THE REPORT

OF

THE CAUVERY WATER DISPUTES TRIBUNAL

WITH THE DECISION

IN THE MATTER OF WATER DISPUTES REGARDING THE INTER-STATE RIVER CAUVERY
AND
THE RIVER VALLEY THEREOF

BETWEEN

1. **The State of Tamil Nadu**
2. **The State of Karnataka**
3. **The State of Kerala**
4. **The Union Territory of Pondicherry**

VOLUME V

APPORTIONMENT OF THE WATERS OF THE INTER-STATE RIVER CAUVERY

NEW DELHI
2007

Volume V

Apportionment of the water of inter-State river Cauvery

(Issues under Group III)

Chapter 1

Crops and Crop Water requirement in Tamil Nadu and Karnataka in the Cauvery basin

The development of irrigation in both the States covered the following periods:-

(i) Areas existing prior to 1924;

(ii) Areas contemplated to be developed under various clauses of the 1924 Agreement in each State;

(iii) The areas which have been developed/under ongoing development for irrigation beyond the entitlement contemplated in the 1924 Agreement covering the period from 1924 to 1990.

2. Having examined the areas of the two States as indicated above, the next step is to make an assessment of the water required for irrigation for those areas in each State. This part of the dispute is not only very crucial but also of scientific nature. From the earlier volumes of this report it shall appear that dispute regarding sharing of the water of river Cauvery between the State of Madras/Tamil Nadu and the State of Mysore/Karnataka goes back to about 150 years. Details whereof have already been given including the correspondence starting from the middle of the 19th century. The situation has been aggravated and became more complicated as the years have passed because in the meantime both States have developed areas under the terms of the agreement of the year 1924 and areas not covered by the terms of the agreement.

3. On the question of water requirement for irrigation, both States have produced documents including information given in the Common Format. Eminent witnesses who are experts in the field were examined on behalf of the two States. During the arguments the learned counsel appearing on behalf of these States could not satisfy as to how the demand of 566 TMC on behalf of the State of Tamil Nadu and 465 TMC on behalf of the State of Karnataka can be adjusted when the total yield of the basin of river Cauvery has been estimated to be about 740 TMC. Apart from the claim of these two States there are claims on behalf of the State of Kerala for about 100 TMC and Union Territory of Pondicherry for about 9 TMC. It is obvious in this background that some curtailments in the demand of the two States have to be made. For this object some restrictions have to be imposed in order to do justice to both the States for the purpose of determining the need and the equitable share of the each State in the waters of the inter-State river Cauvery. In this process the following factors are important and relevant.

i) The State of Tamil Nadu was having three paddy crops in the delta area as well as in some other areas. In the same field they were having first Kuruvai and followed by Thaladi and in the rest, Samba crop which takes a longer time to mature was being grown. After examining the records it appeared that Madras/Tamil Nadu was having Kuruvai followed by Thaladi in about 95,000 acres prior to the agreement of the year 1924 in the delta area. From the agreement of 1924 read with its Annexures it shall appear that the State of Madras was allowed to extend double crop in the same field by 90,000 acres (70,000 acres in the old delta and 20,000 acres in the Mettur Project area). The total being 1,85,000 acres. The practice of growing

double crop by the cultivators in the aforesaid area of 95,000 acres was being followed much before the execution of the agreement; it is difficult to direct to discontinue that practice. Same is the position so far the balance of 90,000 acres are concerned because that was permitted under the terms of the agreement and has been specifically mentioned in the Cauvery Mettur Project Report (1921) as well. All these aspects have been discussed in earlier chapters. But it is an admitted position that State of Madras/Tamil Nadu with the copious flows of water being available started growing double crop of paddy in the same field in different areas. The total of such areas has been discussed in earlier chapters. Similarly Karnataka also followed a practice of growing double crops which were not permitted by the agreement. In this background it is considered necessary in the end of justice not to take note for the purpose of apportioning the waters of inter-State river Cauvery in respect of growing second paddy crop or any other crop in the same field in the same agriculture year except in the areas in which these practices were being followed prior to 1924 agreement or was specifically permitted under the terms of the agreement.

ii) The State of Karnataka under the terms of the agreement of the year 1924 was allowed to grow sugar-cane only on 40,000 acres which it has raised to about 70,000 to 90,000 acres. It is well known that crop like sugarcane requires much more water, affecting equitable distribution of waters. Therefore, note is being taken of areas for sugarcane only upto 40000 acres as provided in the agreement for the purpose of apportioning the waters of inter-State river Cauvery .

iii) It is admitted position that both the States were having summer crop including summer paddy from the waters of river Cauvery. When there is so much scarcity of water in the basin, they have to be restricted from growing any summer paddy except in some area where it was being grown prior to 1924 agreement, even

that is to be replaced by any light irrigated crop within the irrigation season.

iv) The delta of water claimed on behalf of the two States in respect of different crops including paddy have to be reduced in view of the new variety of paddy and other inputs which have been developed of late which require lesser delta of water.

v) Trans-basin diversion takes out the water of the basin to another basin. As such no note is being taken for the purpose of determining the need and the equitable share of the each State in the waters of the inter-State river Cauvery in respect of any trans-basin diversion already made or proposed for providing extra waters.

vi) Lift schemes will not be considered for water allocation.

4. The two States have also admitted that the water requirement of the crops over the years (after 1920) have been reduced with the new variety of seeds of paddy being grown by the cultivators in the basin. Same is position in respect of semi-dry and dry crops. In this connection several circulars in respect of delta of water, from Central Government concerning Southern States with reference to the nature of soil, are of great relevance. Even the notes of the arguments and charts which were filed by the two States during the hearing of the arguments show that the delta of water for different crops have been reduced.

5. There was a time when the cultivators of paddy were extremely happy when the paddy plants used to float in the water. But the situation has drastically changed because of the introduction of new variety of high yielding paddy crops requiring less delta of water. It will be proper to mention that the State of Karnataka has taken a clear stand that they are

not going to grow wet crop which consumes more water in the new project areas as specified in Annexure K-V filed during the hearing of the application for interim relief before this Tribunal in the year 1991. There they said that in those areas only semi-dry crops shall be grown and water shall be provided according to the requirements of the plants.

6. In the present proceeding for ascertainment of the share of water for the different riparian States eminent witnesses have been examined, who have filed affidavits before this Tribunal on behalf of their States and Union Territory of Pondicherry in support of their respective claim of waters. The views of several renowned Agriculture scientists, namely, Dr. M.S. Swaminathan, witness on behalf of Tamil Nadu, Dr. I.C. Mahapatra, Agronomist, and Dr. J.S. Kanwar, Dry Land Farming Expert, witnesses on behalf of Karnataka are already on record. Dr Gopalakrishnan, Agronomist has been examined on behalf of Kerala. Dr A.A. Ramasastry, Deputy Director General, India Meteorology Deptt, witness on behalf of Tamil Nadu was also presented and cross-examined. All these experts had submitted their affidavits and were cross examined at great length by the learned senior counsel of different party States. Their evidence has been referred to by the learned counsel of parties during the course of final arguments. Apart from that during the course of arguments, the Tribunal directed the party States on 12.11.2002 to file affidavits giving details of the water requirement as well as the crops which they were growing and to state the minimum crop water requirement keeping in view the scarcity of the water in the river Cauvery. In pursuance to the said order, the State of Tamil Nadu filed an

affidavit on 8.7.2004 [Exhibit T.N. 1665, pages 55 and 56] giving the details of the crops as well as the requirements of the water including the delta (water-depth) required in different seasons in different projects. Similarly, the State of Karnataka filed detailed affidavit on 28.3.2003 (Exhibit KAR 518) giving the details of the projects, nature of crops grown and the delta (water-depth) required for such crops. In support of the aforesaid claims, several documents have been filed on behalf of the two States including publications in respect of water requirement for different crops in the States of Tamil Nadu and Karnataka. In view of the aforesaid evidence produced on behalf of the two States, the Tribunal has to come to the conclusion as to what reasonable water is required by each State within the limitation of the total water available in the Cauvery basin.

7. In the State of Mysore (now Karnataka) and Madras (now Tamil Nadu), the age old cultivation had been mostly of paddy crop wherever irrigation facilities were available in the basin. In the Mysore State, the paddy cultivation was provided irrigation through Anicut channels or tanks and same was the case in the Tamil Nadu area where bulk of paddy cultivation was in the Cauvery delta area fed by Grand Anicut and through other anicuts across the main Cauvery, Bhavani and Amaravathy. This scenario continued till 1928. Later on when Krishnarajasagar reservoir (KRS) was constructed, as per the provisions of 1924 Agreement, the Mysore State extended its irrigation to new areas. The State of Madras also constructed Mettur reservoir to provide regulated supplies to the delta areas as also regulating flows into the anicut channels between Mettur and Grand

Anicut besides covering new areas under the Cauvery Mettur project (G.A. Canal). After construction of these two major reservoirs providing large scale irrigation facilities, the bulk of cultivation in both the States remained confined to paddy crop; and in Karnataka, sugarcane cultivation which is a perennial crop was also developed.

8. The State of Tamil Nadu, in their statement of case have mentioned about the cropping pattern as under:-

> "Rice is the dominant crop in delta which physically accounts for most of Thanjavur District and whole State of Tamil Nadu largely depends on this District for rice, is staple food of the people. Rice has been cultivated in the delta from ancient times, due to demand as well as ideal conditions for growing rice viz. alluvial soil, lie of the land, drainage conditions, availability of river flows and farm labour. In isolated pockets, sugarcane, banana and betelvines are grown. Similar cropping pattern obtains in the commands of the old channels, above the delta as well."
>
> [Ref: TN I, page 27, para 29(d)].

The State of Tamil Nadu have furnished information about the existing crops in various projects in the common Format. In respect of Cauvery delta system they have shown raising of 'Kuruvai' and 'Thaladi' crops of paddy and also 'Samba' crop. Similarly in other projects the State has shown that sugar-cane, banana and other crops (groundnut and garden crop) have been introduced in 1980 onwards. In the Anicut systems, besides raising the two crops of paddy they have also introduced summer paddy in some projects. The raising of two crops of paddy has been in vogue in old Amaravathy channels, Noyyil river channels, Cauvery Mettur Project (Grand

Anicut Canal) etc. While furnishing information in common format Tamil Nadu have indicated the irrigation practices as under:-

> "The normal pattern in the Cauvery basin is to raise the first crop of short duration paddy known as `Kuruvai' in June, with the waters of south-west monsoon flowing down the river, early enough, to be harvested before the onset of the north-east monsoon. After the harvest of `Kuruvai', a second crop of medium term paddy-known as `Thaladi' is grown in these areas with the benefit of north-east monsoon to be harvested by January-February. The rest of the areas grow only a single crop of long term paddy known as `Samba' commencing from July/August, to be harvested in December/January. In other riverine tracts too, subject to availability of supply, two paddy crops are grown, followed by a cash crop like green gram and black gram. Under the tanks in the rainfed tracts, generally one paddy crop can be raised successfully, depending on the fillings the tanks receive."
>
> (Ref. E-21, page 52)

9. In the information furnished and during the arguments on behalf of the State of Tamil Nadu it is found that high yield varieties, which are receptive of higher doze of manures/fertilizers, are in practice. A very substantial area is having the benefits of this high yielding variety and the use of chemical fertilizers to enhance total yield in different fields.

10. The State of Karnataka in their statement of case (KAR-1, page 61) have given the nature of crops being grown in that State. It has been stated:-

> “15.1 In Cauvery basin in Karnataka, ragi, jowar, sesame, groundnut, redgram and short duration pulses are the common kharif crops under rainfed conditions. In some areas, where there are

pockets of retentive soils or where late rains occur, some rabi crops like jowar, Bengal gram and cotton are cultivated. However, in these areas failure of rains is very common and as such are severely drought prone……. Appropriate doses of irrigation would also help increase the productivity and stability of the yield…….”

“15.2 In the Cauvery basin, particularly, in old irrigation projects in Karnataka, rice and sugarcane are the main crops under irrigation. This has been an old practice in Karnataka in the situation where irrigation prevailed as also in Tamil Nadu. In years of inadequate monsoons, rice is discouraged and light irrigated crops like ragi, groundnut etc., are grown in rabi/summer. In the new irrigation projects in Karnataka there is no provision to grow paddy even during kharif season except in limited areas to a limited extent. Light irrigated crops like ragi, maize, jowar, pulses, groundnut, sunflower etc., are grown. On the other hand in Tamil Nadu, paddy is the major crop…….”

11. The State of Karnataka in the Common Format Information has said that irrigation in that State, including the Cauvery basin projects is aimed at extensive rather than intensive use of water to afford protection to the drought affected areas. However, in the old projects of KRS and anicut channels, cultivation of paddy and sugarcane is in practice since beginning. In all the new projects, the emphasis is on growing light irrigated crops. The cropping pattern is largely kharif and to a limited extent rabi. The cropping pattern is specified for each irrigation project. The kharif cropping synchronizes with the rainfall season and the utilization of irrigation water is only to meet the crop water requirements during dry spells.” (Ref: E-24, page 22, para II). In the irrigated areas, rice is predominant crop, whereas in light irrigated crop, ragi is the main crop followed by maize and potato.

Also sugarcane, mulberry, coconut and other fruit crops are grown depending on availability of water. (Ref: E-24, page 23-25)

12. The National Commission on Agriculture, 1976, in their report Part-V-Resource development, Chapter 15 Irrigation, page 46, para 15.8.4 have mentioned that in India, rice is grown in about 40% of the irrigated area under all crops; rice crop is the largest consumer of irrigation water, accounting for 50% of the total irrigation supply. Next to rice comes the wheat crop followed by other cereals and these consume about 15% and 12% of the irrigation supplies respectively. Amongst cereals, rice has the lowest productivity per unit of water as is evident from the following table:-

Productivity of Cereals per Unit of Water

Crop (new strains)	Water requirement in a typical tract (mm)	Productivity per mm of water (kg/ha)
Rice	1,200	3.7
Sorghum	500	9.0
Bajra	500	8.0
Maize	625	8.0
Wheat	400	12.5

(Source: National Commission on Agriculture report, page 46, Table No. 15.8)

"The main rice crop is, however, grown in the rainy season and irrigation supplies are needed to make up the water requirement left unmet by rainfall. Rice crop grown in non-rainy season or low rainfall areas consumes disproportionately more water than the production it gives. Under such water paucity conditions, therefore, rice should be grown only if the available irrigation supplies cannot be put to better use for other crops." (Ref: Para 15.8.4)

"In the southern States, wherever the heavier black cotton soil is located in the valleys and the lighter red soils higher up, it would be a good arrangement to confine growing rice in the valleys and reserving the lighter soils for light irrigated crops, as otherwise, apart from consuming more water due to greater percolation losses, the

percolated water would make the heavy soil lower down soggy, rendering it unfit for growing any other crop than rice. This has happened on some existing projects including lower Bhavani in Tamil Nadu." (Ref. Para 15.8.7)

"15.8.8 We recommend therefore, that rice should be grown preferably where there is good support from rainfall on soils which have a permeability less than 5 mm per day and lower down in valleys where generally there is heavy soil. Further, rice should be grown in non-rainy season or low rainfall areas only if the available irrigation supplies cannot be put to more economic use for other crops."

[Emphasis supplied]

13. The view of the National Commission on Agriculture appears to be that rice should be grown preferably where there is good support from rainfall and on soils which have a permeability of less than 5 mm. per day. It has also been recommended that rice should be grown in non-rainy season or low rainfall areas only if the available irrigation supplies can not be put to more economic use for other purposes. (Ref. Page 47, Para 15.8.8) It has also been said that in the low rainfall areas, it is important that there should be at least one assured crop to sustain the farmer. As water resources in such areas are scanty, irrigation supplies have to be put to the most economical use in order to extend the benefit of irrigation to as large a number of people as possible. (Ref: Page 47, para 15.8.9).

14. Before this Tribunal, the State of Tamil Nadu produced Dr. M.S. Swaminathan, a renowned Agriculture Scientist as their expert witness. Dr.

