5,478
34	Sapota	Annual	298	974	3,268
35	Lime	Annual	39	433	11,107
36	Dry chilli	Kharif	630	527	836
		Rabi	95	150	1,579
		Summer	101	131	1,300
		Total	826	808	978
37	Turmeric	Annual	94	407	4,334
38	Areca nut	Annual	681	4587	6,803
39	Coconut	Annual	16,956	80,995	4,825

Source : Fully Revised Estimates of Principal crops of Karnataka, Directorate of Economics and statistics, Bangalore 2002, D E S No. 16/2002

Agriculture Seasons

Agriculture seasons of the district are identified locally as *Khar* and *hain* seasons. *Khar* season starts during April-May whereas the *hain* season starts during July. Along with these two seasons, *Rabi*, which starts during September-October is another season of agricultural activities. But, of late, agriculture seasons are classified as *Rabi*, *Kharif* and *summer*. Seasonal details of major crops grown in the district are given in table 4.10.

Table 4.10 Seasonal details of major crops

Crop	Season	Sowing time	Intercultivation	Harvest time
1 Paddy	Hain	June-July	August-September	December-January
	Kar	February-March	April-May	June-July
2 Ragi	Hain	June-July	August-September	December-January
	Kar	February-March	April-May	June-July
3 Jowar	Kharif	March-April	April-May	June-July
	Winter	September-October	November	December-January
4 Sugarcane	Annual	January-February	April-May	June-July
		September-October	December-January	January-February

Agricultural Implements

Following agricultural implements are used in the district. Among the land preparation implements, Kolar Mould Board Plough, bar point plough, bund former, puddler, ridger are the main implements; Ragi combined seeder, groundnut combined seeder, drum seeder, multiple row implement are the major seeding implements; threshing implements include groundnut decorticator, coconut tree climber, coconut dehusker, winnowing machine and improved storage bin.

IRRIGATION

Irrigation water had been provided for 1,10,587 hectare area in the district during 1997-98 under Krishnaraja Sagar and Hemavathi reservoir projects. This was 22.2 % of the total geographical area of the district and 4.76 % of the total irrigated area of the state. Krishnarajpet has the highest irrigated area, whereas, Nagamangala has the lowest irrigated area in the district. Out of the total irrigated area, 80.43 % area is irrigated from canal water and 16 % from wells and tanks. Taluk-wise irrigation facilities provided from different sources during 1997-98 are given in the table 4.11.

Table 4.11 - Irrigated area of the district (in hectares)

Taluk	Canals	Tanks	Wells	Bore wells	Other sources	Total
Krishnarajpet	17,208	4,200	2,180	130	422	24,140
Maddur	1,771	681	1,115	1,050	151	20,768
Malavalli	15,840	1,547	1,850	280	196	19,713
Mandya	16,840	282	926	27	371	18,446
Nagamangala	1,600	2,510	741	800	69	5,720
Pandavapura	8,833	300	1,126	173	188	10,620
Shreerangapatna	10,864	85	195	22	14	11,180
Total	88,956	9,605	8,133	2,482	1,411	1,10,587

Source : Mandya District At a Glance 1997-98, Office of the District statistical officer, Mandya

Table 4.12 - Details of crop-wise irrigated area (in hectares)

Year	1980-81	1990-91	1993-94
Paddy	65,110	66,367	74,069
Jowar	1,019	102	631
Ragi	21,338	15,466	12,816
Cereals and minor millets	87,867	81,912	87,532
Pulses	3,180	3,054	3,181
Sugarcane	25,230	29,965	32,265
Banana	782	525	509
Coconut	28	1,730	2,590
Groundnut	1,348	1,667	1,602
Sunflower	83	7	104
Total oil seeds (Except coconut)	1,456	2,402	2,325
Mulberry	5,620	6,627	7,196
All crops	1,30,031	1,28,413	1,38,076

Source: Brochure on irrigation statistics in Karnataka from 1980-81 to 1993-94, Directorate of Economics and statistics, Bangalore, 1995

Table 4.13 - Details of irrigation sources

Particulars	1980-81	1990-91	1993-94
Bore wells	0	250	420
Wells	6,990	8,491	9,722
Total wells	6,990	8,741	10,142
Lift irrigation projects	5	168	163
Tanks with more than 40 ha command area	158	158	158
Tanks with less than 40 ha command area	460	460	460
Total tanks	618	618	618
Electric irrigation pump sets	8,591	16,757	21,069
Diesel Engine irrigated pump sets	738	728	782
Total pump sets	9,319	17,485	21,851
Irrigated area (ha)			
From canals (Total)	1,07,654	1,08,705	1,16,428
From canals (Net)	81,271	82,799	86,471
From tanks (Total)	10,839	8,520	10,831
From tanks (Net)	6,179	7,448	8,353
From wells (Total)	9,174	9,069	8,108
From wells (Net)	7,960	7,432	6,633
From all sources (Total)	1,30,031	1,28,413	1,38,419
From all sources (Net)	97,467	99,563	1,03,969

Table 4.14 - Taluk-wise irrigation facilities in the district, 1999-2000

Particulars	Krishnar ajpet	Maddur	Malavalli	Mandya	Nagam angala	Panadav apura	Shreerang apatna	Total
Bore wells	138	103	170	21	335	42	58	867
Lift irrigation projects	6	21	14	96	5	29	-	171
Tanks								
More than 40 ha of command area	10	61	11	31	38	6	3	160
Less than 40 ha of command area	132	82	36	64	97	42	16	469
Total tanks	142	143	47	95	135	48	19	629

Irrigation pump sets								
Electric	3,772	4,652	5,276	3,965	3,040	2,750	956	24,411
Diesel	115	198	168	140	220	48	54	943
Total	3,887	4,850	5,444	4,105	3,260	2,798	1,010	25,354
Irrigated area in hectares								
From canals								
Total	19,941	18,957	16,709	26,619	3,576	10,193	15,217	1,11,152
Net	14,757	15,001	13,560	21,386	2,407	8,296	10,942	86,349
From tanks								
Total	3,710	2,838	1,175	1,100	815	520	92	10,250
Net	3,675	1,760	995	700	496	460	72	8,158
From wells								
Total	3,315	3,710	2,300	1,300	1,140	2,110	534	14,409
Net	2,840	2,910	1,822	580	425	1,385	328	10,290
From bore wells								
Total	130	2,023	370	185	650	335	275	3,968
Net	130	1,000	260	45	415	300	125	2,275
From lift irrigation projects								
Total	126	245	39	142	-	128	-	680
Net	126	195	39	90	-	125	-	575
From other sources								
Total	28	146	10	138	59	145	42	568
Net	28	146	10	60	24	70	37	375
From all sources								
Total	27,250	27,919	20,603	29,484	6,180	13,431	16,160	1,41,027
Net	21,556	21,012	16,686	22,861	3,767	10,636	11,504	1,08,022

Source : Annual Seasons and Crop Statistics. 1999-2000 Directorate of Economics & Statistics

In this district, since olden days, dams/barrages were constructed across the rivers such as Cauvery, Hemavathi, Shimsha, Lokapavani, Veeravaishnavi and other water bodies and through canals water was utilised for agriculture. The six anicuts of the district included Mandagere, Hemagiri, Taggalli, Bolenahalli, Uyyanahalli and Dummasandra dams.

A dam of 666 feet length has been constructed across the river Hemavathi at Mandagere of Akkihebbalu block of Krishnarajpet taluk. The lengths of its right and left bank canals are 37 miles and 21 miles respectively. In the same block, near Bandihole, a dam of 1360 feet length has been constructed across the river Hemavathi and its left bank canal length is 21 miles. In Maddur taluk, near Taggali, a dam of 825 feet length has been constructed across Shimsha

River. Its left and right bank canals are, respectively 23 miles and 12 miles in length. A dam of 132 feet length has been constructed across the river Lokapavani near Bolenahalli of Melukote block. Water is supplied to Madarahalli tank from here. The length of the dam constructed near Uyyanahalli of Nagamangala taluk against the river Lokapavani is 370 feet. It has a canal of 3-miles length. A dam of 400 feet length constructed across the river Veeravaishnavi near Dummasandra of Nagamangala taluk has 4 miles length canal.

Even before Krishnarajsagar project, water from the river Cauvery and its tributaries was utilized for agriculture. The details of the dams that existed during the period of KRS dam construction is as follows.

Table 4.15 - Details of canals and dams constructed across the river Cauvery in Mandya District

Particulars	River		Command area (Hectares)
	2	3	
1			4
Krishnarajpet Taluk			
Shreerama devaru dam	Hemavathi	Left bank canal	1,262
Mandagere dam	Hemavathi	Left bank canal	1,477
		Right bank canal	4,860
Hemagiri dam	Hemavathi	Left bank canal	992
Ramanathapura	Cauvery	Left bank canal	220
Kattepura	Cauvery	Left bank canal	1,012
		Total	9,763
Maddur Taluk			
Shimsha	Shimsha	Left and right bank canal	3,078
Malavalli Taluk			
Ramaswamy	Cauvery	Left bank canal	486
Madhavamanthri	Cauvery	Left bank canal	208
		Total	694

1	2	3	4
Shreerangapatna Taluk			
Edathittu	Cauvery	Left bank canal	36
Bangaradoddi	Cauvery	Right bank canal	262
Mahadevapura	Cauvery	Right bank canal	70
Devaraya	Cauvery	Right bank canal	1,008
Virijanadi	Cauvery	Right bank canal	4,531
Chikkadevaraya	Cauvery	Left bank canal	6,636
		Total	12,543
Mandya district's total			26,038

Madadakatte dam of 776 feet length has been constructed near Sithapura village of Shrirangapatna taluk. The Chikkadevaraya canal, which originates from this dam is 72 miles in length and is supplies water to Mandya and Mysore districts.

The Virija canal which starts from Balamuri dam which is one mile away from Belagola, covers a distance of 38 miles. In Shrirangapatna, across Paschimavahini, there is Bangaradoddi dam and Bangaradoddi canal originating from this dam reaches Shrirangapatna Island through overhead canal and branches into three parts there. The first canal reaches Shrirangapatna fort through underground canal whereas the second canal reaches Dariya Daulat garden. The third canal reaches Gumbaz through the island.

Krishnarajsagar Irrigation Project

Efforts were being made since many years to utilise the water for agriculture purpose by constructing the dam across the river Cauvery. Rampura's Inscription of 905 informs that, during the reign of Ganga *Arasa* Immadi Rachamalla, an officer by name Kesiga of Perbana village was gifted this to construct a dam across the river Cauvery at a place by name Talenere as per the request of the Jain saint Mathisagara Panditadevabhattachara. During the 14th century, Devaraja Urs, brother of the then Nagamangala ruler prabhu Thimmanna Dandanayaka, has built a barrage near Kannambadi. His plan was to take water to Nagamangala via Haravu and Tondanur. The laying of

canal up to Tondanur was also completed along with the barrage construction work. As part of his plan, he built Sithapura in the name of his mother, in Pandavapura taluk and recorded all the details of his Kannambadi plan in the inscription. Secondly, it is believed that Doddamma, wife of Mysore ruler Ranadheera Kantheerava, planned to construct a dam near Kannambadi to provide irrigation to agriculture and gifted large quantity of gold for this noble cause. Even now in Shreerangapatna, one canal is called **Bangaradoddi canal** in the memory of that great lady. Records show that another Mysore ruler, Chikkadevaraja helped to develop agriculture by constructing a big dam in this place. Because of torrential rains unheard of before, and the resultant floods, the dam was destroyed as evident from the records. Later on Tippu and Krishnaraja Wodeyar IV continued this practice of utilising Cauvery water for agriculture purpose. It is evident from the Persian Inscription of Kannambadi that, Tippu had a plan of constructing a dam across Cauvery at Kannambadi.

In 1902, Hydro Electricity Power Generation Station was established at Shivanasamudra of Malavalli taluk. Its production capacity was 4300 KW (Kilo watts) when it was commissioned. The power so generated was supplied to Kolar gold mines, Bangalore and Mysore cities. When the water flow in Cauvery decreased during summer, power generation used to be hampered. In such situations, the required quantity of water had to be stored at a place and then supplied to Shivanasamudra in order to meet the demand for electric power. Sir M Vishweshwaraiah with many years of experience, working for the Mumbai government, playing a major role in construction of many reservoirs, submitted a report to the government on May 15, 1911 regarding a project of extending irrigation facility along with power generation. In 1911, a special survey was undertaken for the dam site. It was decided to construct the dam across Cauvery near Kannambadi village, 14.5 kms and 19 kilometres away from Srirangapatna and Mysore, respectively. Krishnaraja Wodeyar by accepted this project and issued an order on 12th October 1911. In the first phase, 80 lakh rupees was sanctioned for this project. In the beginning, the objective was to construct an embankment of 97 feet height with a plan to store

water up to a depth of 80 feet. The first phase of dam construction commenced with an outlay of Rupees 91 lakhs.

A 111 feet wide foundation was dug up. The difficult task of laying foundation at the bottom of the river was successfully completed. A wall of 60 feet height on the southern side and 36 feet on the northern side was constructed and in the empty space in the middle water to a depth of 8 feet was stored. The stones and granites sans proper shape used in the dam construction were available in the hills within an area of seven km and trolleys were used to transport these stones from hills. It is learnt that nearly 10000 workers were employed during the final stage of dam construction.

The height of the dam was raised to 65 feet in 1915 it was planned to release water as per the requirement with the help of automatic sluice gates. 50 feet water was stored during June 1915. The expenditure incurred till this stage was rupees 71.45 lakhs. By this time, Sir M Vishweshwaraiah who was the Diwan, had resigned from his post. The succeeding Diwans, Kantharaje Urs, Alpijan Byanerjee, Mirja Ismail and others took interest in the dam work. By 1919, the dam height reached 107 feet. More than Rupees 155 lakhs had been spent by this time. In order to implement the Griffin committee decisions related to Cauvery river disputes, an office of Public works department was started there. A chief engineer was appointed to look after the Cauvery project work. The first phase was completed by 1921 and water supply for agriculture was completely organised.

A special committee was appointed in 1922 to look after the further construction work of the reservoir. The total expenditure incurred for this project till 1923 was Rupees 211 lakhs. An additional amount of rupees 14.66 lakhs was also provided. Along with the embankment construction, the construction of canals was also started in 1924. By that time Rupees 227.9 lakhs had been spent. An additional amount of Rupees 10.05 lakhs was released again in 1926. Canal construction work on the northern side of the dam was started. The dam construction work, which was started in 1911, was completed in 1932. This was the only large-scale irrigation project of the old Mysore state in those days.

The total storage capacity of the reservoir is 48,335 million cubic feet. The total catchment area of the reservoir is 10,619 square kilometres. The bottom of the river is 2,344 feet above the mean sea level. The dam has been constructed on the granite gneiss rock basement. The height of the dam is 140 feet from the foundation. A 14.5 feet wide road has been built on the top of the dam. The dam is sloping from top to bottom. The length of the dam is 8,600 feet. The water of the reservoir is spread over an area of 50 square miles. The average length of the reservoir is 25 miles and the width is 5 miles. All along the dam, 171 iron gates of varying sizes have been erected at different heights. Of them 136 are automatic sluice gates. The total expenditure incurred for the project was Rupees 323. 47 lakhs during those days. In 1939, 48 thousand acres were irrigated from this project. By 1940, 70,230-acres of land was brought under irrigation.

Due to the construction of this dam, 9,520 acres of wetland and 13,923-acres of dry land has been submerged, and 15,000 people of 25 villages have been rehabilitated.

Canals : In the beginning, it was planned to supply water from a height of 60 feet from the bottom of the dam, through canals for agriculture. The canal had to pass through Hulikere hill, which was 25 miles away from the reservoir. For this purpose, it was planned to construct a tunnel of nearly 1.5 miles length through this hill and to extend the canal up to about 50 to 70 kilometres distance.