M.S. Swaminathan, while deposing before this Tribunal has stressed the need of not disturbing the overall economy of the Tanjavur district in particular and Tamil Nadu State as a whole, where rice is the major crop. He has mentioned that the rice yield in the Cauvery delta and Tamil Nadu as a whole is quite high compared to All India average yield of rice crop. According to him, the State of Tamil Nadu compares well with the State of Punjab in the rice yield. He mentions that due to shortage of irrigation water, the total production in the State could not be increased to meet the requirements of Tamil Nadu State. Dr. Swaminathan stated that upper portion of Cauvery basin in Karnataka is blessed with a fairly reliable south-west monsoon while the lower portion of the basin lying in Tamil Nadu gets rain mostly during the north-east monsoon which, on the whole is erratic. On a careful analysis of the rainfall pattern he divides the entire Cauvery basin into three zones which are as under:-

(1) Zone 1 : Upper reaches of Cauvery covering Kerala and Karnataka portions of the basin.
(Annual rain fall -1401 mm)

(2) Zone 2 : Cauvery up to the confluence of Amaravathy
(Annual rainfall -1010 mm)

(3) Zone 3 : Rest of Cauvery basin upto the mouth of the River.
(Annual rainfall -1012 mm)

15. Dr. Swaminathan, in Para 12 of his affidavit has stated about the introduction of high yielding varieties and adoption of associated modern agronomic practices by the farmers to improve the yield of rice. He has then indicated that in countries like Japan and China, the rice yield is reported to be very much higher as 6.33 and 5.73 tonnes per hectare

respectively for the year 1990. It can be said that this witness has also accepted about the improved varieties of seeds and adoption of modern practices by the farmers of Tamil Nadu to improve the yield of rice. During cross examination Dr Swaminathan has virtually supported and admitted in respect of the views expressed by the Agriculture Commission. The questions No 85-87 by the learned senior counsel for the State of Karnataka put to Dr Swaminathan and answers given by him are reproduced below:

> "Q.No.85: Now you are aware and this is what perhaps also you wrote, that rice requires much more water than other cereals and its productivity per unit of water is much lower than others?
>
> Ans: Productivity per unit of water is much lower depends upon where you have grown it. It could be high. But the generalisation at that time in the 70s we felt that we must improve the water use efficiency because there are other areas with very high efficiency. But the fact remains that rice requires water and that is why, ecologically, you find our country also, rice is one crop with a very wide adaptation from Kanyakumari to Kashmir, from Kohima to Maharashtra. Wheat cannot be grown that way. Wheat requires much lower temperature. That is why, when you come to peninsular India, it is one of the reasons why I have mentioned in my affidavit that rice occupies a key position in our National food security system.
>
> Q. No. 86: I was on rice as compared to others. That comparison still holds.
>
> Ans: Naturally, Sir, if you take Jowar, Bajra to rice. I agree.

Q.No.87: This is what it says in its summary, the Irrigation Commission, para 19.17:.1s.

> "Rice requires much more water than other cereals. But its productivity per unit of water is much lower than that of others. The Commission, therefore, suggests that the need for adequate support, from rainfall should be kept in view while planning for rice production. It, further, recommends that a second rice crop, particularly in the non-rainy season, should be grown in an area only if the irrigation supplies cannot be put to better use."

Ans: I take it that whatever you read is correct."

16. Thereafter the learned counsel for the State of Karnataka in question No 115 drew the attention of the witness to paragraphs 15.8.7 and 15.8.8 of the report of the National Commission on Agriculture. The aforesaid paragraphs 15.8.7 and 15.8.8 have already been quoted above where the Agriculture Commission has recommended that in the Southern States wherever the heavier black cotton soil is located in the valleys and the lighter red soil higher up, it would be a good arrangement to confine growing rice to the valleys reserving the lighter soils for light irrigated crops, as otherwise apart from consuming more water due to greater percolation losses, the percolated water would make the heavy soil lower down soggy rendering it unfit for growing any other crop than rice. The view of the National Commission on Agriculture appears to be that rice should be grown preferably where there is good support from rainfall and on soils which have

a permeability of less than 5 mm. per day. It has also been recommended that rice should be grown in non-rainy season or low rainfall areas only if the available irrigation supplies can not be put to more economic use for other purposes. Dr Swaminathan agreed to the aforesaid recommendation of the National Commission on Agriculture.

17. While answering Q.No.453, 454 & 455, Dr. Swaminathan commented that if there are two crops of paddy in Tamil Nadu plus one pulse crop that would spread employment of the agricultural labourers throughout the year and such employment would be much more assured. From the above reply of Dr. Swaminathan, he seems to be recommending raising of Kuruvai and Thaladi crops followed by one pulse crop.

18. Substance of the statement in affidavit and evidence of Dr Swaminathan is that as the soil and the climate in the delta area is very conducive for growing paddy, there should not be any restriction on the number of times paddy is grown in the same field in the same agriculture year. The logical sequence to this is that the water of river Cauvery should flow to the state of Tamil Nadu through major reservoirs as was the situation when the agreement was in force. This aspect has been examined in detail earlier while discussing the principles of equitable apportionment in the light of the several judgments of the American Supreme Court as well as the opinion of our own Supreme Court as to what is the right of one riparian State vis-à-vis the other over an inter-State river. The basic spirit of just and equitable apportionment of water of an inter-State river is to live and let others live. The upper riparian States have equal right to develop. The right

to development of the under developed countries or States has become worldwide issue and is being discussed at different forums. It has already been pointed out in earlier chapters that at one stage the civilization and the main activities including the agriculture grew and was developed at the mouth of the rivers in different countries which had good delta soil, but later the situation had to change keeping in view the predicament and need of the upper riparian States who require water for their development. In order to meet the necessity of millions of its citizens who have come into existence with passage of time, the principle of equitable apportionment of waters was evolved and has been recognized throughout the world. That is the reason that one crop in one agriculture year to every cultivator has been allowed and cultivators have also been permitted to grow Kuruvai and Thaladi along with Samba in areas over which they were growing prior to the agreement of 1924 and as well as in the areas permitted by the agreement of 1924. If the ageold practice of those fields are discontinued or what has been permitted under the terms of the agreement are ignored to save water because of the double crop which will disturb the settled economy it shall cause hardship to the cultivators who have been enjoying that privilege and facility since their ancestors. But no note can be taken of the second crop at this stage, beyond the area covered by the two conditions keeping in view the shortage of water in the basin and the claim of upper riparian States. So far Karnataka is concerned the paddy and sugarcane, which are more water consuming crops, have been restricted to the areas to the period prior to 1924 as well as permitted under the terms of

the agreement. In respect of future development they themselves have said that in the new projects mostly semi-dry crops are to be grown. In their case also no note is taken of the double crop even of semi-dry variety, in one agriculture year.

19. The State of Karnataka filed an affidavit of Dr. I.C. Mahapatra on the subject "Rice and rice based cropping system in relation to climate, soil and water resources in Cauvery basin of Karnataka and Tamil Nadu". While elaborating on supplementaries arising from Q. No.2617, Dr. Mahapatra stated that a suitable cropping pattern of Karnataka would include ragi, pulses, oilseeds, sugarcane and one crop of rice alongwith horticultural crops of fruits, flowers and other useful trees. (Ref: Deposition Vol.IV, Page 722-723). He further mentioned that ragi is the most dominant crop in Karnataka, it is number one in the whole country, and the productivity is fairly high. Moreover, ragi can grow both under rainfed conditions as well as under irrigated conditions. But with irrigation, its potentiality is far higher. (Ref: Deposition Vol. IV, page 723, para 2). He also suggested that two crops of rice being cultivated at present in some parts of Karnataka need to be discouraged (Ref: Page 722 para last but-one, page 724, para 2).

20. As regards Tamil Nadu, Dr. Mahapatra mentioned that:-

> "Tamil Nadu has two or three crops of rice in different parts of the State. That is because the temperature in Cauvery delta part of the Tamil Nadu is not a limiting factor. Rice can be grown in the entire delta from January through December. Any month of the year, one can sow the nursery, transplant rice crop and harvest rice crop. But what is important is the rainfall pattern..... one has to think of

cropping pattern in relation to water availability....." (Ref: Deposition page 727 - middle para).

He further mentioned that rice has to be necessarily grown during the months of August to December-January. There is no other alternative because entire delta is just like one flooded area. So there is no alternative to growing rice. (Ref: ibid, page 727- last but one para). He further suggested that after Samba crop is harvested, black gram/green gram can be taken on residual moisture without any irrigation. (Ref: ibid, page 728, para 1). He also mentioned that groundnut crop is next important crop which is already there but it has to be synchronized with appropriate timing. (Ref: ibid, page 729, para 2)

21. On a query as to "why the farmers are anxious to grow Kuruvai Crop"? Dr. Mahapatra in response stated that "farmers are anxious simply because they have ready access to availability of water in the month of June, because according to the schedule of irrigation water release, 12th of June was supposed to be the date of release of water from Mettur dam and it takes about three to four days to reach delta and that is why they are used to it ....." (Ref: ibid, page 731, last para) There is no dispute that in the field where Kuruvai is grown has to be followed by Thaladi. The farmers of Tamil Nadu are anxious to grow kuruvai because it is a short term crop and its cultivation process including putting seeds in the fields for seedlings etc start by the end of June. It appears to be more or less an admitted position that for growing kuruvai, the State of Tamil Nadu is primarily dependent on releases of water by Karnataka to Mettur reservoir. The Karnataka has

another plea saying that during June - July there is not enough water to release for kuruvai unless the areas over which the kuruvai is grown is restricted or stopped altogether. That creates crisis in the basin. This will be discussed in detail later while allocating the waters to the two States.

22. Dr. J.S. Kanwar, witness on behalf of the State of Karnataka has submitted his affidavit on the subject "Encountering Drought for Sustainable Agriculture and Environment in Cauvery basin of Karnataka". It may be pointed out that Dr. Kanwar is an expert on "Dry Land Farming" and in his affidavit he has analyzed various aspects of managing agriculture in the drought areas of Cauvery basin lying in Karnataka. Dr. Kanwar while describing Karnataka's agriculture in Chapter 1 of his affidavit at page 1, inter-alia has stated as under:-

> "1.1 Rainfed agriculture in India is a gamble in the monsoons and recurrent droughts and floods are its common features. Impressive scientific advances in agricultural technology in the last three decades have ushered in a green revolution in the irrigated and other favourable ecologies. However, agriculture in dry farming areas and, particularly, in the drought prone areas still remains a risky enterprise and subsistence type of farming system……. This has led to a widening disparity in progress between the farmers of the irrigated and non-irrigated farming areas. The recurrent rainfall aberrations both in space and time and the consequent droughts of various frequency and intensity, further widen this disparity."
>
> "1.3 Experience has shown that whenever a farmer has gained access to some water resource, be it a canal, a well, a tank or a pond, it triggered a change in his attitude to the adoption of improved technology and a market oriented productive and sustainable

agriculture system. This change in his attitude is necessary for improving productivity, sustainability and economic viability of agriculture in dry farming areas."

"1.8 Despite serious efforts to enhance the production and productivity in dry farming areas by taking up integrated watershed development and dry land programmes most vigorously, the State has not been able to make a noticeable impact on crop productivity to meet the growing demand for food……It has the least area under irrigation and feels constrained in developing its potential. The nature of the terrain and soils also inhibit the realization of the full potential of rains which have more inter-seasonal and intra-seasonal breaks."

23. The comparative position of important land use in Cauvery basin area of Kerala, Karnataka and Tamil Nadu for the year 1989-90 has been given in Table 2.1 at page 8 of his affidavit as under:-

(Area: 000 ha)

Sl.No.	Item	Kerala	Karnataka	Tamil Nadu
1.	Culturable area	154	2477	2891
2.	Net sown area	113	1684	2059
3.	Net irrigated area	22	355	698

From the above statistics, it is noticed that although the difference in total culturable area and net sown area in Karnataka and Tamil Nadu area of Cauvery basin is only about 4 lakhs ha (about 10 lakh acres) the net irrigated area in Tamil Nadu is almost double that of Karnataka. Dr. Kanwar has further observed that "in the drought prone areas, the syndrome of low

crop yields, crop failures and subsistence agriculture based on the growing of low value crops and poverty of farmers, persists."

24. The Irrigation Commission 1972 considered that the areas receiving less than 750 mm rainfall over 20% of the years as drought areas, where the percentage of irrigated area is less than 30% of the culturable area. Although, later on, Ministry of Rural Development, Govt. of India under their Drought Prone Area Programmes (DPAP) has modified the criteria of 30% irrigation development in a taluk as suggested by the Irrigation Commission to 40% as a reasonable immunity against the drought in the case of areas receiving less than 750 mm rainfall. (Ref: ibid, page 25, para 3.16). Within Cauvery basin, 28 taluks in Karnataka have been identified as drought prone areas by the Irrigation Commission (Ref: ibid, page 34) as listed at page 27-28 (Statement No. 3.1) of Dr. Kanwar's affidavit. The details of 48 taluks alongwith 28 drought prone taluks taken from Dr. Kanwar's affidavit are given in the following table:-

Statement showing 48 Taluks of Karnataka lying wholly or partly in Cauvery basin alongwith 28 Taluks identified as drought prone areas

S. No	Name of Districts/Taluks in Cauvery Basin	Name of Districts/Taluks identified as drought prone areas	% age of taluk's area lying in basin	Culturable area in basin (ha)	Population 1991
1	2	3	4	5	6
I	**Bangalore (Urban) District:**				
	1. Anekal	1. Anekal	36.7	17,061	80,733
	2. Bangalore North	-	-	-	-
	3. Bangalore South	-	-	-	-
II	**Bangalore (Rural) District:**				
	4. Channapatna	2. Channapatna	100.0	40,599	2,38,060
	5. Devanahalli	3. Devanahalli	13.5	4,986	21,612
	6. Doddaballapura	4. Doddaballapura	42.4	26,707	94,871
	7. Kanakapura	5. Kanakapura	100.0	93,523	3,13,324
	8. Magadi	6. Magadi	100.0	63,884	1,92,928
	9. Nelamangala	7. Nelamangala	94.8	39,433	1,35,512
	10. Ramanagara	8. Ramanagara	100.0	42,032	2,05,326
III	**Chickkamagalur District:**				
	11. Chikkamagalaure	-	-	-	-
	12. Mudigere	-	-	-	-
IV	**Hassan District:**		-		
	13. Alur	-	-	-	-
	14. Arakalgud	-	-	-	-
	15. Arasikere	9. Arasikere	16.0	15,167	45,868
	16. Belur	-	-	-	-
	17. Channarayapatna	10.Channarayapatna	100.0	87,547	2,53,952
	18. Hassan	-		-	-
	19. Holenarasipura	11. Holenarasipura	100.0	43,071	1,58,495
	20. Sakaleshpura	-	-	-	-
V	**Kodagu District:**				
	21. Madikere	-	-	-	-
	22. Somwarpet	-	-	-	-
	23. Virajpet	-	-	-	-
VI	**Mandya District:**				
	24. K.R. Pet	12. K.R. Pet	100.0	74,305	2,20,976
	25. Maddur	-	-	-	-
	26. Malavalli	13. Malavalli	100.0	60,278	2,63,729
	27. Mandya	-	-	-	-
	28. Nagamangala	14. Nagamangala	100.0	85,235	1,78,416
	29. Pandavapura	15. Pandavapura	100.0	43,116	1,59,970
	30. Srirangapatna	-	-	-	-
VII	**Mysore District:**				
	31. Chamrajanagar	16. Chamrajanagar	100.0	84,927	3,11,129
	32. Gundlupet	17. Gundlupet	100.0	84,530	1,95,593
	33. Nanjangud	18. Nanjangud	100.0	80,166	3,23,914
	34. T. Narasipur	19. T. Narasipur	100.0	52,546	2,57,345
	35. H.D. Kotte	-	-	-	-
	36. Hunsur	20. Hunsur	100.0	71,632	2,21,332
	37. Kollegal	21. Kollegal	100.0	70,416	3,03,301
	38. K.R. Nagar	-	-	-	-
	39. Mysore	-	-	-	-
	40. Periyapatna	22. Periyapatna	100.0	60,748	1,86,617
	41. Yelandur	-	-	-	-
VIII	**Tumkur District:**				
	42. Chickkanayakanahalli	23. Chickkanayakanahalli	3.0	2,731	5,795
	43. Gubbi	24. Gubbi	65.8	59,033	1,51,950
	44. Kunigal	25. Kunigal	100.0	79,994	2,34,514
	45. Tiptur	26. Tiptur	60.5	41,711	1,18,296
	46. Tumkur	-	-	-	-
	47. Turuvekere	27. Turuvekere	100.0	69,200	1,64,428
IX	**Kolar District:**				
	48. Chikkaballapur	28 Chikkaballapur	0.07	19	118
		Total……..		14,94,597	50,38,154

25. Dr. Kanwar in his affidavit Part-II, Annexure-IIIA, page 1-4 has given a statement giving identification of drought prone areas in Karnataka by different types of analysis. Col. 9 of the said statement gives analysis based on the criteria of "erratic distribution of rainfall." This criteria was considered by National Commission on Agriculture 1976 and Irrigation Commission 1972. The result of the analysis based on this criteria adopted by the two important National Commissions, have categorized almost all the taluks of Mysore, Hassan, Mandya, Bangalore and Tumkur districts as drought prone areas. In Col. 10, another analysis based on the criteria "Aridity Index" (data analysis from 1901 to 1980) has also categorized the above districts as drought prone. The above studies were made by the Central Water Commission, Ministry of Irrigation, Govt. of India. Dr. J.S. Kanwar in his affidavit has examined the minimum water requirement for raising crops in dry land situation. He has not worked out the crop water requirement for kharif semi-dry crop. He has clearly indicated that "400 mm rain is considered the absolutely minimum rainfall (after) allowing for surface runoff and internal drainage losses, to meet the evapo-transpiration losses of the crops". The minimum water requirement and the crop water requirement are two different parameters. The latter is calculated while framing project reports and is quite different from the minimum water requirement in dry land situation. In paragraph 4.10 Page 48 of Dr. Kanwar's affidavit it has been stated:-

> "4.10 For the production of crops under dry land situation, the minimum rainfall requirement during the growth period of seasonal crops (around 120 days duration from mid July to mid November) is

about 400 mm. This growing period covers part of both the Southwest and Northeast monsoon seasons. The 400 mm rain is considered the absolutely minimum rainfall allowing for surface runoff and internal drainage losses, to meet the evapotranspiration losses of the crops. Moreover, the distribution of rainfall, both in space and time, is equally important. The rainfall distribution and the soil moisture supply must meet the requirements of the growing crop adequately at different stages of growth. This is the critical factor, which is often overlooked by the planners, demographers and even by the irrigation departments while considering the need for irrigation for the success of a cropping system. The number of taluks that have received less than 400 mm rainfall during the crop growth period in the different ranges of years, are shown in Fig. 4.4 and details in Annexure 4C. From Fig.4.4, it is evident that 32 out of 48 taluks receive less than 400 mm rainfall in the 20-40 years range out of 61 years. Thus the historical rainfall data reveal that more taluks in the Cauvery basin of Karnataka have greater intensity of unfavourable rainfall than the minimum required for successful cropping."

26. Dr. Kanwar has clearly mentioned that the lands in Karnataka areas are mostly red sandy soil and red loamy soil. Both these categories drain well i.e. they have low water holding capacity. Dr. Kanwar has further observed that the upper 20 cm layer of the soil is critical to plant growth and drying of this upper soil layer is an early indicator of yield loss (Donald A. Wilhite & Associates 1987). As such, since the Karnataka soils are sandy in nature, the upper layer of 20 cm will quickly dry because of low water holding capacity of the soil and this will adversely affect the crop yield. Dr. Kanwar has, therefore, suggested that such light soils would need irrigation

and that can only be possible by way of artificial irrigation and not by the pattern of rainfall as is available in these drought areas of Karnataka.

27. The implications of water balance study method for Cauvery basin of Karnataka have been mentioned by Dr. Kanwar in para 6.15 of his affidavit (page 99-100) quoted below:-

> "6.15 From the above discussion it follows that 20 taluks have the most stressed environments with shortest favourable period and longest period less favourable for cropping. The 13 taluks with 17-23 weeks of favourable period are the second group of stressed environments which despite the two peaks of bimodal rains are not able to realise the full potential of even one crop. Both these groups of taluks need supplemental irrigation during the prolonged less favourable moisture availability period so as to realise the full potential of variable rains from April/May to November. These environments are capable of producing two crops in a year with supplemental irrigation and with increased productivity and increased rain water use efficiency."

In his concluding remarks at page 106, Dr. Kanwar has observed as under:-

> "…… Using alternative methods for water balance studies, it can be concluded that the 28 drought prone taluks identified by the Irrigation Commission 1972, do necessarily need protective irrigation for mitigating the effect of drought ……."

28. The distribution of drought prone taluks in the command of Hemavathy, Harangi and Kabini projects is given in the following table:-

Statement showing drought prone taluks falling in the command of Hemavathy, Harangi and Kabini projects

S. No	District/Taluk	Taluks in the command of projects and taluks identified as drought prone areas					
		Hemavathy		Harangi		Kabini	
		Taluk in command	Taluk identified as drought prone area	Taluk in command	Taluk identified as drought prone area	Taluk in command	Taluk identified as drought prone area
1	2	3	4	5	6	7	8
I.	**Hasan District:**						
	1. Hasan	1. Hasan	-	-	-	-	-
	2. Alur	2. Alur	-	-	-	-	-
	3. Arkalgud	3. Arkalgud	-	1. Arkalgud	-	-	-
	4. Holenarasipura	4.Holenarasipura	1. Holenarasi-pura	-	-	-	-
	5. Channarayapatna	5.Channaraya-patna	2. Channa-rayapatna	-	-	-	-
II.	**MandyaDistrict:**						
	6. Mandya	6. Mandya	-	-	-	-	-
	7. K.R. Pet	7. K.R. Pet	3. K.R. Pet	-	-	-	-
	8. Pandavapura	8.Pandavapura	4. Pandava-pura	-	-	-	-
	9. Nagamangala	9. Nagamangala	-	-	-	-	-
III.	**KodaguDistrict:**						
	10. Somwarpet	10. Somwarpet	-	2. Somwarpet	-	-	-
IV.	**Mysore District**						
	11. K.R. Nagar	11. K.R. Nagar	-	3. K.R. Nagar	-	-	-
	12. Periyapatna	-	-	4. Periya-patna	1. Periya-patna	-	-
	13. Hunsur	-	-	5. Hunsur	2. Hunsur	-	-
	14. H.D. Kotte	-	-	-	-	1. H.D. Kotte	-
	15. Nanjangud	-	-	-	-	2. Nanjan-gud	1. Nanjangud
	16. T. Narasipur	-	-	-	-	3. T.Nara-sipur	2.T.Narasipur
	17. Yelandur	-	-	-	-	4. Yelandur	-
	18. Chamrajanagar	-	-	-	-	5.Chamraja-nagar	3.Chamraja-nagar
	19. Kollegal	-	-	-	-	6. Kollegal	4. Kollegal
V.	**TumkurDistrict**						
	20. Tumkur	12. Tumkur	-	-	-	-	-
	21. Gubbi	13. Gubbi	5. Gubbi	-	-	-	-
	22. Kunigal	14. Kunigal	6. Kunigal	-	-	-	-
	23. Tiptur	15. Tiptur	7. Tiptur	-	-	-	-
	24. Turuvekere	16.Turuvekere	8. Turuvekere	-	-	-	-

(Source: Columns 3,5 & 7 – Common format information E-65, page 10 to 12, E-69, page 15-68, page 20. Columns 4,6 & 8 – Dr. Kanwar's affidavit page 27-28)

29. On behalf of the State of Tamil Nadu a stand was taken that rainfall of 400 mm should be considered adequate for even semi-dry crop; however, during arguments, the learned senior counsel conceded that in

some of the project areas receiving deficient rainfall, one to two wettings of two inches each may be required for khariff semi-dry crop. The suggestion of the learned counsel on behalf of the State of Tamil Nadu that the State of Karnataka does not need any water for raising semi-dry crops in the command of Hemavathy, Harangi and Kabini projects does not hold good and assured water availability would be necessary for proper raising of the semi-dry crops to give optimal productivity; here it may be emphasized that even the definition of "Crop water requirements" given in the Govt. of India guidelines mentions about the depth of water needed for achieving full production potential.

30. The crop water requirement takes note of the topography of the land, water intake characteristics of the soil and its irrigability class besides climatic conditions. In arid and semi-arid areas where air temperatures and wind velocities are high, appreciable losses may be expected from the resulting evaporation. In such a situation, suggesting two inch watering does not appear to be practicable in the farmers' field. (Ref: Govt. of India guidelines-TN Compilation XIII, pages 25-26).

31. Dr. Swaminathan has been engaged in agriculture research in respect of wet crops and is a well known agricultural scientist; Dr. I.C. Mahapatra was widely engaged in agriculture research covering a range of crops within the country. Similarly, Dr. J.S. Kanwar is an authority on dry land farming and had remained as Director General of International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) at Hyderabad. The above named experts in agriculture have submitted affidavits before this

Tribunal and were also extensively cross-examined when various aspects in respect of cropping pattern and crop water requirement were covered in detail and their views were known.

32. The C.F.F.C considered in detail the nature of crops which were grown in the two States. It shall be advisable to quote that portion. Regarding Mysore (Karnataka) it was said:-

> "(ii) Mysore:
>
> Mostly, all the crops are grown in the kharif season alone, and the extent of rabi and summer crop area is very small. The area under ragi, jowar, pulses etc. which are mostly rainfed is predominant. Among the food crops, ragi is the major crop accounting for 44% of the area. Paddy is the next major food crop and accounts for 21% of the area under food crops. Among non-food crops, the major crop is groundnut followed by sugarcane.
>
> In the hilly region, ragi, horse-gram and other pulses are grown during the rabi season. In the central areas, ragi is grown, followed by jowar and castor. In the eastern and south-eastern parts, jowar, ragi and castor are grown in kharif and horse-gram, beans and other pulses during the rabi. Sometimes, summer crops of paddy and irrigated ragi are also grown depending on the availability of water in tanks. Sugarcane is grown in the command areas under major tanks……..
>
> The crop season for paddy is from June-July to December-January. The cropping season normally starts with the commencement of the south-west monsoon, which is in early June. Whenever facilities are available, the seedlings are usually transplanted in June and July. The local variety of paddy is harvested in December-January. The variety which is grown only with rainfall is usually of a shorter duration and coarser and is harvested after the

> end of the south-west monsoon (i.e. November-December). In recent years, new high yielding strains like ADT 27 have been introduced in the Krishnarajasagar command. The crop season for these extends from June to October making it possible for a second crop of either paddy or semi-dry crops like ragi to be grown, depending on the availability of water."

In respect of Tamil Nadu, the Cauvery Fact Finding Committee said:-

> "(iii) Tamil Nadu:
>
> In Tamil Nadu, the Cauvery delta is the most important agricultural tract and almost all the area is under paddy. Agricultural operations in the delta start with the advent of freshets in the river with the commencement of south-west monsoon. The Mettur reservoir is opened for irrigation only when south-west monsoon actively sets in. In some areas the first crop of paddy called the `Kuruvai' is grown, which is normally of 105 days duration. After harvest of this crop, the second shorter duration crop, known as `Thaladi' is grown. Kuruvai generally extends from June to October, Thaladi generally extends from October to February and is of 165 days duration. In most of the areas, due to the difficulty of getting early supplies, one long term crop called `Samba' of 180 days duration is grown and constitutes the major crop in the delta. Transplantation of this crop starts in the middle of July and goes on till September. The crop is harvested after the north-east monsoon is over and the crop season extends upto January. In recent years high yield strain ADT-27 has also been introduced." (Ref. TN Vol. XV, Exh. No.840, CFFC report, pages 69-71).

However, the practice needs to be changed now and the of water depths (delta) which were being given by the two States to their crops have to be revised to ensure justice to all the cultivators of the basin Sates under the

circumstances in which the dispute has arisen regarding sharing of the water.

33. Regarding delta of water being used in the State of Tamil Nadu (Madras) and the State of Karnataka (Mysore), the C.F.F.C. had obtained the figures being achieved in respect of old as well as new projects to assess the reasonableness of the use of the water for paddy cultivation. In the report it has been observed:-

> "2. Mysore:
>
> Upto 1928 irrigation in Mysore was mainly from tanks and anicut channels. The overall deltas for these channels are indicated below:-

Sl. No.	Sub-basin in which the channels are situated	Delta in	
		mm.	ft.
1.	Yagachi	1585.0	5.2
2.	Hemavathi	1645.9	5.4
3.	Cauvery	1676.4	5.5
4.	Lakshmanathirtha	1645.9	5.4
5.	Cauvery below K.R.S.	1767.8	5.8
6.	Kabini	1828.8	6.0
7.	Suvarnavathi	1911.1	6.27
8.	Gundal	1783.1	5.85
9.	Shimsha	3694.2	12.12

"

(Ref: TNDC Vol. XV, page 103)

The deltas obtained in the newer works including the reservoirs, and canal system are indicated below:-

”

Sl. No.	Name of Project	Delta in	
		mm.	ft.
1.	Krishnarajasagar	1920.2	6.3
2.	Kanva	1676.4	5.5
3.	Byramangala	1737.4	5.7
4.	Marconahalli	1859.3	6.1
5.	Hebbahalla	944.9	3.1
6.	Nugu	1615.4	5.3
7.	Chikkahole	1158.2	3.8
8.	Mangala	2011.7	6.6”

“

(Ref: ibid, page 104)

34. The CFFC, in their report have commented upon the delta (water depth required for maturing a crop) obtained in the old irrigation in various sub-basins in Karnataka as also in the new works i.e. Krishnarajasagar reservoir and other reservoirs constructed thereafter. In the old channels, the delta varied from 5.2 feet to 6.3 feet and the State officials during discussion about these high delta figures had explained to the Committee (CFFC) that most of these channels were old unlined channels running close to the river in which there was considerable escapage and leakage and since these channels were running close to the river, the excess leakage was returning to the river along with considerable surplus from the fields. The observation of CFFC on the above explanation has been as quoted below:-

> “This would clearly indicate that the deltas as obtained do not reflect the true deltas but are inclusive of high percentage of return flow to the river.”

The delta observed in the newer works were also in the range of 5.3 feet to 6.6 feet, on which the CFFC has commented that –

> "Even in the newer systems this high delta would indicate excessive use".
>
> "A study of the above would indicate the need for excessive agricultural reforms regarding conservation of water and the advantage of following more scientific methods of cultivation. Almost all the irrigated areas are growing paddy. In unirrigated areas, ragi is the predominant crop. If the khariff ragi could be grown under irrigated conditions instead of paddy, there would be saving in water without any economic detriment to the farmers, as it is understood that the net return is not far different in the case of paddy and ragi." (Ref:TNDC Vol. XV, Exh. 840, page 103-104)
>
> [Emphasis supplied].