In the first phase of Cauvery reservoir project, the work of constructing new canals was not taken up. The stored water in the reservoir was supplied to Shivanasamudra electricity project used for regular power production. The Chikkadevarayasagar canal, on the northern bank, was extended and irrigation facility was increased from 25,000 to 30,000 acres. In the second phase, the north bank canal work was completed up to 48th mile. This canal ended in Bindenahalli rivulet, which joins Shimsha River. This canal initially has 10-12 feet depth and towards the end, has a depth of 5-6 feet. The width of the canal is 43-86 feet. The water from Krishnarajsagar dam at a height of 60 feet is released in to this canal, which has the capacity to sustain 22,000 cusecs water

pressure. This canal in the beginning passes through 26 miles of plains and then through Hulikere tunnel (9200 feet) and provides irrigation water to 1,20,000 acres. The total length of branches, sub-canals of this canal is about 180 miles. After it passes through Hulikere tunnel, it divides into Maddur and Cauvery branch canals.

The taluk-wise details of area (in hectares) irrigated by Krishnarajasagar irrigation project are as follows. Maddur - 23,600; Malavalli - 18,380; Mandya - 25,000; Nagamangala - 486; Pandavapura - 3,861 and Shreerangapatna - 2,082; Mandya district's total - 73,409.

The world famous Brindavan gardens has been developed on both sides of the river near Krishnaraja Sagara dam. There is a Horticulture farm nearby. (For details see chapter on of interest place).

D Devarja Urs (Krishna Raja Sagara Right bank) Canal

It has been planned to construct an upper canal on the right bank of Krishna Raja Sagara and provide irrigation facility to 32,375 hectares of land in Mysore and Mandya districts. The length of this canal is 135 kilometres. The task of constructing an aqueduct for this canal across the Mysore-Bangalore state highway has been completed and scheduled quantity of water is being released as per the schedule. Under this project an area of 3,055 hectares has been irrigated in Sriranga Pattana Taluk.

Modernization of Krishnarajsagar

Krishnarajasagara modernization project includes supplying water to an additional area of 2,125 hectares and providing water to areas facing water shortage in Vishweshwaraiah canal command area. For this purpose it was found necessary to increase the capacity of Vishweshwaraiah canal from 2,250 cusecs to 3,050 cusecs. The construction of 8 check dams up to 37 mile length of Vishweshwaraiah canal have been completed and now the canal has the capacity to carry the additional water released. The work of link canal is almost completed and water can be released in to link canal. Under this scheme, irrigation facilities are extended to 1,266-hectare area of Shreerangapatna taluk.

Hemavathi reservoir project

Hemavathi dam has been constructed across the river Hemavathi near Gorur village in Hassan district. The water storage capacity of the reservoir is 37.10 tmc and it provides irrigation facility to 2,83,596 hectares area of Hassan, Mandya, Tumkur and Mysore districts. The work of Hemavathi left bank canal is managed by Hemavathi Canal zone under Tumkur division. The details of Mandya districts' taluk-wise command area falling under Hemavathi left and right bank canals are given below.

Mandya - 14,165; Krishnaraja Pete - 18,179; Panadavapura- 19,021 and Nagamangala - 40,875; Mandya districts' total - 92, 240.

Cauvery Water Dispute

Talacauvery, which is 1,341 meters above mean sea level in the Brahmagiri mountain ranges of Western Ghats in Kodagu district, is the birthplace of river Cauvery. Cauvery is an interstate river, which flows through Karnataka, Tamil Nadu, Kerala and Pondicherry. The length of this river is 802 kilometres. Before reaching Karnataka-Tamil Nadu border, it flows to a distance of 381 kilometres. Along the Karnataka-Tamil Nadu border, it flows to a distance of 65-kilometres. Before it reaches Bay of Bengal at Cauvery Pattana it flows to a distance of 357 kilometres in Tamil Nadu.

Near Bhagamandala of Coorg district, the river Kannika joins Cauvery. Cauvery flows with great force to a distance of 80 kilometres along steep slopes and rocky ranges of Kodagu district. The tributary of Cauvery, Harangi River joins Cauvery near Koodige on the border of Mysore-Kodagu districts. Kakkabbe, Kadamooru and Kumma rivulets join cauvery in Kodagu district. Hemavathi and Lakshmanatheertha, tributaries of Cauvery, join the reservoir in the left and right banks of Krishnarajasagara reservoir, respectively. Just few kilometres away from Shreerangapatna, Lokapavani river joins Cauvery. Kabini, which originates in Kerala, joins Cauvery after Tirumakoodalu Narasipura. Shimsha tributary joins Cauvery below the left bank of shivasamudra. Cauvery branches into two near Shivasamudra Island to form Gaganachukki and Barachukki falls. After these falls, the branches rejoin. Before it reaches Mekedatu, the river

Arkavathi joins Cauvery. Later on Udutore rivulet joins cauvery on the right bank.

After it enters Tamil Nadu, Cauvery flows through Salem and Coimbatore districts and reaches Mettur reservoir. Bhavani River joins cauvery 45 kilometres away from Mettur reservoir. Noyil and Amaravathi tributaries join Cauvery on the right bank before it enters Tiruchirapalli district. After Tiruchirapalli, cauvery branches into two and flows. Northern branch is called Koleroon and the southern branch as Cauvery. Afterwards, the two branches rejoin. Just after the Grand dam, it branches out again. One branch is called Cauvery and the other as Vennar. The branch, which retains the name of cauvery all along its path, joins Bay of Bengal at Cauvery Pattana. The northern branch Koleroon joins Bay of Bengal near Chidambaram.

Total availability of water in Cauvery Valley Area.

The average water available in Cauvery Valley areas up to Coleroon lower bank dam is estimated to be 790 tmc. Out of this Karnataka's share is 53.8 % (425 tmc); Tamil Nadu's share is 31.9 % (252 tmc) and Kerala's share is 14.3 % (113 tmc).

Important facts of Cauvery Valley area (As in 1971-72)

Sl No	Particulars	Karnataka	Kerala	Tamil Nadu	Total
1	Irrigated area (Thousand hectares)	3,427	287	4,402	8,116
2	Percentage wise	42.2	3.5	54.3	100
3	Cultivated area (Thousand hectares)	2,477	154	2,891	5,522
4	Percentage wise	44.9	2.8	52.3	100
5	Net irrigated area (Thousand hectares)	273	22	967*	1,262
	* Includes irrigated area of Pondichery				
6	Irrigated area as Percent of cultivated area	11.0	14.0	33.5	
7	Drought prone area (Thousand hectares)	2,144	0	1,279	3,423
8	Contribution to water availability (TMC)	425 (53.8)	113 (14.3)	252 (31.9)	-

Irrigation development in Cauvery basin area of the State

With the construction of Krishnarajasagar, irrigation activities in the state started from 1911. Though foundation stone was laid in 1911, because of the objection raised by Madras government, the construction work of reservoir was stayed till 1924. The irrigation projects of the state slowed down due to the objections raised by Madras government about the fulfilment of conditions mentioned in agreements made during 19th century. As a result, the irrigated area in the state, which stood at 3.15 lakh acres in 1924, was extended up to only 6.6 lakh acres in 1972. In contrast to this, the Tamil Nadu's irrigated area increased from 14.5 lakh acres in 1924 to 22 lakh acres in 1972. According to the study conducted by C. C. Patel, Joint secretary to Government of India, by 1972, while Tamil Nadu was utilising 489-tmc of water, Karnataka was using only 177 tmc of water.

The agreements of 1892 and 1924 between the then Mysore province and the Madras government were the major reason for the slow progress of the irrigation programme in Karnataka state. The 1892 agreement imposed lot of restrictions on Karnataka (then Mysore) regarding utilisation of water from Cauvery and tributaries for irrigation purpose. As per this agreement, for taking up any irrigation project in the state, including repairs of existing irrigation structures Karnataka had to take the prior-permission from the then Madras province. But, there were no such restrictions on Madras government regarding works in Cauvery river basin area.

The 1924 agreement was just another form of agreement of 1892. This agreement imposed many conditions on Mysore government. As per this agreement, only when the river flow level is more than the minimum, it could store water in the Krishnarajasagara reservoir. Along with this, it allowed the Madras government to construct Mettur dam with 93.5 tmc capacity and provide irrigation facilities to 3,01,000 acres, providing regular water supply in the river basin area even for the second crop and constructing dams across tributaries of cauvery in Madras province. But, this agreement imposed many restrictions on the then Mysore state. This agreement allowed the Mysore state to construct Krishnarajasagar dam with 44.83 tmc capacity and provide

irrigation to 1,25,000 acres of land. Apart from this the other condition was, whenever Mysore state wants to take up dam construction across Cauvery and its tributaries and provide irrigation to 1,10,000 acres of land, in future, it has to take the prior permission of Madras Government, the total capacity of other reservoirs should not exceed 45 tmc and water storage can be done only when the water flow in the Cauvery river is more than the minimum level. As per these conditions of the agreement, Karnataka could store water only when the water inflow to river was more than the agreed upon level every month.