The State Govt. of Karnataka, before this Tribunal have categorically stated that in their new projects, the State Govt. is planning to raise only semi-dry crop. The CFFC had also observed that:

> "Further, long duration varieties of paddy are in vogue and there is scope for intensive research and introduction of short-term varieties. Such a step would enable follow-on crops which require considerably less quantity of water and keep the farmers busy for a longer period of the year". (Ref: ibid, page 105)

35. In respect of Tamil Nadu, the CFFC in their report have stated that most of the irrigation is from old systems which have been in existence for several years. The CFFC has given a statement of 15 projects (old as well as new, as existing in 1971) including Cauvery delta system, old direct channels taking of from main Cauvery, Bhavani and Amaravathy rivers, as also Cauvery Mettur project and Lower Bhavani and Amaravathy reservoir projects. The delta obtained in each of the projects are given for four bench mark years namely: 1901, 1928, 1956 and 1971. A statement

showing delta obtained in four different years in various projects of Tamil Nadu is given below:-

"

S. No.	Name	1901 Delta in		1928 Delta in		1956 Delta in		1971 Delta in	
		mm.	ft.	mm.	ft.	mm.	ft.	mm.	ft.
1	2	3	4	5	6	7	8	9	10
1.	Cauvery Delta system	1615.4	5.3	1615.4	5.3	1505.7	4.94	1280.2	4.2
2.	Lower Coleroon Anicut	2255.5	7.4	2255.5	7.4	2060.5	6.75	1645.9	5.4
3.	Sethiathope	762.0	2.5	762.0	2.5	646.2	2.12	472.4	1.55
4.	Kattalai	5059.7	16.6	5050.71	16.6	2709.7	8.89	1819.7	5.97
5.	Kodiveri	5931.4	19.46	5931.4	19.46	3864.9	12.68	2627.4	8.62
6.	Kalingarayan	3962.4	13.10	3962.4	13.10	3907.5	12.82	3224.8	10.58
7.	Salem-Tiruchi channel	3666.7	12.03	3666.7	12.03	3142.5	10.31	1813.6	5.95
8.	Old Amaravathi	1813.6	5.95	1813.6	5.95	1737.3	5.68	1737.4	5.7
9.	Noyil	1386.8	4.55	1386.8	4.55	1386.8	4.55	1402.1	4.6
10.	Cauvery Mettur project							1188.7	3.9
11.	Lower Bhavani					1219.2	4.0	1219.2	4.0
12.	Mettur canals					1493.5	4.90	1493.5	4.90
13.	Amaravathi							1950.7	6.40
14.	New Kattalai High Level							1706.9	5.60
15.	Pullambadi							1554.5	5.10

(Ref: TNDC Vol. XV, page 105-106) "

36. It is seen from the statement that in the case of Cauvery delta system which covers the major irrigated area in the Cauvery basin of Tamil Nadu, the delta has varied from 5.3 ft. in 1901 to 4.2 ft. in 1971. Similarly, in the direct old channels, the delta has come down from 12.03 ft. in Salem-Tiruchi channels and 19.46 ft. in Kodiveri scheme during 1901 to 5.95 ft. and 8.62 ft. respectively in 1971. As regards the new projects like Cauvery Mettur project, Lower Bhavani and Mettur Canals systems the delta achieved in 1971 has been mentioned as 3.9 ft., 4.0 ft. and 4.9 ft. respectively.

37. The Committee has remarked that even considering the delta obtained in 1971, the realization of high deltas in the older systems is said to be for reasons similar to that of Mysore, i.e. unlined channels close to the

river with seepage and escapage into the rivers. The delta obtained in the new projects adjoining the old ones namely: Cauvery Mettur project, Cauvery delta and Lower Coleroon Anicut systems which are all contiguous to each other and all of them are benefited by the Mettur reservoir, there appears to be no reason for large variation from 3.9 ft. to 5.4 ft. The Committee has also remarked that long term variety of paddy is grown in the delta and commands of Bhavani and Amaravathy projects etc. The Samba crop being of 180 days duration which goes well beyond December requiring storage facilities. As far the rainfall occurring in Cauvery delta area, the Committee has observed as under.

> "The Cauvery delta receives rainfall both from the South-West monsoon and the North-East monsoon which is more predominant. However, on account of intensive rainfall in the North-East monsoon and lack of storage facilities, the utilizable rainfall is comparatively low. The non-utilisable rainfall drains away into the sea and is lost. In the Cauvery delta the river channels of the Cauvery and the Vennar serve as irrigation channels as also drainage channels. At the tails of these channels, regulators have been constructed and the non-utilisable rainfall passes to the sea through these tail regulators."

38. The Committee, has therefore, observed that the Samba crop which is grown from August to February, would have to be irrigated by releases from Mettur during the months of August, September, January and February.

The Committee has suggested that savings can be effected by:

"(i) restricting the double crop paddy area;

(ii) introduction of a shorter duration variety in place of `Samba`;

(iii) growing crops requiring less water.

These considerations would apply to all projects."

(Emphasis supplied)

(Ref: ibid, page 107)

39. The report of CFFC was discussed in an inter-State meeting held on 9th – 10th October, 1973. During the discussions, the States had agreed that it was necessary to effect economies in the present utilisation of water as also that envisaged in new projects. The States had desired that the Govt. of India should make a study on the scope of economy in the use of Cauvery water. In pursuance of this discussion, a Committee headed by Shri C.C. Patel and other experts, namely, S/Shri P.R. Ahuja, B.R. Palta, consultants, Dr. C. Dakshinamurthy (Director, Water Technology Centre – IARI) and Shri S.P. Gupta, Director, Central Water and Power Commission was constituted. The committee had also engaged Dr. J.S. Patel, an agronomist as consultant. The committee had conducted technical study of the data called for by them from the party States as also undertaken tours in the basin and held discussions with the State officials; and based on the facts submitted by the States, impression gained during the tours and analysis made of the voluminous data received from time to time from the States submitted their report titled "Appraisal of availability and requirements of Cauvery waters". The said report has been submitted by

the Ministry of Water Resources before this Tribunal and is marked as Exh. B-1. The committee, in the Appraisal Report have mentioned that based on the information supplied by the State Govts. in respect of rainfall in the command of irrigation projects, extent of irrigated areas-projectwise, the cropping pattern and crop duration (crop calendar) have been taken into consideration in reviewing the reasonable irrigation water requirements. However, the committee has mentioned that their assessment is on broad basis. Report is of not much help in the present proceeding because it gives out the water demand for the areas as given by the party States. The Tribunal has to determine as to what amount of water is necessary to conserve the areas over which the respective States are entitled to the waters of river Cauvery.

40. From the pleadings of the parties and the data submitted before this Tribunal, it became clear that the use of the excessive water continues for raising crops in the party States. The Tribunal, therefore, during the course of hearing on 12.11.2002 directed the party States and Union Territory of Pondicherry as under:-

> "During the course of hearing of arguments it transpired that most of the riparian States which are party to the proceedings cultivate paddy and allow at least 2-3 inches of water to remain in fields throughout till the crop matures. We are told that this is the traditional practice which is being followed.
>
> In many States in India paddy crops, after transplantation, are watered from time to time and a particular level of water need not remain in the fields throughout. It need not be pointed out that

traditional practice, which is being followed in Cauvery basin states obviously will consume and require more water in the fields.

Since 1973, different recommendations have been made requesting the riparian States before us to practice economy while utilizing waters of river Cauvery.

Learned Additional Advocate General, appearing on behalf of the State of Tamil Nadu stated that during last several years, steps have been taken to improve the water use efficiency. Similar stand has been taken on behalf of the States of Karnataka, Kerala and the Union Territory of Pondicherry.

It need not be impressed that if better scientific methods are adopted in cultivation of paddy, the requirement of water is bound to be less.

All the party States and the Union Territory of Pondicherry shall file their respective affidavits within six weeks from today, as to what steps have already been taken to reduce the requirement of water for cultivation and what steps are likely to be taken in near future. In the affidavit it should also be stated as to what minimum delta is required for different crop varieties in their respective States."

41. Pursuant to the above order of this Tribunal, the State of Karnataka filed their affidavit on 28th March 2003 which has been marked as Karnataka Exh. KAR- 518. The State of Tamil Nadu filed their affidavit on 8th July, 2004 which has been marked as Tamil Nadu Exh.TN-1665. In the said

affidavits, both the States have furnished details of parameters normally used in the computation of crop water requirement; these being crop duration, ET crop, puddling requirements, percolation losses, effective rainfall and system efficiency. The State of Tamil Nadu have given projectwise details of crops grown in each project, and worked out crop water requirement, (Ref: TN Exh. 1665, page 55 & 56) which are reproduced in the next page.

STATEMENT PREPARED BY TAMIL NADU

COMPUTED-CROP WATER REQUIREMNT

(Cols. 12 to 18 on next page) 55

Sl. No	System	Crop Season	Gross Area Lakh Acres	Crop Duration (Days)	Total E.T crop in mm		Puddling & Percolation in mm		Gross irri. Req. (mm)	
					Nur-sery	Main Field	Nursery*	Main Field**	Nur-sery	Main Field
1	2	3	4	5	6	7	8	9	10	11
A.	**SYSTEM FED BY METTUR**									
1.	Cauvery Delta System	Kuruvai	4.250	105	234.4	539.84	100	360	334.4	899.84
		Samba	4.820	150	273.3	518.57	120	430	393.3	948.57
		Thaladi	3.400	135	135.0	389.72	110	360	245.0	749.72
		Total	12.470	-						
2.	Lower Coleroon Anicut	Kuruvai	0.308	105	234.4	539.84	100	360	334.4	899.84
		Samba	1.015	150	273.3	518.57	120	430	393.3	948.57
		Thaladi	0.308	135	135.0	389.72	110	360	245.0	749.72
		Total	1.631							
3.	Salem Trichy Channels	Samba	0.713	150	220.1	601.44	155	545	375.1	1146.44
		Navarai	0.413	110	100.0	541.81	125	405	225.0	946.81
		Total	1.126							
4.	Kattalai Scheme	Samba	0.763	150	220.1	601.44	155	545	375.1	1146.44
		Navarai	0.459	110	100.0	541.82	125	405	225.0	946.82
		Total	1.222							
5.	Cauvery Mettur Project	Kuruvai	0.666	105	234.4	539.84	125	440	359.4	979.84
		Samba	1.894	150	273.3	518.57	155	545	428.3	1063.57
		Thaladi	0.666	135	135.0	389.54	140	465	275.0	854.54
		Total	3.226							
6.	Mettur Canal	Samba	0.450	135	213.5	484.83	155	500	368.5	984.83
7.	New Kattalai HLC	Samba	0.230	135	213.5	484.83	155	500	368.5	984.83
8.	Pullambadi Canal	Samba	0.233	135	213.5	484.83	155	500	368.5	984.83
9.	Sethiathope anicut System (supplementation)		0.606							
	Total(A)		**21.194**							
OTHER SCHEMES IN THE BASIN										
B.	**BASIN ABOVE METTUR**									
	Thoppiar	I crop irri. Dry	0.053	100	0.0	431.74	0	0	0.00	431.74
		II crop irri. Dry	0.053	100	0.0	427.11	0	0	0.00	427.11
		Total(B)	**0.106**							
C.	**BHAVANI SUB BASIN**									
1	Kodiveri Anicut System	I crop (Samba)	0.245	135	227.8	676.49	155	500	382.80	1176.49
		II crop (Navarai)	0.245	135	206.0	459.74	155	450	361.00	909.74
		Total	0.490							
2.	Kalingarayan Anicut System	I crop (Samba)	0.140	105	169.8	511.11	125	440	294.80	951.11
		II crop (Navarai)	0.140	135	173.0	459.78	155	450	328.00	909.78
		Total	0.280							
3.	Lower Bhavani Project	Samba	1.035	135	213.5	454.04	155	500	368.50	954.04
		Ground nut	1.035	105	0	427.11	0	0	0.00	427.11
		Total	2.070							
4.	Other Minor Schemes	Irrigated dry crops	0.080	100	0.0	431.74	0	0	0.00	431.74
	Total(C)		**2.920**							

Note: Col. 2 to 4 –Information in Common Format, T.N.-Vol.I –pages 129 to 132. Col. 6 to 11 –Estimated by CTC in consultation with Tamil Nadu Agriculture University, Coimbatore. *Includes puddling requirements at 50 mm for nursery. *Includes puddling requirements at 200 mm for main field, Kuruvai/Samba and 150 mm for Thaladi/Navarai as the case may be. Note: (1) Extent under Minor Irrigation is not included. (2) For irrigated dry crops and computed values are for the systems as a whole as the systems lie in the same region.

STATEMENT PREPARED BY TAMIL NADU 55(A)

COMPUTED-CROP WATER REQUIREMNT

Sl. No	System	Crop Season	Eff. Rainfall (mm)		Net Irrigation Requirement on Field (mm)			System Eff.%	NIR at Head TMC
			Nur-sery	Main Field	Nur-sery	Main Field	Total NIR ($1/10^{th}$ of Col.14) +Col.15)		
1	2	3	12	13	14	15	16	17	18
A.	**SYSTEMS FED BY METTUR**								
1.	Cauvery Delta System	Kuruvai	21.33	133.88	313	766	797.3	0.60	80.70
		Samba	45.67	312.25	348	636	671.1	0.60	77.04
		Thaladi	70.20	263.73	175	486	503.5	0.60	40.77
		Total							198.51
2.	Lower Coleroon Anicut	Kuruvai	27.43	173.14	307	727	757.4	0.60	5.56
		Samba	60.16	349.74	333	599	632.1	0.60	15.28
		Thaladi	84.55	270.28	160	479	495.5	0.60	3.63
		Total							24.47
3.	Salem Trichy Channels	Samba	12.45	215.79	363	931	966.9	0.60	16.42
		Navarai	7.96	1.14	217	946	967.4	0.60	9.52
		Total							25.93
4.	Kattalai Scheme	Samba	12.45	215.79	363	931	966.9	0.55	19.17
		Navarai	7.96	1.14	217	946	967.4	0.55	11.54
		Total							30.70
5.	Cauvery Mettur Project	Kuruvai	23.34	163.72	336	816	849.7	0.60	13.48
		Samba	53.11	274.67	375	789	826.4	0.60	37.28
		Thaladi	77.03	184.04	198	671	690.3	0.60	10.95
		Total							61.71
6.	Mettur Canal	Samba	61.87	188.23	307	797	827.3	0.60	8.87
7.	New Kattalai HLC	Samba	59.82	210.25	309	775	805.4	0.60	4.41
8.	Pullambadi Canal	Samba	46.29	194.51	322	790	822.5	0.60	4.56
9.	Sethiathope anicut System (supplemen-tation)								4.00
	Total(A)								**363.17**
B.	**BASIN ABOVE METTUR**								
	Thoppiar	I crop irri. Dry	0	44.08	0	388	387.7	0.60	0.49
		II crop irri.d ry	0	5.63	0	421	421.0	0.60	0.53
		Total(B)							**1.02**
C.	**BHAVANI SUB BASIN**								
1	Kodiveri Anicut System	I crop (Samba	34.8	46.43	348	1130	1164.9	0.55	7.41
		II crop (Navarai)	89.52	118.08	271	792	818.3	0.55	5.21
		Total							12.63
2.	Kalingarayan Anicut System	I crop (Samba)	10.78	125.15	284	826	854.4	0.55	3.11
		II crop (Navarai)	97.18	56.78	231	853	876.1	0.55	3.19
		Total							6.29
3.	Lower Bhavani Project	Samba	61.55	157.23	307	797	827.5	0.60	20.40
		Ground nut	0	5.63	0	421	421.5	0.60	10.39
		Total							30.79
4.	Other Minor Schemes	Irrigated dry crops	0	44.08	0	388	387.7	0.60	0.74
	Total(C)								**50.45**

Note: Col. 12 & 13 – Estimated adopting Table 10 at page 57 of the Publication on "A guide for estimating Irrigation Water Requirement- No.2 (Revised), GOI, Ministry of Irrigation Water Management Division – New Delhi-May 1984.

Col. 14= Col. 10 - Col.12

Col. 15= Col. 11 – Col.13

Col. 16= Col. 14 x 0.1 + Col. 15

Col. 18= (Col.4 x Col. 16 x 0.01429)/Col.17

COMPUTED-CROP WATER REQUIREMNT

(Cols. 12 to 18 on next page)

Sl. No	System	Crop Season	Gross Area Lakh Acres	Crop Duration (Days)	Total E.T crop in mm		Puddling & Percolation in mm		Gross irri. Req.(mm)	
					Nur-sery	Main Field	Nurs-ery*	Main Field**	Nur-sery	Main Field
1	2	3	4	5	6	7	8	9	10	11
D.	**AMARAVATHI SUB-BASIN**									
1.	Old Amaravathy	Samba	0.312	135	211.6	652.99	140	515	351.60	1167.99
		Navarai	0.173	110	100.0	527.23	125	405	225.00	932.23
		Total	0.485							
2.	Amaravathy RP	Samba	0.120	150	213.5	553.56	155	545	368.50	1098.56
		Irr.dry crops	0.033	100	0.0	427.11	0	0	0.00	427.11
		Cotton	0.032	160	0.0	578.88	0	100	0.00	678.88
		Sugarcane	0.030	330	0.0	1987.47	0	100	0.00	2087.47
		Total	0.215							
3.	Palar Porandalar	Irri.dry crops	0.097	100	0.0	427.11	0	0	0.00	427.11
4.	Vattamalaikarai Odai	Irri.dry crops	0.060	100	0.0	427.11	0	0	0.00	427.11
5.	Kodaganar	Irri.dry crops	0.090	100	0.0	427.11	0	0	0.00	427.11
6.	Nanganjiar	Irri.dry crops	0.062	100	0.0	427.11	0	0	0.00	427.11
7.	Other Minor Schemes	Samba	0.010	135	211.6	652.99	140	515	351.60	1167.99
		Navarai	0.004	110	100.0	527.23	125	405	225.00	932.23
		Irrigated dry cops	0.033	100	0.0	427.11	0	0	0.00	427.11
		Total(OMS)	0.047							
	Total (D)		**1.056**							
E	**NOYYIL SUB BASIN**									
1.	Noyyil river channels	Samba	0.148	135	219.8	531.39	155	500	374.80	1031.39
		Navarai	0.023	110	100.0	527.23	125	405	225.00	932.23
		Total	0.171							
2.	Noyyil Authupalayam	Irri. Dry crops	0.096	100	0.0	427.11	0	0	0.00	427.11
3.	Orathupalayam	Irri. Dry crops	0.104	100	0.0	427.11	0	0	0.00	427.11
	Total(E)		**0.371**							
F.	**OTHER MINOR SCHEMES**									
1	Minor Schemes	Samba	0.018	135	242.8	661.39	140	515	382.80	1176.49
	Above and below Mettur	Navarai	0.019	110	236.0	504.74	125	405	361.00	909.74
		1crop Irri. dry	0.120	100	0.0	431.74	0	0	0.00	431.74
		II crop Irr. Dry	0.020	100	0.0	427.11	0	0	0.00	427.11
	Total (F)		**0.177**							427.11
	GRAND TOTAL		**25.824**							

Note:
Col. 2 to 4 –Information in Common Format, T.N.-Vol.I –pages 129 to 132.
Col. 6 to 11 –Estimated by CTC in consultation with Tamil Nadu Agriculture University, Coimbatore.
*Includes puddling requirements at 50 mm for nursery
** Includes puddling requirements at 200 mm for main field, Kuruvai/Samba and 150 mm for Thaladi/Navarai as the case may be
Note: (1) Extent under Minor Irrigation is not included
(2) For irrigated dry crops and computed values are for the systems as a whole as the systems lie in the same region.

STATEMENT PREPARED BY TAMIL NADU 56A

COMPUTED-CROP WATER REQUIREMNT

Sl. No	System	Crop Season	Eff. Rainfall (mm)		Net Irrigation Requirement on Field (mm)			System Eff.%	NIR at Head TMC
			Nur-sery	Main Field	Nurs ery*	Main Field	Total NIR (1/10th of Col.14) +Col.15)		
1	2	3	12	13	14	15	16	17	18
D.	**AMARAVATHI SUB-BASIN**								
1.	Old Amaravathy	Samba	11.41	166.92	340	1001	1035.1	0.55	8.39
		Navarai	11.93	3.20	213	929	950.3	0.55	4.27
		Total							12.66
2.	Amaravathy RP	Samba	11.14	135.08	357	963	999.2	0.60	2.86
		Irr.dry crops	0	5.63	0	421	421.0	0.60	0.33
		Cotton	0	137.53	0	541	541.0	0.60	0.41
		Sugarcane	0	167.10	0	1920	1920.0	0.60	1.37
		Total							4.97
3.	Palar Porandalar	Irri.dry crops	0	5.63	0	421	421.0	0.60	0.97
4.	Vattamalaikarai Odai	Irri.dry crops	0	5.63	0	421	421.0	0.60	0.60
5.	Kodaganar	Irri.dry crops	0	5.63	0	421	421.0	0.60	0.90
6.	Nanganjiar	Irri.dry crops	0	5.63	0	421	421.0	0.60	0.62
7.	Other Minor Schemes	Samba	11.41	166.92	340	1001	1035.1	0.55	0.27
		Navarai	11.93	3.20	213	929	950.3	0.55	0.10
		Irri.dry crop	0	5.63	0	421	421.0	0.55	0.36
		Total (OMS)							0.73
	Total(D)								**21.46**
E.	**NOYYIL SUB BASIN**								
1.	Noyyil river channels	Samba	0.81	128.45	374	903	940.3	0.60	3.31
		Navarai	9.15	1.47	216	931	952.3	0.60	0.52
		Total							3.84
2.	Noyyil Authupalaym	Irri. Dry crops	0	5.63	0	421	421.0	0.60	0.96
3.	Orathupalayam	Irri. Dry crops	0	5.63	0	421	421.0	0.60	1.04
	TOTAL(E)								**5.84**
F.	**OTHER MINOR SCHEMES**								
1	Minor Schemes	Samba	34.8	46.43	348	1130	1164.9	0.60	0.50
	Above and below Mettur	Navarai	89.52	118.08	271	792	818.8	0.60	0.37
		1crop Irri. dry	0	34.03	0	398	398.0	0.60	1.14
		II crop Irr. dry	0	5.63	0	421	421.0	0.60	0.20
		Total (F)							**2.21**
	GRAND TOTAL								**444.15**

Note:

Col. 12 & 13 – Estimated adopting Table 10 at page 57 of the Publication on "A guide for estimating Irrigation Water Requirement- No.2 (Revised), GOI, Ministry of Irrigation Water Management Division – New Delhi-May 1984.

Col. 14= Col. 10 - Col.12

Col. 15= Col. 11 – Col.13

Col. 16= Col. 14 x 0.1 + Col. 15

Col. 18= (Col.4 x Col. 16 x 0.01429)/Col.17

42. It may be mentioned that the State of Tamil Nadu in their affidavit Exh. TN-1665 Statement at page 56 have indicated irrigation requirement as 444.15 TMC for an area of 25.824 lac acres; whereas, they have separately demanded irrigation requirement of 68.9 TMC for an area of 3.445 lac acres under minor irrigation besides reservoir evaporation losses of 10 TMC. (Ref:TN Exh. 1665, page 47, para 16.3)

43. As regards the State of Karnataka, they have submitted their crop water requirement for the existing, ongoing and proposed projects in their affidavit marked as KAR Exh. 518 from pages 113 to 121. At page 113 of the affidavit, projectwise crop water requirement as indicated in the common format information and Karnataka's Statement of Case has been furnished; whereas at page 114 of the affidavit, the crop water requirement is reported to have been computed following the Govt. of India guidelines. The delta worked out for different crops is supported by sample calculations in respect of representative projects to determine the crop water requirement (delta) of different crops being raised in the existing projects and also planned for the ongoing and proposed projects. The details of sample calculations are given on pages 115 to 121 of the affidavit.

44. The State of Karnataka during the course of arguments have relied on the crop water requirement as given in the project reports and further indicated at page 113 mentioned above which is reproduced below:-

Statement showing cropwise area and utilisation under existing, ongoing and proposed projects claimed by Kamataka as in statement of case and Common Format.

(Cols. 14 to 26 on next page),

51. No	Name of the Project	Ayacut OOO'AC	Utili sa-tion	Kharif paddy			Kharif Semi-dry			Rabi/summer paddy		
				Area OOO' Ac	Requir ement TMC	Delta in inches	Area OOO'Ac	_ Requir ement TMC	Delta in inches	Area OOO'Ac	Requir -ement TMC	Delta in inches
1	2	3	4	5	6	7	8	9	10	11	12	13
I	**EXISTING PROJECTS**											
1.	Anicut Channels	190.514	57.700	185.578	47.828	71.008	-	-		-	-	
2.	KR Sagar	195.950	61.200	136.000	31.200	63.208	-	-		-	-	
3.	Kanva	4.942	1.200	3.929	NA		0.741	NA		-	-	
4.	Byramanaala	3.953	1.000	2.400	NA		-	-		-	-	
5.	Markonahalli	15.073	4.000	15.000	3.960	72.737	-	-		-	-	
6.	Hebbahalla	2.965	0.400	3.050	0.360	32.520	-	-		-	-	
7.	Nugu	25.946	7.700	18.110	7.600	116.537	-	-		-	-	
8.	Chilkkahole	4.201	0.700	2.400	0.380	43.624	1.077	0.170	43.490	-	-	
9.	Mangala	1.977	0.600	0.500	0.129	71.084	3.540	0.333	25.918	-	-	
10.	Suvarnavathi+	6.919	3.600	14.894	NA		1.800	NA		-	-	
11.	Gundal+	9.884	1.400	6.600	0.974	40.660	6.500	0.394	16.701	-	-	
12.	Nallur Amanikere	3.212	0.300	-	-		3.200	0.270	23.247	-	-	
	Total-I	465.536	139.800	388.461	92.491		16.858	1.167		-	-	
II	**ON GOING PROJECTS**											
13.	Kamasamudra lf't Irriaation	7.660	0.800	-	-		9.670	0.369	10.514	-	-	
14.	Hutchanakopullu	5.683	0.600	-	-		8.300	0.518	17.195	-	-	
15.	Hemavathy	700.776	54.700	13.000	2.500	52.985	426.256	23.790	15.377	-	-	
16.	Votehole	18.533	2.400	5.500	0.875	43.833	-	-		-	-	
17.	Yagachi	53.127	5.700	10.000	1.650	45.461	21.600	1.174	14.975	-	-	
18.	Kabini	217.200	65.000	53.000	12.217	63.510	149.200	10.054	18.566	39.000	10.980	77.56
19.	Harangi	134.917	18.000	17.067	3.664	59.150	117.828	8.623	20.164	-	-	
20.	Chicklihole	4.201	0.800	4.200	0.680	44.608	-	-		-	-	
21.	Manchanabele	9.390	0.800	-	-		7.000	0.468	18.420	-	-	
22.	Taraka	17.297	3.200	-	-		17.400	1.281	20.284	-	-	
23.	Arkavathy	21.251	3.100				7.500	NA		-	-	
24.	Iggalur	9.884	1.800	3.650	0.703	53.066	-	-		-	-	
25.	D.Devaraja Urs (Varuna)	80.060	10.500	-	-		80.000	4.890	16.841	-	-	
26.	Uduthorehalla	15.567	1.200	0.800	0.173	59.581	9.500	0.460	13.341	-	-	
27.	Modernisation of KRS	4.942	0.000	5.000	-		-	-		-	-	
	Total-II	1300.488	168.600	112.217	22.462		854.254	51.627		39.000	10.980	
III	**MINOR IRRIGATION**											
28.	Existing & On-going	619.232	71.300	330.000	71.300	59.529	-	-		-	-	
	Total III	619.232	71.300	330.000	71.300		-	-		-	-	
	GRAND TOTAL I+II+III+	2385.256	379.700	830.678	186.253		871.112	52.794		39.000	10.980	
IV	**PROPOSED PROJECTS**											
29.	Lakshmana-thirtha	6.919	1.500	7.000	NA		-	-		-	-	
30.	KRS Extension	112.430	8.200	-	-		88.430	NA		-	-	
31.	Chengavadi	6.425	1.300	-	-		9.000	NA		-	-	
32.	Lokapavani	7.413	2.000	6.200	NA		-	-		-	-	
33.	Poorigali L.I.S	8.895	1.400	-	-		18.000	NA		-	-	
34.	Minor irrioation	83.273	13.900	47.000	NA		-	-		-	-	
	Total IV	225.355	28.300	60.200			115.430			-	-	

Note:

1. Column No. 1,2,3 and 4 are based on details given in statement of case of Karnataka. Ayacut figures in statement of case are in hectai
2. Column no. 5,6,8,9,11&12 are culled out from the information in the Common Format for the respective projects(E-52 to E-82) and the project report except in the case of anicut channels.
3. The remaining columns 7,10,13 giving delta in Ft. are computed: Delta in inches= 22.96 multiplied by 12 divided by duty in acres per M
4. +Stabilization of atchkat under Suvarnavathy Project is 9694 Acres
5. +Stabilization of Atchkat under Gundal Project is 5100 Acres
6. Minor irrigation details under 51.No. 28 are for the existing and on going projects.

(Statement is attached at the end of this volume by page No.45)

45. It may be mentioned that the State of Karnataka have indicated their irrigation water requirement for cropped area of 25.278 lac acres as 381.71 TMC which includes irrigation water requirement of 71.3 TMC for an area of 3.30 lac acres under minor irrigation in their affidavit Exh. KAR 518, page 113 reproduced above. Further in the said affidavit, Karnataka have demanded 28.158 TMC of water for their proposed projects covering an area of 2.008 lac acres. (Ref: ibid, item (iv) – Proposed projects). The proposed projects can only be considered subject to availability of water after meeting the requirements of existing and ongoing irrigation projects and domestic water, industrial water, environmental needs etc.

46. From the facts stated including the charts containing the demand of the two States in respect of the areas and water for irrigation, it is apparent that the claims of both the States are excessive in nature and they have to be modified in a just and equitable manner. So far the areas for which the two States require waters of river Cauvery have already been determined in chapters 2 and 3, Volume-IV of this report. The nature of crops of the two States have been determined. Now, the actual water requirement has to be worked out.

Chapter 2

Trans-basin diversion of the waters of river Cauvery or its tributaries

Depending upon the topography of land, different river basins have been formed by nature and the main river and its tributaries meet with the water needs of that basin/watershed. Normally, all the available water in the river basin should be utilized to meet the in-basin requirements for different beneficial uses like drinking water for human and animal population, irrigation, hydro-power generation, industrial use and environmental protection etc. After meeting the in-basin demands on the waters of its river system, if there is any surplus water, that could be considered for transfer to the other needy basin. In India also, there are some rivers which have surplus waters like Brahmaputra, Mahanadi and Godavari etc. But even surplus waters from these rivers could be diverted trans-basin to water short areas after fully meeting the in-basin requirements and by agreement among the concerned State Governments. So far as river Cauvery is concerned, it is an admitted and accepted position that the yield is much less than the claims for utilisation of water by different riparian States. In no other river dispute in India, there was so much shortage of water against the claims made by the States concerned.

2. Courts and Tribunals while reiterating that there should not be any diversion of the waters of the basin of origin to another watershed have observed at places that if the water is sufficient to serve the necessity of the basin, in that event either by mutual agreement or by adjudication, some

water can be permitted to be diverted to the adjacent basin whose needs are just. In Helsinki Rules of 1966, reference has been made to basin States but this process of diversion cannot be executed by any one of the riparian States at the cost of other lower riparian States affecting their irrigation, economy and social needs.

3. The Krishna Water Disputes Tribunal has considered the question of diversion of the Krishna Water outside the Krishna basin, in detail in Chapter XIII of the Report. From a reference to page 128 (page 88 of the TN Compilation No. 11,) it shall appear that the Tribunal observed:

> "The preponderance of opinion seems to indicate that diversion of water to another watershed may be permitted, but normally, in the absence of any agreement, the prudent course may be to limit the diversion to the surplus waters left after liberally allowing for the pressing needs of basin areas. In general, basin areas are more dependent on the water than other areas. Maximum economic benefit can rarely be achieved by ignoring the pressing needs of the areas of origin and permitting development elsewhere."