Karnataka Master Plan

'The master plan prepared by Karnataka State in 1976 and sent to centre and concerned basin states were based on the total requirements of cauvery basin area. Based on this the irrigated area in the total cauvery Valley was to be extended from 14.4 lakh hectares to 31.2 lakh hectares. Comparative details of each state based on the master plan is as follows (area in lakh hectares)

Particulars	Karnataka	Kerala	Tamil Nadu (Including Karaikal of Pondichery)	Total
Cultivated area in Cauvery Valley	24.77	1.54	28.91	55.22
Command area in 1971	2.68	0.22	8.94	11.84
Irrigated crop area in 1971	2.76	0.22	11.42	14.40
Final command area as per Master plan	9.85	1.01	9.95	20.81
Final cropped area as per Master plan	12.20	1.83	17.26	31.29
Irrigated area as Percent of the total cultivated area in 1971	11	14	39	26
Irrigated area as Percent of the total cultivated area as per master plan	49	119	60	57

Karnataka's stand before the Cauvery Water dispute Tribunal

In 1983, under the interstate water dispute regulation's third section, the Tamil Nadu farmers filed an application before the Supreme Court to appoint

a tribunal to solve the Cauvery water dispute. In this regard, based on the Supreme Court's judgement given on 04.05.1990, the Government of India on 02.06.1990 issued a notification regarding the formation of Cauvery water dispute tribunal and assigned it the responsibility of resolving water dispute emerged regarding sharing of cauvery water and cauvery Valley based on the application number 117527/K2.82-111 dated 06.07.1986, submitted by the Tamil Nadu government to the tribunal. All the states concerned submitted their statements, counter-statements and replies to the statements issued by the other states, to the tribunal.

Karnataka state clarified that considering its water contribution to Cauvery Valley area (425 tmc out of 790 tmc), extent of drought prone areas in the state (63.81 percent of basin area in Karnataka compared to 29.16 percent in Tamil Nadu), lack of ground water and other resources and to provide irrigation water to semi arid crop and from the point of view of extending the cultivated area to a suitable proportion (11 percent to 42.6 percent), Karnataka state requires 465 tmc of water for irrigation, domestic use and industrial water supply from the ongoing projects under construction as well as the proposed projects.

National water policy : Since proper guidelines related to river water sharing are non-existent in the country, Karnataka, right from the beginning, has opposed handing over the river water dispute to the tribunal. Till today, the guidelines have not been formed.

Interim order : At the time when the Cauvery water dispute tribunal held hearings, Tamil Nadu and Pondicherry submitted the applications before the tribunal. Tamil Nadu in its application requested the tribunal to direct Karnataka not to store and use water from the reservoir in excess of the level that existed as on 31.5.1972 and not to take up any new projects or to continue the works of ongoing projects without the prior permission of tribunal and Tamil Nadu. Pondicherry in its application had requested the tribunal that it should direct Tamil Nadu and Karnataka to release water during the period from September to March as per the time schedule. After the conducting the enquiry among the states concerned to water dispute the tribunal rejected the

applications since issuing interim order did not come under its jurisdiction. Tamil Nadu and Pondicherry filed a writ petition in the Supreme Court in 1991 questioning the order issued by the tribunal. Based on the Supreme Court's judgement given on 26.4.1991, regarding these special writ petitions the case was returned to tribunal's lap and hence the tribunal gave the following directions in its order issued on 25.6.1991.

1. Karnataka, from its reservoirs, has to release water from June to May months of the year so that the water level in Mettur reservoir can be maintained at 205 tmc.
2. The tribunal has indicated the quantity of water to be released every month.
3. Water has to be released in four equal instalments in four weeks.
4. If, in any of the weeks, the water released is less than the quantity indicated, the deficit has to be met in the succeeding week.
5. Karnataka should not increase its area under irrigation beyond 11.2 lakh hectares.
6. Tamil Nadu government has to release 6 tmc water to Pondicherry.
7. This order will be in effect till the tribunal gives its final verdict.

Month-wise volume of water to be released is as follows (in tmc) : June - 10.16 July - 42.76 August - 54.72 September - 29.36 October - 30.17 November - 16.05 December - 10.37 January - 2.51 February - 2.17 March - 2.40 April- 2.32 May - 2.01 Total - 205 tmc.

Karnataka cannot further increase its area under irrigation beyond 11.2 lakh hectares.

Karnataka's Reaction

The unanimous decision taken on 6.7.1991 by both the legislative houses of Karnataka state regarding this order reflected state's majority opinion. This decision is quoted here under.

Since the interim order of 25.6.1991 of the tribunal is detrimental to the interest of the state, is beyond tribunal's jurisdictions and it is far away from

the reality, law points and practical aspects, the house unanimously urges the government to reject the order.

In this back ground, the house unanimously urges the central government to stay all the proceedings of the tribunal till the national water policy is laid down, to make suitable amendments in the inter state water or 1956 and will bring the necessary corrections to the interstate water act of 1956 and clear guidelines are laid down for the tribunal.

Ordinance of 1991 for the Protection of Irrigation in Karnataka cauvery Valley area

Because of various circumstantial pressures, the ordinance had to be issued exercising the legislative power. The judgement has not yet been given regarding fair sharing of the river water among the states in dispute and there is no central law existing to regulate this legislative power. In addition, since Karnataka has the right to get its share of water, there is a provision as mentioned in the section 162 of the constitution Karnataka can protect and enjoy its right through legislative and executive bodies. If the ordinance had been issued from any other point of view it would have led to judicial and administrative complications.

On 25th July 1991, the then Governor issued an ordinance, **Protection of Irrigation in Cauvery basin areas ordinance of 1991**. The main aim of this ordinance was to protect the irrigated areas of Cauvery and its tributaries catchments area. It was also the intention of this ordinance to protect the 8,49,700 hectares of land, which was benefited from the completed or ongoing projects in the Cauvery basin. After this, during September-October 1991, this ordinance has been converted into protection of irrigation in the Karnataka Cauvery valley area Act of 1991.

Reference from the President to the Supreme Court

Since there were differences of opinion about the interim order of the tribunal and also due to the doubts aroused regarding and the constitutional appropriateness of Protection of Irrigation in Cauvery valley areas ordinance of 1991 and its clauses due to the fact that, these developments lead to public

outrage and unwanted consequences, the president referred this issue to the supreme court to verify the following aspects and give its opinion. These aspects were

1. Whether the ordinance and its clauses issued by Karnataka is constitutional?
2.
 - a) Whether the interim order of the tribunal comes under the purview of the section 5(2) of the act of the tribunal's report;
 - b) Whether it is necessary for the central Government to issue an order to the states to implement the interim order;
3. Whether any of the tribunals appointed as per the act for solving the water dispute has power to provide temporary solutions to the contesting factions;

The Supreme Court after conducting the hearings during August and September months of 1991, gave its opinion on 22.11.1991 regarding the above mentioned queries as mentioned below

1. Since The Cauvery valley basin area irrigation protection ordinance of 1991 issued by the Karnataka Governor on 25.7.91 does not come under the purview of the legislation, it is against the principles of constitution.
2.
 - a) The interim order of the tribunal comes under the purview of the section 5(2) of the act of the tribunal's report and is a part of the decision.
 - b) Therefore, it is necessary for the central government to issue letters to the states directing them to implement this order under the sixth context of the act.
3. Any tribunal appointed to resolve the water dispute has the power to provide temporary solutions if the central government asks it to do so.
4. If the central government does not ask the tribunal about the temporary solution, the question as to whether the tribunal has the power to issue a temporary solution does not arise at all. Therefore, this question needs no answer.

Requisition for review based on 5(3) section of the interstate water dispute act

Karnataka filed an application to the tribunal on 25-11-1991 requesting it to give clarification regarding its order issued on 25.6.1991, based on 5(3) section of the interstate water dispute act, after the supreme court gave its opinion on the interim order of the tribunal in response to the president's request. This came up for hearing on 7.01.92.