At page 137 of the Report (Page 97 of the TN Compilation No.11), the Tribunal said:

> " ……..
>
> The available river supplies in the Krishna basin are insufficient to satisfy the demands of all the existing uses and the projected additional uses as well. The river Krishna commands extensive irrigation potential along the natural course of the river. The demands for the pressing needs of irrigation alone are so large that they cannot be wholly satisfied from the river supplies. Until irrigation from the new projects is fully developed, it may be possible to allow westward diversion of some additional water for purposes

of power production. But upon full development of such irrigation, it will be impossible to satisfy the demands of the irrigation projects as well as the additional demands for the westward diversion schemes. There is a clear conflict of interest between claims of downstream irrigation and power development by westward diversion of water. The question is whether; - in allocating the waters of the river Krishna, the claims of power production by westward diversion of water should be allowed at the expense of irrigation."

4. The Narmada Water Disputes Tribunal in their report have also quoted the above observation of KWDT at para 10.10.3 of their report. From pages 128 and 129 (pages 88 and 89 of the TN Compilation No.11), it shall appear that some diversion outside the basin which was in existence since long, had been conceded by all parties as such were not disturbed.

5. In this connection, it is relevant to quote paragraphs 5.21 and 5.22 of the report of the Irrigation Commission 1972, Volume I, page 90:-

Paragraph 5.21:

"Multipurpose river valley projects offer the best use of surface water resources; but apart from situations where both power generation and irrigation may be possible; there may be other cases in which a choice has to be made between the use of water either for irrigation or power generation. The Western Ghats offer sites with high heads for the generation of cheap hydro-electric power by diverting westwards the waters of east flowing streams. In Maharashtra parts of the waters of the Koyna, a tributary of the Krishna, has already been partly diverted westwards to generate hydro-electric power at Koyna power station, which has an installed capacity of 560 M.W. In such cases, where a choice is involved, priority has to be determined not only by economic considerations, but by recognition of the fact that irrigation is possible only by the use of water, whereas power

can be generated from alternative sources such as coal, gas, oil and atomic fuel."

Paragraph 5.22:

"In view of the overall capacity of water resources, we recommend that wherever a choice has to be made between irrigation and power generation, preference should be given to irrigation. The east flowing rivers rising in the Western Ghats traverse areas which have low rainfall and suffer from water scarcity. The needs of these areas should receive priority. It is interesting to note that the United States Bureau of Reclamation considers irrigation of paramount importance in the planning of multi-purpose projects, and nowhere in its policy-making legislation does the Bureau accord recognition to power production as a function superior to the use of water for irrigation."

6. In New Jersey v. New York 283 U.S. 336 (1931) at p. 343, the U.S. Supreme Court observed:

"The removal of water to a different watershed obviously must be allowed at times unless States are to be deprived of the most beneficial use on formal grounds. Diversion of water from one river basin to another is viewed with distrust and resisted by the basin population."

[Emphasis supplied]

7. In University of Colorado Law Rev 527, Lawrence J. Mac Donnel, Director National Resources Law Center, University of Colorado School of Law and Charles W. Howe, Professor of Economics, University of Colorado, Boalder, in their Article titled 'Area of Origin Protection in Trans-basin Water Diversions, An Evaluation of Alternative Approaches' 1986 (Ref: KAR Compilation S-30 at page 539) it has been said:-

> "Economically Efficient Trans-basin Diversion – We start by considering the conditions that must exist if an out of-basin transfer project is to be considered economically desirable. Three conditions are required: (1) the transfer must be the least-cost alternative for providing that quantity of water (of comparable reliability) to the users; (2) the benefits to the users of the transferred water must exceed: (a) losses to the area of origin (including downstream basins to which it may be tributary); plus (b) transfer-related construction and operation costs; and (3) no one should be made worse-off by the project. Although these conditions seem self-evident, they require careful explication so they can be properly translated into operational guidelines."
>
> [Emphasis supplied]

8. The Government of India had set up an Expert Committee in 1973 headed by Sh. C.C. Patel the then Additional Secretary, Ministry of Irrigation and Power alongwith Sh. P.R. Ahuja and Sh. B.R. Palta eminent engineers as consultants and others to study the report of CFCC and suggest the scope of economy in the use of Cauvery water. The Committee's report entitled "Appraisal of availability and requirements of Cauvery Waters" is placed before this Tribunal by the Ministry of Water Resources, Govt. of India, which is marked Exh.B-1. In the said report the observations of the Expert Committee regarding Mananthavady and Kerala-Bhavani projects are quoted below:

> "3.7.3 Kerala
>
> The State have proposed Mananthoddy Multipurpose Project in the Kabini sub-basin, Kerala-Bhawani, Panthanthodu and Pamber-Bhawani in the Bhawani sub-basin involving transfer of the Cauvery Waters outside the basin. Since the basin itself is short of water,

such transfers are not desirable……." (Ref: ibid Exh. B-I, Page 25)

So far Cauvery basin is concerned because of shortage of water, against demands by each riparian State, no note is to be taken of claims made by the States for trans-basin diversion already made or proposed for any purposes.

Chapter 3

Apportionment of the Cauvery waters for Irrigation in Tamil Nadu and Karnataka

After having determined the areas in the Cauvery basin over which the States of Tamil Nadu and Karnataka are entitled to irrigate from the waters of river Cauvery it has also been examined and determined the nature of crops that should be grown by the two States keeping in view the following criteria namely:

(i) No note has been taken of the double crop/perennial crop de-hors 1924 Agreement;

(ii) No area for summer paddy has been considered; and

(iii) The area under summer paddy existing prior to 1924 to be replaced by any semi-dry crop.

This issue not only involves the factual or legal aspects but also technical aspects. Several documents have been filed on behalf of respective States apart from the oral evidence of expert witnesses in the field of agriculture. Several statements and charts were also filed on behalf of the two States in respect of their requirements of water with reference to the delta claimed by each of them for different crops. The learned counsel appearing for the two States on basis of material on record were heard for months. Each side supported its claim of water as made in the statement of case and on the evidence produced.

2. Almost the entire cultivation in the Cauvery basin within Tamil Nadu is based on paddy crops. In the delta area which is the major zone for paddy cultivation for Tamil Nadu, three varieties of paddies are grown i.e., Kuruvai, Thaladi and Samba. These crops are also grown in the Lower Coleroon Anicut System and Cauvery Mettur Project. It has already been said earlier that in the same field first Kuruvai is grown and harvested followed by Thaladi which shall be deemed to be their second crop in the same field in the same agriculture year. This system is in vogue much prior to the year 1924 when the agreement was executed between the then States of Madras and Mysore. At that point of time the area under the double crop was of the order of 95,000 acres which was later increased by another 90,000 acres under the terms of the agreement of 1924. Thus making a total of 1,85,000 acres. However, during the course of time and especially after the construction of the Mettur reservoir when regulated irrigation supply became available for the delta area the farmers gradually started replacing single long duration Samba crop with double crop system of Kuruvai followed by Thaladi. It appears that after 1934, gradually the area under double crop increased to about 33% of the paddy cultivation in the entire delta including Lower Coleroon System and new delta area. It has already been considered earlier as to whether for a just and equitable apportionment of waters of river Cauvery, this system should be continued, curtailed or confined to a limited area. It is just and proper that the cultivation of double crop over 95,000 acres which was the practice prior to 1924 should be allowed to continue otherwise it shall dislocate and cause

dissatisfaction amongst the cultivators of those areas. In the agreement of 1924, for Madras/Tamil Nadu extension of the double crop upto 90,000 acres was provided under the Mettur Reservoir Project. This was mentioned in Annexure III of the agreement. There is no question of restricting the double crop on this area of 90,000 acres. Thus the State of Tamil Nadu has been held to be entitled to grow Kuruvai followed by Thaladi in about 1,85,000 acres in the areas specified. The Mettur Reservoir Project permitted extension in two areas such double crop, the total being 90,000 acres, details whereof have been given in earlier chapters. The total yield in the Cauvery basin has been estimated to be about 740 TMC. The C.F.F.C. estimated that by 1972 the demand of water for irrigation and other purposes works to about 1260 TMC by the riparian States, especially, the States of Tamil Nadu, Karnataka and Kerala. Before the Tribunal, Tamil Nadu has claimed 566 TMC which includes water for irrigation and other beneficial uses. On the other hand the State of Karnataka has claimed 465 TMC for irrigation and other purposes. The State of Kerala has claimed about 100 TMC, their contribution being about 147 TMC. The Union Territory of Pondicherry claimed about 9 TMC. How to reconcile these claims with the limited water available in the basin? In this background some restrictions had to be imposed. Reasonable reduction in the delta of water claimed by the States had to be made in order to make just and equitable apportionment of the water between Tamil Nadu and Karnataka.

3. The crop water requirement has been defined in ‘Guidelines for predicting crop water requirement ‘ FAO-24, page 1:-

> "The depth of water needed to meet the water loss through evapotranspiration (ET crop) of a disease-free crop, growing in large fields under non-restricting soil conditions including soil water and fertility and achieving full production potential under the given growing environment."

The States have furnished details of various parameters used in computation of crop water requirement. In respect of two categories of principal crops namely - paddy and its varieties and semi-dry crops (during kharif and rabi season) the parameters to be considered are as under:-

	Paddy varieties	Semi-dry crops
1.	Crop duration	Crop duration
2.	Puddling	Main field preparation
3.	E.T. Crop (Evapo-transpiration)	E.T. Crop (Evapo-transpiration)
4.	Percolation loss	--
5.	Effective rainfall	Effective rainfall
6.	System efficiency	System efficiency

The States of Tamil Nadu and Karnataka have extensively argued on each of the above parameters in respect of different crops and referred to the materials in support of their contention.

4. As per the direction of the Tribunal, Tamil Nadu and Karnataka have filed their crop calendars which were taken on record on 12.8.2004 marked as Tamil Nadu Exhibit No.1666 and Karnataka Exhibit 519 respectively.

Tamil Nadu

5. As has been said earlier, in Tamil Nadu in the Cauvery basin different paddy crops viz, Kuruvai, Thaladi and Samba are grown. Thaladi is grown in the same field after harvesting of Kuruvai which is a short duration crop. It cannot be disputed that growing of two crops in the same field shall require more water than one crop like Samba. We have provided for the double crop area in 1,85,000 acres. The area of sugarcane which requires much more water throughout the year was also increased by Karnataka. That has also been limited to the terms of the agreement of 1924 i.e. to about 40,000 acres only.

6. From the crop calendar submitted by Tamil Nadu it appears that the duration of the three varieties of the paddy is as under:-

(i)	Kuruvai	105 days
(ii)	Thaladi	135 days
(iii)	Samba	150 days

It will be proper to say at the out set that this period of 150 days with replacement of different varieties of seeds of Samba paddy should be gradually reduced to 135 days or near about that.

7. Tamil Nadu has shown in their crop calendar that ‘Navarai’ crop is grown between the period first week of December and last week of March. This has to be replaced by any light irrigated crop within the irrigation season June - January. Similar economy of water should be practiced in Amaravathy and Lower Bhavani Project.

Karnataka

8. It has already been said that the principal crops raised in the Cauvery basin of Karnataka are kharif paddy, kharif semi-dry, i.e. ragi, sorgam, maize, etc, rabi semi-dry i.e. groundnut, pulses, etc. Karnataka is also growing perennial crops like sugarcane, mulberry, garden crops etc. besides summer crops, i.e., rabi/summer paddy and rabi summer semi-dry. The summer paddy and summer semi-dry crops cannot be taken note of in view of the scarcity of the water. It appears that the period for the kharif paddy crop is of 145 days as indicated by the State of Karnataka i.e. 15 June to 15 November.

9. The learned counsel appearing on behalf of the State of Tamil Nadu referred to some of the projects of Karnataka, viz, Krishnarajasagara, Nugu, etc. and pointed out that the number of days, i.e. the crop season for kharif paddy has been shown as 120 days (20th June to 19th October) and 123 days. Reference has been made in this connection to Exhibit E-52 page 16 and E-57 page 10. The object of this argument appears to be that if in the project report, the crop period has been shown as 120-123 days, then the water requirement should be much less. It will be relevant to refer to Exhibit E-52 relating to Krishnarajasagara project. In the foot note at page 16, the duration of the kharif rice crop has been shown as 120 days, but from the supplies released into the canal system, the details of which are given in the same document from pages 22 to 43 covering the years 1956-57 and then 1971-72 to 1991-92 (over 21 years); it appears that water has been released into the canal system between June and December and from the

aforesaid period of releases it can be inferred that crop season extended upto December. The small releases in the month of June indicate that it is in respect of early nursery. In this background it is not possible to hold that the crop calendar for kharif paddy in Karnataka is only for 120 days. Karnataka in Exhibit 518 at page 115 has computed kharif paddy water requirement in respect of Krishnarajasagar; the period shown therein is 15 June to 15 November. The bifurcation whereof shall be 25 days for nursery and 120 days for the main field, total being 145 days. It seems that in the document E-52 where mention is made about 120 days, it is only for main field crop without including the nursery period. Even in respect of the project of Nugu, E-57, it will appear from page 17-33 that crop duration was almost for 6 months from July to December. Report of C.F.F.C. as well as the Karnataka Master Plan also says that the crop duration of Samba/kharif paddy to be of the order of 145 to 150 days.

10. The research in respect of developing different varieties of paddy is continuing for the last some decades in different research institutes including University of Agricultural Sciences, Bangalore. The publication 'The Package of Practices for High Yields - August, 1983' issued by the University of Agricultural Sciences and Department of Agriculture, Bangalore, which has been brought on record indicates that 'Jaya' variety which has been developed is of duration of 140 - 145 days. It gives an yield of 30 - 35 quintals/acre, whereas short duration variety like "Madhu" of 120 - 125 days gives an yield of 20 - 25 quintals/acre. In the latter publication of April 2005 on the same subject, wherein the results of two research stations

at Bangalore and Dharwad are indicated, shows that “Jaya” high yield variety of 140 - 145 days duration, gives yield of 5.5 to 6 tons/ha (Ref: page 2, item 2), whereas high yielding variety of 120 -125 days gives yield of 4 to 4.5 tons/ha. Thus, there is about 30 -35% reduction in the yield. It need not be pointed out that the input of irrigation is an important factor depending on the availability of water which becomes available after huge investments. It is clear that it would be prudent on the part of Karnataka farmers to go in for a paddy crop of medium duration which gives higher yield. The kharif season normally ends in the month of October. It shall be advisable to modify the crop period to 135 days duration - from 15 June to 31 October. This should be considered in due course, keeping in view the new research findings.

11. The State of Karnataka in their Exhibit 518 have indicated that in the case of Kharif paddy grown under minor irrigation schemes, the State Government had successfully persuaded the farmers to introduce short duration paddy variety of 120 to 130 days which resulted in saving of about 10% of water compared to the medium duration varieties. This is perhaps to avoid severe reduction in yield caused by cold weather after October. The crop calendar for kharif paddy under minor irrigation has been shown, from 20 July to 30 November although in the reservoir projects crop period starts from 15 June. The State Government may continue to encourage short duration variety of 120 - 130 days in minor irrigation area as indicated by themselves in Karnataka Exhibit 519. But at the same time it is not possible to accept the contention of the Tamil Nadu that for an area over 5

lakh acres, the kharif paddy crop duration should be taken at 120 days. Any new system takes time to evolve and farmers have to be convinced in respect of gain and loss between the two varieties of same crop; only persuasion and efforts can be made on the part of the State Government.

12. So far kharif semi-dry crops are concerned, main crop is ragi which is a 120 days crop raised during the period 15 June to 15 October. Ragi crop is not only a less water consuming crop but it gives economic return to the farmers compared with paddy in Karnataka. C.F.F.C. in its report (T.N. exhibit 840 at page 104) has mentioned:-

> "If the kharif ragi could be grown under irrigated conditions instead of paddy, there would be saving in water without any economic detriment to the farmers, as it is understood that the net return is not far different in the case of paddy and ragi."

In this background the State Government of Karnataka should also encourage as far as possible for replacing the areas which are under kharif paddy by ragi which is a kharif semi-dry crop.

13. The rabi semi-dry crop which has been extensively planned in the new projects prepared by the Karnataka, details whereof have been given in Exhibit K-V filed before this Tribunal when the interim order was to be passed. From the crop calendar submitted on behalf of the State of Karnataka, it appears to be a crop of 120 days extending from first November to end of February. Efforts should be made to advance it from November to October so that the crop is harvested by end of January.

During this period areas can have rainfall also reducing pressure on the irrigation.

14. In respect of rabi summer paddy and rabi summer semi-dry crop from first January to end of April, this cannot be taken note of in view of the deficiency of water in the basin during that period.

15. The parties have claimed different quantities of water in the two States and have also given the stages at which and how much water is required for different crops. The claims have been made under different heads, especially, in respect of paddy, i.e., (i) Nursery Preparation (ii) Puddling while preparing the main-field; (iii) Evapo-transpiration - E.T. Crop; (iv) Percolation Losses; (v) Effective rainfall and (vi) System Efficiency. In deciding reasonable delta (water depth) required for a crop, the factors (i) to (v) have an important role to play.

Land Preparation

16. The State of Karnataka while submitting their crop water requirement in respect of semi-dry crops have shown water requirement of about 100 mm for field preparation before the crops are sown. Normally, the operation of sowing the seed is undertaken when the field is wet for easy ploughing and continuing the seeding operation. Since wetting of the soil by rainfall is not certain at all times because it depends upon the natural rainfall, it becomes imperative that provision for wetting the soil is made so that the sowing of the crop as per the crop calendar becomes possible. However, the calculations given by Karnataka have not been considered by us and the overall delta for these crops as indicated in their project reports has

been adopted. In this connection, it may be mentioned that the learned senior counsel on behalf of the State of Karnataka had also repeatedly stated during arguments that the crop water requirement as given by the State in their project reports are being relied upon by them. (Ref: KAR Note 29, pages 14 & 15; and KAR Note 39, page 1)

Puddling

17. In Tamil Nadu, as most of the areas within the basin including the delta grow paddy, more emphasis has been laid on behalf of the State of Tamil Nadu on requirement of water for puddling of the main field. The data furnished by the party States in respect of puddling requirements in their statements Exh.1665 and Exh. 518 seem to be reasonable. Dr I.C. Mahapatra in his affidavit paragraph 4.07 at page 35 has mentioned:

> "The water requirement for puddling is likely to be much less when the operation is carried out in the rainy season and the soil profile is wet. There is scope to reduce water requirement for puddling if the field operations are carried out within a short period. The water requirement for puddling may reasonably be assumed to be 150 to 200 mm (6 to 8 inches)."

However, Shri J.S. Patel, Expert Agronomist associated with C.C. Patel Committee has observed in respect of water requirement for puddling:-

> "In general, in India, we reckon 10" of water for puddling as adequate and the figures of 8" obtained in Philippines, 9" already given by Tamil Nadu and 10" are all very close" . (Ref. Exhibit B-1, Annexure IV, page 2.

On the well settled norms the claims under this head on behalf of both the States appear to be reasonable. There is no need to discuss this aspect further in detail.

Evapo Transpiration - E.T. Crop

18. This factor which is an important component of water requirement is very technical in nature and the learned counsel appearing for the party States have taken pains to explain it for days together. Several publications were also referred to point out as to how evapo-transpiration helps the growth of the plant and the consumptive use of the plant. In the notes of the arguments filed on behalf of the two States stress has been laid on this component which has to be taken note of for the purpose of determination of water requirement. The scientific computation of this parameter depends on various factors, i.e. (i) temperature alongwith day and night weather conditions; (ii) elevation/altitude of the field; (iii) solar radiation; (iv)sunshine hours; (v) wind velocity; (vi) humidity; etc. The Government of India issued a guideline in May 1984 in connection with evapo-transpiration and it has been said at page 3 thereof:-

> "Reference Evapo-transpiration:
>
> The effect of climate on crop water requirements is given by the reference evapo-transpiration. It is defined as the rate of evapo-transpiration from an extensive surface of 8 to 15 cm tall, green grass cover of uniform height, actively growing, completely shading the ground and not short of water."

It appears that first ETo is computed for 'reference crop'. The same is multiplied by crop co-efficient (Kc) to arrive at E.T.c (Evapo-transpiration of

a particular crop). It need not be said that evapo-transpiration for a particular crop grown in different regions would differ because of the variation in one or more of the several factors mentioned earlier.

19. F.A.O. paper 24-1974 (revised in 1977) at pages 1 and 2 under the heading 'Calculation of crop water requirements' specified four methods, viz, (i) Blaney-Criddle, (ii) Radiation, (iii) Penman and (iv) Pan Evaporation. In respect of possible errors in adoption of the aforesaid methods it has been said :-

> "Concerning accuracy, only approximate possible errors can be given since no base-line type of climate exists. The modified Penman method would offer the best results with minimum possible error of plus or minus 10 percent in summer, and up to 20 percent under low evaporative conditions. The Pan method can be graded next with possible error of 15 percent, depending on the location of the pan. The Radiation method, in extreme conditions, involves a possible error of up to 20 percent in summer. The Blaney-Criddle method should only be applied for periods of one month or longer; in humid, windy, mid-latitude winter conditions and over and under prediction of up to 25 percent has been noted (1.1)…….
>
> The effect of the crop characteristics on crop water requirements is given by the crop co-efficient (kc) which presents the relationship between reference (ETo) and crop evapotranspiration (ET crop) or ET crop = kc . ETo. Values of kc given are shown to vary with the crop, its stage of growth, growing season and the prevailing weather conditions. ET crop can be determined in mm per day as mean over the same 30 or 10-day periods. Since the same reference is used, i.e. ETo, the presented crop coefficients apply to each of the four methods(1.2).

The effect of local conditions and agricultural practices on crop water requirements includes the local effect of variations in climate over time, distance and altitude, size of fields, advection, soil water availability, salinity, method of irrigation and cultivation methods and practices, for which local field data are required (1.3)."

In the guidelines issued in 1984 by the Government of India, the methods for calculating crop water requirement it has been said :-

"1) Blaney-Criddle formula –

This formula does not take into consideration such factors as humidity, wind velocity, elevation and the like. These aspects therefore make it necessary to try other methods……..

(Ref:TN Compilation No.XIII – GOI Guidelines, page 6, para 4.14)

2) Hargreaves formula –

This formula uses Pan evaporation data alongwith 'k' factor. The Govt. of India guidelines at page 7, para 4.16 mention as under:-

"4.16 Another method for calculating evapo-transpiration has been developed by Hargreaves. The basis for this method is the high degree of correlation found by various technicians between Class A pan evaporation and evapo-transpiration. Hargreaves has developed a series of k factors by major crop groupings. Hargreaves has also introduced several modifying co-efficients into his pan evaporation formula."

3) Modified Penman formula –

Earlier, Penman method was used "for areas where measured data on temperature, humidity, wind and sunshine duration or radiation are available. This method was slightly modified and uses mean daily climatic data; since day and night time weather conditions considerably affect the level of evapo-transpiration, an adjustment for

this was included. The modified Penman method would offer the best result with minimum possible error of plus or minus 10% in summer, and upto 20% under low evaporative conditions as already mentioned above."

20. Karnataka's insistence during the course of the arguments was that, the estimate of ETo factors by the Tamil Nadu is not consistent with the requirement of F.A.O. 24 referred to above. The Government of India guidelines is different in some respect than what has been said in F.A.O. 24 on which reliance has been placed by Karnataka. In the said guidelines, paragraph 6.10 and 6.11 say:-

"6.10 The relationship of evapotranspiration to pan evaporation has long been used in the computation of irrigation requirements. Many research stations are now reporting consumptive use data by relating evapotranspiration (consumptive use) to pan evaporation……."

"6.11 Where specific data are not available, average values can be used as recommended by Hargreaves. Table 8 shows consumptive use coefficients k, for computing evapotranspiration (E_t) from either computed or measured pan evaporation (E_p). These coefficients are suggested as representative in average conditions and are proposed for use in the formula $E_t = K \times E_p$……."

The Government of India guidelines Chapter VI in paragraph 6.19 in respect of rice which is the main crop in Tamil Nadu, it has been said:-

"6.19 Rice:

The E_t/E_p ratios present a fairly flat curve. A maximum value of 1.30 and a minimum of 0.80 is representative of average conditions."

The State of Tamil Nadu appears to have taken crop k factor as 1.0 which is average of the minimum and maximum values prescribed in the guidelines.

In this connection a statement was made on behalf of the State of Tamil Nadu in their Note T.N.43 at page 61 wherein it has been said that if the Government of India crop factor values are adopted it will result in higher delta. As such in order to reduce the delta the coefficient adopted by them is as worked out by Coimbatore Agriculture University which gives a lower delta. When there is some conflict between the F.A.O. paper 24 and the Government of India guidelines, 1984, it shall be advisable to follow the Government of India guidelines. Apart from that, Tamil Nadu has been successful in showing that coefficient adopted by them as worked out by Coimbatore Agriculture University, gives a lower delta as compared to one worked out on the basis of the Government of India guidelines.

Percolation Losses

21. In respect of Percolation losses, Dr I.C. Mahapatra who was examined as a witness on behalf of the State of Karnataka had filed his affidavit. At page 34 of this Affidavit it has been stated:-

> "Percolation losses can be considerably reduced by proper puddling of the field. For typical transplanted rice fields, this value ranges from 2-4 mm/day. Hence, a value of 3 mm/day can be assumed for projects in Karnataka and Tamil Nadu having well drained and undulating soils, while a value of 2 mm/day may be assumed for delta areas of Tamil Nadu, as it has shallow water table and flat plain topography. The percolation rate is also assumed to be 2 mm/day in the Cauvery delta modernization project of Tamil Nadu."

It is a matter of common knowledge that percolation losses of water depend on nature of the soil, climatic condition, etc. The soil of Karnataka is mostly red soil and at places sandy in nature. Tamil Nadu soil is sandy loam

especially in delta which have been formed with the deposit of silt over the ages, is not as porous as that of Karnataka. Perhaps that is the reason as to why Dr I.C. Mahapatra has estimated 3 mm per day loss for Karnataka and 2 mm per day loss for the delta area of Tamil Nadu. Tamil Nadu has submitted the computation in their Exhibit 1665 at pages 55-56, from which it appears that for the old delta system namely Cauvery and Vennar sub basins and Lower Coleroon Area (L.C.A.), percolation loss at 2 mm per day has been taken whereas for the remaining basin area, a figure of 3 mm per day has been considered which includes even Cauvery Mettur Project, i.e., new delta area.

22. Tamil Nadu has insisted that the soil of the new delta cannot be treated at par with the soil of old delta and as such the percolation loss should be calculated at 3 mm per day. About old delta they admit that 2 mm per day shall be a reasonable basis. From records, it appears that the soil of new delta is different in some respect from the soil of the old delta, but it also appears that rice is cultivated since 1934 and there has been regular puddling operation in the new delta apart from that it has a plain topography. In this background it will be reasonable to allow percolation losses per day at 2.5 mm instead of 2 mm per day as claimed by Karnataka. In respect of Karnataka area paddy is being grown, in low lying areas and close to the river course for last several decades. During the course of the cultivation of paddy in this area because of the puddling of the soil every year it shall be justified to come to the conclusion that the percolation loss would be at 3 mm per day instead of 5 mm per day as claimed by Karnataka in Exhibit 518

at page 115. Same should be the position so far other areas in Karnataka are concerned. The anicut areas where paddy is being grown for centuries and because of the puddling and other agriculture operations for a long time percolation of water in the field decreases, as the quality of soil improves. As such it shall be reasonable to allow 3 mm percolation loss per day for the entire Karnataka areas where paddy is being grown.

Effective Rainfall

23. The Government of India guidelines 1984 'Estimating Irrigation Water Requirements', have clearly pointed out in para 9.10 at page 21 that "The technician engaged in estimating irrigation water requirements of a crop is confronted with the problem of determining what portion of total consumptive use will be met by effective rainfall and what portion will have to be supplied by irrigation. Since there are no records of effective rainfall available, it is necessary to estimate the portion of total rainfall that can be effective. An approximate procedure for arriving at effective rainfall is described in succeeding paragraphs."

The factors which influence the effective rainfall are:-

1) Topography of land;

2) Soil characteristics of the land proposed to be irrigated;

3) Initial soil moisture content of the land;

4) Ground water characteristics;

5) Rate of consumptive use by a crop variety;

6) Intensity, timing and duration of rainfall;

7) Frequency and distribution of rainfall;

8) Climatic conditions;

9) Variety of crop and its stage of growth;

10) Water conservation practices, etc.

In view of wide variability in the occurrence of rainfall, the monthly and seasonal effective rainfall can be expected to vary widely from year to year as rainfall varies (Ref: ibid, para 9.25).

24. Even in Irrigation & Drainage paper No.25 on “Effective rainfall in irrigated Agriculture” published by Food and Agriculture Organization of United Nations in 1974 and popularly known as FAO-25, while dealing with measurement of effective rainfall and evaluation of various methods in Chapter 2 at page 27, it is mentioned as under:-

“3.5 Empirical Relationships:

Several methods of estimating effective rainfall for irrigation schedules are in vogue in different countries. They are based on long experience and have been found to work quite satisfactorily in the specific conditions under which they were developed.

3.5.1 Crops other than rice:

India

For a given area, effective rainfall is taken to be equal to 70 percent of the average seasonal rainfall.

In another method, effective rainfall is taken as the mean value of rain, with the excess over 3 in. in one day and 5 in. in 10 days omitted.

Effective rainfall has also been taken to be equal to the lowest monsoon rainfall occurring in three out of four years……..”

"3.5.2 Rice

Measurement in rice

Rice thrives under conditions of abundant water supply, hence the practice of land submergence. Depth of flooding is governed by the variety grown and its height, the height of field bunds and availability of water. The water requirements of rice include evapotranspiration and percolation. Measuring effective rainfall is thus more complicated. Different empirical methods used in different countries are outlined below (Kung, 1971).

India

In one method, a percentage of total rainfall varying from 50 to 80 percent is assumed effective.

In a second method, rainfall less than 0.25 in (6.25 mm) on any day is considered as ineffective. Similarly any amount over 3 in (75 mm) per day, and rainfall in excess of 5 in (125 mm) in 10 days is treated as ineffective……"

[Emphasis supplied]

25. While evaluating the various methods of measurement of effective rainfall at page 29, para 4, it has been said:-

"4. Evaluation of methods:

A method must account satisfactorily for surface run-off, water storage changes in the soil, evapotranspiration and crop characteristics. For field use, the method should be simple, inexpensive, rapid and accurate. It should be useful for broad regional planning or precise irrigation scheduling under a given set of conditions…….

…….. The empirical methods for crops other than rice (No.3.5.1) and for rice (No.3.5.2), are based on long experience. They may be satisfactory under local conditions but need verification

> when applied in conditions very different from those under which they were developed."
>
> [Emphasis supplied]

While giving comparison of the various studies/methods for determining effective rainfall at page 31, Table 9, items 3.5.1 and 3.5.2, it is mentioned in remarks column that the use of empirical methods for other crops and also rice have (i) very high practicability and (ii) high practicability respectively. The component of effective rainfall will depend upon the time series of rainfall and its length; selection of time period, location of rain gauge stations and their number considered in the computation. As such, effective rainfall would vary from place to place and also for different rainfall series considered in the calculations and hence, its computed value will change accordingly.

26. The State of Tamil Nadu has given the crop water requirement including effective rainfall in respect of each project in consultation with Irrigation, Hydro-Meteorological and Agricultural experts, in their affidavit T.N. 1665 at pages 55 and 56. The State of Karnataka has also given crop water requirement including effective rainfall in respect of various projects in consultation with experts in their affidavit Exhibit KAR 518 at pages 114 to 121. It may be pointed out that Karnataka has relied more in respect of crop water requirement given in the project reports. In Karnataka dams, reservoirs of almost all the projects have been completed and irrigation of the land has also been undertaken. Tamil Nadu had completed all its projects long ago and is irrigating lands for several decades. They have also, in connection with crop water requirement, given the details of

effective rainfall in respect of each project. All the information so furnished along with the materials on record have been considered.