Karnataka's request for clarifications regarding the interim order were as follows

1. The average of the river water should be nearest years of the current year not beyond 10 years. Then 205 tmc water proportion will be changed
2. It is necessary to establish a relationship between the water inflow and the water to be released
3. Once the correct proportion of water to be released is decided, the restrictions imposed on the Karnataka's irrigation development needs to be removed

The solutions sought by Karnataka from the tribunal are as below

- a) Based on the information available as of now, the water availability in the Cauvery valley basin area should be decided suitably and appropriately.
- b) Karnataka state has to get at least 465 tmc of water considering its requirement including domestic and industrial needs
- c) Annuling the disputed agreements of 1892, 1924 and 1929 water of cauvery basin should be shared equitably.
- d) The ground water resources and the other available water resources available in the river delta of Tamil Nadu have to be taken into consideration while sharing the water equitably among the states
- e) The states should be directed not to release water outside the valley areas for either irrigation or for electricity generation.

- f) The states should be allowed to utilise the water of Cauvery and its tributaries for electricity generation in respective states through new projects or if the project is spread over in more than one state by a mutual agreement between them, without affecting the current or proposed irrigation projects.
- g) It should be directed that the project of any states should not lead to the submergence of the areas of other state.
- h) The central government should be ordered to accord sanction to Karnataka's projects in the Calvary basin area and provide all solutions related to it, once the water is distributed to each state.
- i) Other appropriate solutions should be given related to Karnataka's case, &
- j) Karnataka's court expenditure has to be borne.

Publication of the tribunal's order in the Gazette

The central water resource Minister informed the parliament that, on the morning of 11.12.1991 tribunal's order of 25.6.1991 based on inter state water dispute act has been published in the Gazette.

The central government published the interim order in the Gazette. When the state submitted the requisition to the tribunal that the interim order is non-implimentable, the tribunal informed that prorated adjustment could be made when there is reduction in water inflow. As per the Supreme Court's directive, the central government came forward to set up Cauvery basin authority comprising of technocrats and officers during 1997, in order to supervise the implementation of the tribunal's interim order. As a result Cauvery valley River Authority was formed. The prime minister is the president of this authority and the chief ministers of all the four states of Cauvery basin are its members. The supervising committee headed by the secretary of water resource department of the centre has been formed to assist the authority.

Severe drought hit the state during 2002-03 due to the failure of the southwest monsoon. In addition, the water in most of the dams (including K.R.S. dam) of the Cauvery catchments area reached the lowest level, creating great anxiety for the farming community. In addition to this difficulty, Tamil

Nadu Government pressurised the Karnataka state Government to release water required for its samba crop grown in the lower plains of Cauvery River. It filed an application in the Supreme Court for its intervention and according justice, contesting that the Cauvery River Authority following delaying tactics. The Supreme Court held the hearing and in its order dated 3.6.2002 directed the state to release water from its reservoirs to maintain a daily water level of 1.25 tmc in the Mettur reservoir and in this regard the decision of the cauvery authority is final and when it comes in to vogue, its i.e., the supreme court's order becomes null and void. Accordingly, the state released the water amidst the opposition from farmers of the command area and also tried to call for a meeting of the cauvery river authority. As a result, under the chairmanship of the Prime Minister, the Cauvery River Authority met on 8.9.2002, and issued a temporary order to the state to release 9000 cusecs of water on weekly average basis so that Mettur reservoir gets water during September-October months.

Before the state could implement this order of the Cauvery authority, farmers of cauvery catchments area protested strongly and announced that if the state releases water to Tamil Nadu, they will sacrifice their lives by jumping into the dam and held fast unto death protest in Krishnarajasagar, Kabini and other reservoirs. A grim situation was created as a result. When the state released water from the Kabini reservoir, Guruswamy one of the four farmers who plunged into the reservoir died and the situation worsened and the state government got into a fix. Then the Tamil Nadu Government filed a contempt of court case against Karnataka, alleging that it is unnecessarily delaying the release of water to Tamil Nadu ignoring the orders of Supreme Court and cauvery authority. As a result, after hearing the arguments of the centre and both states, the Supreme Court directed the concerned to visit the cauvery basin area of both the states conduct a survey and submit an immediate report regarding the water levels in the reservoirs. Accordingly, Cauvery supervisory committee comprising of representatives from all the four states (Karnataka, Tamil Nadu, Kerala and Pondicherry) visited both the states and submitted its report. In the meanwhile, the Tamil Nadu government filed another contempt of court case against the Karnataka Government. After reviewing the report

submitted by the supervisory committee, by keeping aside the contempt of court application filed by Tamil Nadu Government against Karnataka, the court expressed its displeasure towards Karnataka for not implementing the orders of the court and the Cauvery River Authority and ordered that Karnataka should release water to Tamil Nadu. The Supreme Court through its order-dated 28.10.2002 directed the Karnataka Government to release 9,000 cusecs of water daily from 1st to 6th November and 6,000 cusecs from 7th to 15th November to Tamil Nadu. Further, it asked to release water regularly in future as per the orders of Cauvery River Authority. It suggested resolving the issue by calling the sitting of the river authority at the earliest. It also said that after carefully observing the actions of the state in the coming days, the court would review the contempt of court case pending against Karnataka in due course. As a result, amidst the serious opposition from the farmers, the Karnataka had to release water in determined proportions to Tamil Nadu as per the Supreme Court's order.

HORTICULTURE

In the district, Coconut is grown in 52.85 % and Mango in 7.65 % of total area under horticultural crops. Nagamangala, Krishnarajapet, Maddur and Mandya taluks have 72 % of total area under Coconut. Vegetables are mainly grown in Nagamangala, Pandavapura, Krishnarajapet and Malavalli taluks. Major flower crops include Chrysanthemum, Crossandra and Jasmine, cultivation of which is concentrated in Krishnarajapete, Malavalli and Pandavapura taluks. Out of the total production of horticultural crops, the share of tomato is 12.07%; banana is 11.61 %, Cucurbits is 9.22 % and Mango is 9.19 %. Taluk-wise details of horticultural farms in the district are given hereunder.

Sl No	Farm detail	Year of starting	Area (hectares)
A. Mandya Taluk			
1	Mandya Horticulture Farm	1956-57	5.60
2	Shivalli Horticulture Farm, Mandya	-	44.50
3	Pura Horticulture Farm, Mandya	1982-83	5.30

B. Maddur Taluk			
1	Maddur Horticulture Farm	1942-43	17.80
2	Navile Horticulture Farm	-	4.00
3	Chikkaankanahalli Horticulture Farm	-	15.40
C. Pandavapura Taluk			
1	Halebidu Horticulture Farm	1965	17.80
D. Krishnarajpet Taluk			
1	Sheelanere Horticulture Farm	-	40.01
2	Murukanahalli Horticulture Farm	-	17.80
3	Nayakanahalli Horticulture Farm	-	76.9
E. Nagamangala Taluk			
1	Javaranaahalli Horticulture Farm	1962	22.3
2	Mallasandra Kaval Horticulture Farm	1967	359.2
3	Nagamangala Nursery	-	0.4
F. Malavalli Taluk			
1	Malavalli Nursery	1967-68	1.3
2	Hittinahalli Koppalu Nursery	1994-95	1.4
3	Poorigali Horticulture Farm	1986-87	73.7

Table 4.16 - Area and production details of Horticultural crops of the district

		1994-95	1995-96	1996-97 (Estimate)	1999-2000
Fruits	Area (ha)	5,647	6,496	6,720	12,005
	Production (Tonnes)	99,966	1,20,017	1,18,915	81,667
Vegetables	Area (ha)	7,392	8,369	7,866	11,105
	Production (Tonnes)	1,63,565	1,86,182	1,77,858	1,07,153
Plantation/Spice crop	Area (ha)	23,975	25,391	26,748	34,152
	Production *	15,089	17,908	20,003	31,706
Commercial Flowers	Area (ha)	549	890	1,054	1,117
	Production	2,931	5,501	6,968	10,639
Total	Area (ha)	37,563	41,146	42,388	
	Production	2,81,551	32,960	3,23,744	

* Production is given in tonnes except for Coconut, Nutmeg, Betel leaf,

Source : Horticultural crop statistics of Karnataka state during 1994-95 to 1996-97

Table 4.17 - Area and production of Horticultural crops of the district

Sl No	Crop	1998-99		1999-2000	
		Area (ha)	Production (Tonnes)	Area (ha)	Production (Tonnes)
FRUIT CROPS					
1	Mango	4,172	4,133	5,135	20,476
2	Banana	1,177	23,456	4,326	27,177
3	Guava	418	1,892	361	3,529
4	Sapota	645	6,527	801	4,664
5	Lime	240	3,354	-	-
6	Pomegranate	174	1,452	115	813
7	Jack fruit	557	9,140	661	9,874
8	Papaya	269	13,450	228	5,697
9	Ber	60	300	71	2,948
10	Custard apple	37	72	20	163
11	Fig	25	100	6	9
12	Rose apple	28	42	9	6
13	Watermelon	-	-	220	5,760
14	Others	643	3,205	52	551
	Total	8,445	67,123	12,005	81,667
VEGETABLE CROPS					
1	Potato	36	288	86	816
2	Tomato	1,615	34,011	3,016	33,609
3	Brinjal	945	22,025	1,441	13,450
4	Beans	583	5,830	1,102	5,874
5	Onion	818	12,270	795	6,845
6	Tapioca	291	2,680	110	2,545
7	Cabbage	746	11,190	393	4,183
8	Ladies finger	609	-	777	9,979
9	Radish	506	5,060	542	4,165
10	Beetroot	16	160	10	83

11	Red radish	29	290	20	252
12	Capsicum	280	2,950	433	6,203
13	Pumpkin	879	17,580	1,468	13,543
14	Others	1,185	17,775	912	5,156
	Total	8,538	1,32,109	11,105	1,07,153
SPICES CROPS					
1	Black Pepper	26	26	76	458
2	Tamarind	767	9,192	893	3,943
3	Ginger	53	580	150	1,122
4	Turmeric	173	3,473	394	4,737
5	Garlic	165	967	368	1,591
6	Chilli	1,237	12,380	1,088	11,055
7	Coriander	152	71	185	1,585
8	Others	704	1,056	26	91
	Total	3,277	27,745	3,180	24,582
PLANTATION CROPS					
1	Coconut	26,172	2,239	29,508	4,847
2	Areca nut	764	764	1,028	1,689
3	Betel leaf	197	1,675	56	509
4	Cocoa	57	-	86	40
5	Oil palm	263	-	227	26
6	Cashew	99	53	67	13
	Total	27,552	817	30,972	1,768
COMMERCIAL FLOWER CROPS					
1	Rose	17	34	16	125
2	Jasmine	152	152	157	986
3	Chrysanthemum	485	4,846	241	1,804
4	Tuberose	40	3	6	155
5	Aster	17	169	47	460
6	Crossandra	173	692	181	441

7	Margold	84	688	517	6,590
8	Champakka	11	3	3	43
9	Others	136	222	9	30
	Total	1,115	6,839	1,177	10,639

Source : Department of Horticulture, Bangalore

Note : 1. Area under Coconut and Betel leaf has been included under total area under horticultural crops.
2. The production of Coconut (lakkis nuts) and Betel leaf (lakkis leaves) is not included under total production of horticultural crops.

FISHERIES

There are suitable water resources in the district for fisheries. The district has a total river water resource of 299 kilometres including Carvery flowing to a distance of 75.2 kilometres, Shimsha flowing to a distance of 83.2 kilometres, Lokapavani flowing to a distance of 49.2 kilometres, Hemavathi flowing to a distance of 59.2 kilometres and Veravashnavi flowing to a distance of 32 kilometres. Netkal reservoir with 95 hectares of water area, Shivansamudra reservoir with 320 hectares of water area, Bhima reservoir with 80 hectares of water area in Malavalli taluk and Krishnarajasagar reservoir with 12,924 hectares of water area in Srirangapatana taluk are suitable for fisheries. Details of tanks available for fisheries in the district are given in table 4.18.

Table 4.18 - Details of tanks available for fisheries in the district (1999)

Total water area (ha)	Minor tanks (<10 ha Water area)	Major tanks						Taluks
		Department (< 25 ha water area)		Zilla panchayath (> 10 ha and > 25 ha water area)				
Area	Number	Area	Number	Area	Number	Area	Number	
2,997	147	185	83	2,303	34	489	30	Mandya
2,413	122	125	69	1,890	27	398	26	Malavalli
3,434	150	155	78	2,805	43	474	29	Maddur
364	43	64	33	218	3	82	7	Srirangapatna
3,298	159	319	77	2,576	30	703	52	Nagamangala
1,935	141	330	90	1,144	20	461	31	Krishnarajpet
911	84	122	73	711	9	28	2	Pandavapura
15,652	846	1,350	503	11,647	166	2,635	177	Total

In the district Indian carps and other carp fishes are reared. Among the Indian fishes 1.catla (*catla catla*), 2.Rohu (*Labeo rohita*), 3. Mrigal (*Cirrhinus mrigal*) and 4.Grass carp (*Ctenopharyngodon idella*) were the major. Other carp fishes include Common carps (*Cyprinus carpio*) variety.

In the district 7,188 people are actively involved in fisheries. Among them, 98 are women. Taluk-wise details of fishermen are given in the table 4.19.

Table 4.19 - Taluk-wise number of fishermen in the district

Taluk	Number of Fishermen		
	Men	Women	Total
Mandya	6,388	6,137	12,525
Maddur	7,872	7,563	15,435
Malavalli	8,780	8,434	17,214
Nagamangala	7,474	7,180	14,654
Pandavapura	5,871	5,444	11,315
Krishnarajapete	5,153	4,951	10,104
Shreerangapatna	8,127	7,808	15,935
Total	49,665	47,517	97,182

Under the Central government group accident Insurance scheme, state and central governments pay the insurance premium of Rs 12 per head, every year, sharing in 50:50 proportions, to National board of Co-operative fisheries Societies, Delhi, to help the fishermen who meet with accidents while fishing. Under this scheme, a compensation of Rs.35, 000 is paid to the families of deceased or permanently disabled fishermen, and an amount of Rs. 17,500 to the families of fishermen who become partially disabled. Under the fishermen welfare fund of the central government, facility of providing free housing to the homeless fishermen has been implemented. Under the housing scheme, drinking water facilities are provided along with construction of community hall. To every beneficiary house are constructed with 100 percent aid with amount not exceeding Rs 30,000 to Rs 35,000. Till January 2000, under Matsya Aashraya

Scheme, 340 houses have been sanctioned, of which construction of 318 houses has been completed. Taluk-wise details of the houses sanctioned (till 2000-01) are given in table 4.20.

Table 4.20 - Houses sanctioned for fishermen

Taluk	Houses sanctioned under central sponsored scheme	Houses sanctioned under HUDCO assisted Matsya Ashraya scheme	Total
Shreerangapatna	150	65	215
Maddur	100	100	200
Mandya	20	50	70
Nagamangala	-	25	25
Malavalli	20	30	50
Krishnarajpet	-	10	10
Pandavapura	50	-	50
Total	340	280	620

Table 4.21 - Taluk-wise details of fish production (Metric tonnes) in the district

Taluk	1995-96	1996-97	1997-98	1998-99
Mandya	252	249	725	1,119
Maddur	481	475	833	848
Malavalli	899	850	1,215	1,371
Krishnarajpet	268	268	654	1,336
Nagamangala	1,160	1,160	1,675	2,234
Pandavapura	476	476	1,835	1,179
Shreerangapatna(including fish produce from Krishnarajsagar)	2,262	2,153	3,480	1,825
Total	5,798	5,631	10,417	9,912

Fish Seed Production

Budanur fish production centre of Mandya taluk is working under Fish farmer's development agency. The total area of this production centre is 106 hectares and the water area is 0.98 hectares. Four fish breed storage ponds, 18 fingerling-rearing ponds, 2 earthen ponds and one quarters are located. The Shree Vishveshwaraiah fish production centre of Gopalapura in Mandya Taluk has 11 cement ponds and 32 earthen ponds. Details of taluk-wise fingerling rearing centres of the district are given in table 4.22.

Table 4.22 - Details of the fingerling rearing centres

Taluk	Rearing centre	Area	No. of ponds
Malavalli	Malavalli	0.40	4
Maddur	Maddur	0.10	1
Pandavapura	Pandavapura	0.10	4
Nagamangala	Nagamangala	0.14	7
Krishnarajpet	Hemagiri	0.40	6
Shreerangapatna	Krishnarajsagara	1.30	14

The construction work of Krishnarajsagara aquarium has been completed; interior decoration work has to be completed.

Fish Farmers' Development Agency

Fish farmers' development agency was established during 1985-86 at Mandya and is implementing the programmes with aids from state and central governments. Under the chairmanship of Chief Executive Officer of Zilla Panchayat, the government with an objective of successful conduct of the programmes has formed an administrative committee. The objective of this agency is economic development of the unemployed rural youth of the district through creating self employment opportunities by training them in fisheries and providing them small tanks suitable for fish farming on long term lease and increasing the fish production by utilising all the water resources of the district. The progress report of this agency is given in table 4.23.

Table 4.23 - Progress of Fish Farmers' Development Agency

Details	Unit	1995-96	1997-98	1999-2000
Training	Number	116	91	72
Tanks given on lease	Number	63	52	50
Tanks under pisciculture	Number	86	84	78
Area of fish tanks	Hectares	237	189	172
Fingerling production	Lakhs	18	5	11
Fingerling stock	Lakhs	9.5	9.6	8.8
Fish production	Metric tonnes	295	265	210
Average fish production	Kg/hectare	1,410	1,450	1,320
Subsidy amount released	Lakh Rupees	42.3	53.5	32.5

A Fish market has been established at Maddur to facilitate the marketing of fishes. The department has issued licences for 13 private fish marketing outlets in different taluks. The details of the income generated by the department of fisheries under various heads are as follows.

Table 4.24 - Income generated from Fisheries

Head	Income (Thousand Rupees)				
	1995-96	1996-97	1997-98	1998-99	1999-2000
Rent	388.8	463.4	971.6	1394.8	1260.4
Licence fee	7.5	2.9	7.9	3.9	0.5
Income from reservoir fisheries development units	221.1	224.6	108.7	410.5	134.8
Fish seed sold	322.9	3136.5	854.5	916.5	765.9

ANIMAL HUSBANDRY AND VETERINARY SERVICES

Animal wealth is considered as backbone of the farmer. Animals are very essential to farmers both economically and to carryout various agricultural activities. Cows and buffaloes for milk; poultry birds for egg and meat; sheep for wool and meat; Goats, pigs, rabbit etc are domesticated. Animal husbandry has become an integral part of agriculture. As per the provisional cattle census data for the year 1992, there were 2,70,827 local, 22,293 exotic, 47,830 crossbred cows and 2,12,979 buffalos in Mandya district. Hallikar breed is famous in the district. Hallikar breed cattle are suitable for agriculture. This breed is extensively used not only in Mandya but also in neighbouring Hassan, Tumkur, Bangalore and Mysore districts. Long and straight horns, brown or ash colour white patches around the eyes and below the neck, predominant hump, long and well built body, strong thighs, long tail grown up to 3/4th of the hind legs are the main features of this breed. Further, sharp eyes and alert characters are noticeable. They come to heat very late. Calving gap is also high. Though the milk yield of Hallikar is low they are valued for their utility in agricultural purposes and from this point of view it is essential to rear them.

In addition to improve the Hallikar breed suitable for agriculture, it is also necessary to convert the local cows into crossbred ones for increased milk production. Since the bullocks are the backbone of agriculture in the district, calves of pure hallikar breed are obtained by conserving the Hallikar breed. The male calves are used in agriculture. Female calves are used in reproduction when they grow up. Now a days, a shortage of Hallikar breeding bulls is observed. In the earlier days plenty of breeding bulls were reared in the villages, but now a days number farmers rearing such bulls is a decreasing.

Even in the cattle fairs good breeding Hallikar bulls are not seen these days. It is very essential to preserve this breed from extinction.

Milk production is low in Hallikar breed and local breeds. It is necessary to develop crossbred cows with higher milk yield for economic development. Farmers can obtain crossbred cows by artificially inseminating the local cows with semen of exotic bulls. If they look after the female cows well, they will definitely yield more milk. The males will be useful in agriculture. From this

cross breeding method the progeny of local cows can be improved gradually and more milk production can be obtained. Programmes supporting this are in vogue in the district, steps have been taken to develop more crossbred cows. Artificial insemination centres have been established in animal husbandry department and Mandya Milk producers' co-operative societies. When the local cows come to heat they are artificially inseminated with semen of exotic bulls like Jersey or HF.

From the bulls developed in the five semen centres of the state, every year 3.5 lakh frozen semen tubes are being produced. Artificial insemination is being carried out at various veterinary institutes of the district. The semen from strongly built breeds suitable for traction work, such as Hallikar, Amruth mahal, Khillari and Diyoni is used to develop breeds suitable for agricultural purpose. For increasing the milk yield through cross breeds, the semen of special quality breeds like Jersey and HF is used for artificial insemination. This semen is also being used to improve the milk yielding potential of Murrha and Surthi breeds of buffaloes.

11 live stock farms are operating in the district under the state animal husbandry department. In some farms, good quality germplasm production, production of quality fodder seeds, training to farmers and such activities are being carried out. In these farms, training to farmers about improved dairying, supplying of improved fodder seeds and the slips of fodder grasses, production of semen and supplying the semen to veterinary institutes, studying the importance of rabbit rearing, for breed development rearing of Surthi he buffaloes and cattle and many such other programmes have been taken up.

Sheep development

There are 3,55,007 local and 12,309 crossbred sheeps in the district. The bandur sheep is in more numbers in Malavalli, Maddur and Mandya taluks where as in remaining taluks there are bandur and other breed sheep. Due to the decrease in grazing land and increasing demand for meat rather than development of sheet breed, the number of sheep is declining significantly. Since there is demand for meat and wool, it is necessary to give more attention to sheep production. Since the sheep manure is of high quality, farmers need

to rear sheep in large number and not neglect sheep rearing. There is a kannada proverb, 'kuri yiddavanu kubera' which means the person possessing sheep is the god of wealth. Since there is more income in sheep rearing, sheep rearing has to be developed. During summer season, migratory sheep come to Mandya district. They migrate to irrigated areas and stay in the field. Sprouts in the paddy fields provide fodder to sheep and the fields receive good manure. The owners of sheep get more income.

Since the demand for mutton has increased and there is no corresponding production sheep rearing on large scale has to be taken for higher production of mutton. Though the number of grazing lands is diminishing sheep can be reared by cultivating improved grass in agricultural fields. For this purpose crossbred rams are supplied in the district. The foliage of trees and shrubs is the main fodder for goats. It is believed that trees and shrubs will be destroyed wherever goats are there. So, goat rearing is not receiving more encouragement. The number of goats is more in the areas where there are forests. Since goats are required for reproduction the number of goats need to be increased. Since, goats have more disease resistance power and can survive under any climatic condition, rearing them is easy.

Piggery

Piggery is also an enterprise for the economic development. In recent days, more farmers and unemployed educated youth are coming forward to take up piggery on scientific basis. There is a potential to increase the production by rearing exotic sheep breeds. Since it is believed that, brain fever is spread through pigs, Piggery is not receiving more encouragement. There is not much scope for Piggery in the district, since pig rearing is banned in urban areas.

Rabbit rearing

Rabbit rearing is being taken up these days for meat and wool requirements. Zilla Parishat has taken up a programme of rearing the young ones and distributing them to farmers and rabbit rearing centre has been started in Malavalli. New Zealand white, California white, crescent and Chinchula breeds are being reared.

Poultry Farming

Among the animals reared for meat, after sheep and goats, poultry birds are the important ones. Among the poultry development activities 1. Scientific rearing and breeding of Giriraja mother hens in association with University of Agricultural Sciences, Bangalore 2. Production and distribution of chicks to farmers and poultry farms of the department 3. Rearing the Giriraja chicks up to 8 weeks and then distributing to beneficiaries under various socio-economic schemes 4. Training the interested farmers in rearing of broilers and layers and 5. To maintain the quality of poultry and animal feeds produced by public and private sector companies are the major activities.

Regional poultry centre located at Malavalli distributes the chicks of layers to beneficiaries. There are 62 poultry units rearing layers and 184 broiler production units in the district. Broiler chicks are brought from private chick production firms, reared up to 8 weeks and then sold for meat purpose. Giriraja, being an improved breed, yields more egg and meat than the local ones. Annually it lays 140 to 150 eggs and weighs 4.5 kgs on an average. The demand for this breed is increasing these days and chicks are being distributed from regional poultry centre.

Integrated Sample Survey

The objective of the integrated sample survey is to estimate the production of milk, egg, wool and meat, the major animal products of the district. Animal products play a major role in supplying public nutrition. They are also key indicators of economic status and help in formulating the plans. In order to study the trends in animal products, the survey is taken up in three seasons. The results of the survey conducted during 1998-99 are as follows.

1. Milk production: 125 thousand tonnes from cows and 98 thousand tonnes from buffaloes
2. Local egg production: 450 lakhs and improved eggs production: 177 lakhs
3. Meat production: 453 tonnes from cows, 650 tonnes from buffaloes, 1,859 tonnes from goats, 1,401 tonnes from sheep and 309 tonnes from pigs.

In order to impose restrictions on milk and milk products, the order of 1992 relating to milk and milk products, applicable all over the country, has been implemented. As per this order, any unit or person who produces more than 10,000 litres of milk per day or more than 500 metric tonnes of milk per annum must obtain the compulsory registration certificate from the state or central registrar.

Veterinary Services

There are 194 veterinary institutes in the district including 21 are veterinary hospitals, 74 veterinary clinics, and 88 primary veterinary centres, through which animal health care work is managed. All these centres are as per the recommendations of the National Agricultural commission. With these 7 mobile veterinary clinics and 4 artificial insemination centres are functioning in the district.

In order to take the necessary actions against various contagious diseases of animals like foot and mouth disease, anthrax, black quarter, haemorrhagic septicaemia, sheep pox, and control them, regular vaccination programmes are being conducted in the areas where the diseases are prevalent. The vaccine and other medicines required for treating and controlling such diseases are being supplied from Animal health and Biological institute of Hebbal. Complete control of Rinder Pest of cattle has been achieved in the district.

The number of animals treated in the veterinary service institutes of the district during 1997-98 is as follows. 3,16,587 cows, 1,74,352 buffaloes, 2,26,001 sheep, 87,809 goats, 7,321 pigs, 7,375 dogs, 6,778 hens, 8,752 other animals and totally 7,74,975 animals. The number of animals treated in veterinary hospitals and veterinary clinics during the year 2000-01 is as follows. 1 Cows - 21,819 2. Buffaloes - 3,994 3. Sheep- 48,514 4. Goats - 1,05,975 5. Pigs- 7,234 6. Dogs - 16,392 7. Poultry - 8,047 8. Others- 4,885

Details of vaccines given for various diseases are as follows. Foot and mouth disease 1,29,798, Rabies - 7, Sheep and Goat measles - 16,046, Ranichet disease- 5,64,360, Chicken measles - 762, Anthrax - 19,976, Black Quarter - 12,406, Entero Toximia - 47,867, Details of animals artificially inseminated are as follows. Cows -85,069, Buffaloes - 25,835.

Table 4.25 Census wise details of animals of the district from 1951 to 1997 (Thousands)

Details	1951	1956	1961	1966	1972	1977	1983	1990	1997
Cows	339.9	317.6	349.1	379.8	355.6	362.4	411.1	357.0	342.6
Buffaloes	114.2	116.2	126.3	126.2	122.8	127.6	126.7	222.7	191.9
Sheep	372.4	342.0	421.2	396.4	372.2	372.1	333.4	340.9	363.0
Goats	167.1	131.3	144.1	138.9	120.8	146.1	211.6	183.4	233.3
Pigs	3.2	2.2	2.8	2.9	6.4	7.1	8.1	9.1	11.2
Other animals	6.7	4.3	4.2	2.4	2.2	2.9	46.4	29.7	24.6
Total animals	1006.6	916.9	1081.1	1082.9	1043.4	1028.1	1207.4	1172.8	1169.9
Total birds	419.4	221.2	624.2	271.1	677.0	699.8	699.8	616.3	822.9

Table 4.26 - Details of cattle fairs held in the district

Name of the fair	Place	Block	Taluk	Duration (days)	App. No. of cattle brought	Date of commencement
Kadabasveshwara Swami	Bellandagera	Mandya	Mandya	2	4000	Last Monday of December
Veekaramana Swamy	Karighatta	Shreearagabara	Shreearagabara	7	300	Bigge December 2 nd week
Jarighana Swamy	Bindigavali	Bindigavali	Nagamangala	7	1000	
Ganadhreshwara Swami	Achannuragitti	Davalapura	Nagamangala	10	12000	Mangala Shudha Pournime
Veekaramana Swamy	Hemgiri	Akkippala	Krishnrajpet	10	10000	Mangala Shudha Pournime
Veekaramana Swamy	Hemgiri	Akkippala	Krishnrajpet	12	60000	Mangala Shudha Purnami
Narasimha Swamy	Madguru	Madguru	Madguru	7	20000	Vaisakha Bahula Purnami
Nandi	Chikkanaly	Ataguru	Madguru	4	200	Mangala Shudha Purnama
Basveshwara Swamy	Bepi	Chinakurli	Pandavapura	3	25000	Mangala Bahula Amavasya
Mahadeshwara Swamy	Melkote	Melkote	Pandavapura	6	1000	Chaita Shudha Dashami

Source : Handbook of Animal Husbandry Statistics, Animal Husbandry and Veterinary Department

Table 4.27 - Taluk-wise Live Stock Census of Mandya district for the year 1997

Details	Krishnaraja Pete	Maddur	Malavalli	Mandya	Nagama ngala	Pandav apura	Sriranga Patna	Total
Cows								
Local	56,200	38,426	48,321	40,771	43,318	28,871	18,111	2,74,018
Exotic	253	2,694	6,706	6,970	1,046	453	2,727	20,849
Cross- bred	7,658	8,521	2,270	11,105	4,600	5,070	8,485	47,709
Total	64,111	49,641	57,297	58,846	48,964	34,394	29,323	3,42,576
Buffalos	38,076	33,061	24,831	40,663	33,030	15,508	6,750	1,19,919
Sheep								
Local	42,606	57,339	49,267	73,008	80,730	30,905	17,783	3,51,638
Exotic	25	18	0	48	0	0	0	91
Cross- bred	3,565	3,205	0	1,814	6	847	1,873	11,310
Total	46,196	60,562	49,267	74,870	80,736	31,752	19,656	3,63,039
Goats	22,026	38,746	46,634	48,514	42,135	20,202	15,015	2,33,272
Pigs								
Local	635	2,615	1,127	2,408	1,056	409	1,888	10,138
Exotic	2	347	74	251	6	0	0	680
Cross- bred	97	310	26	130	28	40	76	707
Total	734	5,272	1,227	2,789	1,090	449	1,964	11,525
Rabbits	17	30	56	64	20	14	14	245
Dogs	10,288	7,613	8,105	11,189	6,924	5,716	4,146	53,985
Horses	14	22	0	5	5	16	0	62
Donkeys	4	77	13	45	133	27	73	372
Total animals	1,81,466	1,93,028	1,87,430	2,37,105	2,1,037	1,08,078	76,941	11,96,995
Total poultry birds	1,18,552	1,58,992	2,23,956	1,60,398	1,37,936	58,032	75,119	9,32,985

Important acts Related to Veterinary Services

1. Karnataka State animal slaughter control Act - 1959
2. a) Karnataka State Veterinary Profession Enforcement Act - 1963
b) Indian Veterinary council Act - 1984
3. Prevention of Cruelty to Animals Act - 1960
4. Animals disease control Act - 1961
5. Karnataka live stock development Act 1961 and live stock development regulations - 1969
6. Karnataka State Cattle Trespass Act 1963
7. Karnataka State Sheep and sheep products development Act 1973
8. Karnataka State Cow Slaughter Prohibition and Conservation Act 1964
9. Animal import Act 1898, Amendment 1953
10. Milk and milk products order 1992