System Efficiency

27. From a reference to the information furnished by both Tamil Nadu and Karnataka in their Exhibits TN 1665 and KAR 518 referred to above, it shall appear that both the States have worked out their crop water requirement as is optimally required for different crops. The National Commission on Agriculture 1976 in its report part V page 80 mentions about an experiment on wheat “Sonora 64”, the results of which indicated that single watering after 25 days of sowing raised the yield to 3 times of that of an un-irrigated wheat crop; three waterings at the most appropriate stages of the growth of the crop increased the yield to 3.8 times; four waterings resulted in yield increase to 4.5 time and five waterings increased crop yield to only 5.1 times. These results illustrate that in water short areas giving fewer than optimum number of waterings to a large crop area, at appropriate stages of crop growth give a greater over-all agricultural production. Therefore, planning projects with optimum delta (water depth) would result in higher water demand, and may not be necessary in water paucity areas; where an irrigation system catering for fewer waterings may cover larger areas and secure greater over-all production. Further, this would result in extending benefits of irrigation to a larger number of framing families. This is also termed as “extensive irrigation” which is the requirement of the National Policy of Agriculture in India. Attention of Dr. M.S. Swaminathan, an Expert Agriculture Scientist, examined on behalf of

the Tamil Nadu, was drawn to the Memoirs of Mr. B. Sivaraman (retired ICS and erstwhile Member of Planning Commission) in question No. 154 during his cross examination in the following manner:-

> "154. Ques: Mr. B. Sivaraman, says the following in his Memoirs. It is called, "Bitter Sweet: Governance of India in Transition". And in one passage which is quite illuminating – this is what he says at page 410 to 412:1s1
>
> "In most projects, when the water is released from the reservoir into the canal system, the water flows freely into all the branches of the system and then into the minors and the field channels, without any selectivity. Unless all the farmers concerned follow their cultivation practices simultaneously, the unutilized water flows to the tail ends and is wasted. When water is required in plenty, for operations like puddling for paddy, the farmers at the head reaches generally hog the bulk of the water and over-water their fields, depriving the tail ends of the canal systems of water. Thus, tail ends of all systems in the country invariably complain of insufficiency of water.
>
> Even without following the strict discipline of the Punjab farmers, things could have been a lot better in all the systems, had they followed a blocking system for release of water in rotation. Farmers over-watering their fields from greed and in the mistaken belief that they were helping the plants, had to be disabused, as over-watering invariably spoilt the crop and made fertilizer use wasteful and inefficient. In 1966 and 1967, I undertook this task in both the Thanjavur and the Krishna deltas.
>
> In Thanjavur, when Vedanarayanan of the IAS was the Collector, an experiment was carried out in a block of two thousand acres in Siddhamalli taluk. The entire block, commanded by a branch canal, was brought under simultaneous cultivation by all the farmers in the block. By mutual arrangement, the release of water was

carefully controlled for each farmer's field. The usual practice of draining off one's field through the neighbour's was controlled, to allow for the fertilizer application to be absorbed, before field to field drainage started. It was found that by releasing at the branch canal head only half the usual releases in the system, all the farmers were satisfied. In addition, at the end of the season, the average yield in the controlled block was nearly twice the yield of the neighbouring blocks, where the usual laissez faire methods were followed.

In the Krishna delta, where a similar programme was organized and supervised by a forward-looking Superintending Engineer, the results were equally satisfactory…… "

Therefore, the party States should improve their crop water management practices which embrace several parameters involved in achieving the desired results. It is suggested that both the States should improve the system efficiency to 65% in the existing projects which is not only possible but would also be appropriate. From the records it appears that the State of Tamil Nadu claims system efficiency at 60% for major and medium projects and in some of the anicut channels, the same has been taken at 55%. So far as the State of Karnataka is concerned, they have taken 60% for existing projects and 70% for new projects. Both the States have assured that steps are being taken for improvement of the system efficiency by way of modernization of projects and better management of the irrigation water. Shri C.C. Patel Expert Committee referred to earlier, in its report has suggested conveyance efficiency should be at 67% in both States. (Ref. Exh. B-1, pages 8 & 9).

Assessment of water requirement for Tamil Nadu

28. In the case of Tamil Nadu, bulk of cultivation is in the delta area, the schemes along the main river between the Mettur dam and Grand Anicut followed by Bhavani, Amaravathy and Noyyil sub-basins besides minor irrigation. The State in their Exh. 1665 at pages 55-56 have given their projectwise crop water requirements which are reported to have been worked out by following Govt. of India guidelines. As mentioned earlier, mostly the development of irrigation in Cauvery basin within Tamil Nadu is age old. They have furnished information in the Common Format besides in modernisation scheme of old Cauvery delta system and the Cauvery Mettur reservoir project of 1921. The data furnished in their Exh. TN 1665 has been examined. From the information furnished before this Tribunal and the pleadings, it is noticed that even now the prevalent agricultural practices and the water management techniques need lot of improvement. For example: water once released during a crop season continues uninterruptedly. There is no practice of running the canal system on rotational basis as also no Warabandi is enforced amongst the beneficiaries with the result that almost during the entire irrigation season, the waters let into the channels run to waste during night time. Also, even now in large areas, field to field irrigation practice is continuing. In view of the above situation, at least 5% improvement in the overall system efficiency can be easily achieved by proper management practices in all the existing schemes. Therefore, system efficiency of 65% should be

adopted for working out the crop water requirement and the same has been done.

29. In the case of New Delta area (G.A. Canal system) for paddy cultivation, it is proposed to reduce the percolation loss from 3 mm as adopted by the State to 2.5 mm. For the remaining areas of delta, 2 mm/day and all non-deltaic areas of Cauvery basin in Tamil Nadu, 3 mm/day as adopted by the State seems to be in order.

30. With modification in only one parameter of system efficiency from 60% to 65%, the delta for three varieties of paddy crop in case of Old Delta area and Lower Coleroon system works out as under:-

A)	Old Delta Area:		Delta (Water Depth)
	i) Kuruvai	-	4.00 ft.
	ii) Samba	-	3.40 “
	iii) Thaladi	-	2.50 “
B)	Lower Coleroon Area:		
	i) Kuruvai	-	3.80 ft.
	ii) Samba	-	3.20 “
	iii) Thaladi	-	2.50 “

In respect of the New Delta area (G.A. Canal system) with modification in two parameters namely: system efficiency from 60% to 65% and percolation loss from 3 mm to 2.5 mm, the modified delta (water depth) works out as under:-

i)	Kuruvai	-	4.10 ft.
ii)	Samba	-	3.90 “
iii)	Thaladi	-	3.20 “

The details of irrigation delta required for Cauvery Mettur project (G.A. Canal system) as worked out are given in the table below:-

Irrigation Delta required for Cauvery Mettur Project
(G.A. Canal System)

S. No	Particulars	Computation by Tamil Nadu (Exh. 1665, page 55) (Delta in mm)	Computation with modification in percolation loss & system efficiency (Delta in mm)
1	2	3	4
A.	**KURUVAI (105 DAYS):**		
I.	**Nursery raising (25 days):**		
i)	Puddling	50.00	50.00
ii)	E.T. Crop	234.40	234.40
iii)	Percolation	@ 3 mm/day 75.00	@ 2.5 mm/day 62.50
	Total	359.40	346.90
iv)	Less E.R.	(-) 23.34	(-) 23.34
v)	N.I.R.	336.06	323.56
II.	**Main field (80 days):**		
i)	Puddling	200.00	200.00
ii)	E.T. Crop	539.84	539.84
iii)	Percolation	@ 3 mm/day 240.00	@ 2.5 mm/day 200.00
	Total	979.84	939.84
iv)	Less E.R.	(-) 163.72	(-) 163.72
v)	N.I.R.	816.12	776.12
III.	**Total NIR** (10% of I+II)	**849.72**	**808.47**
IV.	Delta at canal head with system efficiency.	@ 60% 1416.20 or 4.65 ft.	@ 65% 1243.80 or 4.08 Say 4.10 ft.
B.	**SAMBA (150 DAYS):**		
I.	**Nursery raising (35 days):**		
i)	Puddling	50.00	50.00
ii)	E.T. Crop	273.30	273.30
iii)	Percolation	@ 3 mm/day 105.00	@ 2.5 mm/day 87.50
	Total	428.30	410.80
iv)	Less E.R.	(-) 53.11	(-) 53.11
v)	N.I.R.	375.19	357.67

1	2	3	4
II.	**Main field (115 days):**		
i)	Puddling	200.00	200.00
ii)	E.T. Crop	518.57	518.57
iii)	Percolation	@ 3 mm/day 345.00	@ 2.5 mm/day 87.50
	Total	1063.57	1006.07
iv)	Less E.R.	(-) 274.67	(-) 274.67
v)	N.I.R.	788.90	731.40
III.	**Total NIR** (10% of I+II)	**826.42**	**767.17**
IV.	Delta at canal head with system efficiency.	@ 60% 1377.36 or 4.52 ft.	@ 65% 1180.26 or 3.87 Say 3.90 ft.
C.	**THALADI (135 DAYS):**		
I.	**Nursery raising (35 days):**		
i)	Puddling	35.00	35.00
ii)	E.T. Crop	135.00	135.00
iii)	Percolation	@ 3 mm/day 105.00	@ 2.5 mm/day 87.50
	Total	275.00	257.50
iv)	Less E.R.	(-) 77.03	(-) 77.03
v)	N.I.R.	197.97	180.47
II.	**Main field (100 days):**		
i)	Puddling	165.00	165.00
ii)	E.T. Crop	389.54	389.54
iii)	Percolation	@ 3 mm/day 300.00	@ 2.5 mm/day 250.00
	Total	854.54	804.54
iv)	Less E.R.	(-) 184.04	(-) 184.04
v)	N.I.R.	670.50	620.50
III.	**Total NIR** (10% of I+II)	**690.30**	**638.55**
IV.	Delta at canal head with system efficiency.	@ 60% 1150.50 or 3.77 ft.	@ 65% 982.38 or 3.22 Say 3.2 ft.

31. The learned Senior Counsel on behalf of the State of Karnataka repeatedly pointed out that in the Cauvery Mettur Project report of 1921, the then State of Madras (Now Tamil Nadu) had worked out irrigation water requirement for the area as 242 TMC. As such, their present demand for water should be less than 242 TMC as there have been further technological developments in agriculture. In reply, the State of Tamil Nadu

clarified that the water requirement of 242 TMC indicated in the Cauvery Mettur Project report of 1921 was only an estimate of water requirement based on duty factors. The duty assumed was very high and seems to be impractical and arbitrary. As an additional argument, learned Senior Counsel for Tamil Nadu pointed out that in the 1921 project report there was a provision for releasing extra water from Mettur reservoir to cover the transmission losses upto Grand Anicut. This contention of Tamil Nadu was objected to by the learned Senior Counsel on behalf of Karnataka, saying that this is the first time that Tamil Nadu is raising a new point about river transmission losses. During the course of arguments, the State of Tamil Nadu clarified that it was not the case of Tamil Nadu to seek for more allocation on the plea that the transmission loss is involved and it restricts itself to its claim made in T.N. Exh. 1665. (Ref: T.N. Note No.64, pages 5-6)

32. It is true that Cauvery Mettur Project 1921 was revised from time to time which is borne out from the records of the case and in normal course all care should have been taken to estimate the water requirement for the project area but in an age old irrigation system, working out the irrigation requirement based on duty factors was empirical practice which has been gradually improved over the time due to the research. It shall not be just and proper to pin down the State of Tamil Nadu to the water requirement shown in the Cauvery Mettur Project (1921).

33. There is another aspect of the matter. The Tribunal has to assess the crop water requirement of each State based on the present day standards. It has been admitted on behalf of the two States that since the

days of the Mettur Project, i.e. 1921, because of the introduction of varieties of crops, the requirement of water for different crops have to be worked out according to present standards. Whatever may be the claim for water by the two States, it has to be worked out in such a manner that neither the crops starve nor it makes the apportionment of the available water an impossible task. Taking the above mentioned factors into consideration the table aforesaid (para 30)has been prepared in respect of irrigation delta required for Cauvery Mettur Project.

34. Before the total water requirement of whole Cauvery basin in Tamil Nadu is calculated it is proper to refer to the Lower Bhavani Reservoir Project as well as Amaravathy, Noyyil sub-basins. As far the Lower Bhavani reservoir project, Mettur Canal system, Pullambadi canal and New Kattalai High Level canal are concerned, the delta varies from 4.4 ft. for New Kattalai High Level Canal to 4.5 ft. for Mettur Canal, Lower Bhavani project, Pullambadi canal system as worked out from TN Exh. 1665, page 55. By applying system efficiency at 65%, the delta comes to about 4.2 ft. for Mettur canal and Lower Bhavani reservoir project area whereas for Pullambadi and New Kattalai High Level canal, it works out to 4.1 ft. Therefore, while fixing the delta for other projects in this region namely: Salem-Tiruchy canal, Kattalai scheme, Kodivery and Kalingarayan Anicut Systems, a delta of 4.2 ft. is allowed.

35. As regards the Amaravathy and Noyyil sub-basins, the paddy crop duration of 135 days has been shown by the State in their computations for old Amaravathy channels as well as Noyyil river channels, whereas for

Amaravathy reservoir scheme, the crop duration of 150 days has been shown. The crop duration of 135 days for the Amaravathy reservoir command too should be adopted. With this modification and an efficiency of 65%, the delta of 4.6 ft. be allowed for paddy cultivation in these sub-basins. It may also be mentioned that in respect of irrigation delta (for Noyyil channels), the State Govt. has stated in their Exh. E-19 at page 184 that "These are old revenue channels for which details of supply diverted every year are not being maintained. Hence, an average overall duty of 5 acres per Mcft. is adopted. This will workout to a delta of 4.6 feet." The comparative picture of delta for Samba crop in Amaravathy sub-basin is given in the table below:-

Irrigation Delta required for Samba crop in Amaravathy Reservoir Project
(Period 6th August to 18th December – 135 days)

S. No	Particulars	Computation by Tamil Nadu **with 150 days** crop period (Exh. 1665, page 56) (Delta in mm)	Computation with modifi-cations in system efficiency & crop period **of 135 days** (Delta in mm)
1	2	3	4
I.	**Nursery raising**	**For 35 days**	**For 35 days**
i)	Puddling	50.00	50.00
ii)	E.T. Crop	213.50	213.50
iii)	Percolation	@ 3 mm/day 105.00	@ 3 mm/day 105.00
	Total	368.50	368.50
iv)	Less E.R.	(-) 11.14	(-) 11.14
v)	N.I.R.	357.36	357.36
II.	**Main field**	**For 115 days**	**For 100 days**
i)	Puddling	200.00	200.00
ii)	E.T. Crop	553.56	*****494.28
iii)	Percolation	@ 3 mm/day 345.00	@ 3 mm/day 300.00
	Total	1098.56	994.28
iv)	Less E.R.	(-) 135.08	#(-) 117.46
v)	N.I.R.	963.48	876.82
III.	**Total NIR** (10% of I+II)	**999.21**	**912.55**
IV.	Delta at canal head with system efficiency	@ 60% 1665.35 or 5.47 ft.	@ 65% 1403.92 or 4.60 ft.

***** E.T. crop reworked on pro-rata basis.
(Source: TN Statement No. XXXVIII)
Effective rainfall (E.R.) reworked on pro-rata basis.

36. As regards the irrigated dry crop, the crop grown in Amaravathy and Noyyil sub-basins where the influence of northeast monsoon is weak, the delta demanded by the State has been modified with 65% efficiency which comes to 2.1 ft. and the same has been allowed; whereas in the remaining areas where the rainfall is better, a delta of 2 ft. has been permitted which in our opinion, would be sufficient as it would provide around 4 waterings of 6 inches each. There are other small pockets above Mettur reservoir in Chinnar sub-basin where irrigated dry crop is being raised during khariff season for which delta of 1.5 ft. has been allowed as is being done for the adjoining areas of Karnataka.

37. The State of Tamil Nadu has demanded that duty of 5 acres/Mcft. (i.e. 4.6 ft. delta) may be allowed for the entire minor irrigation area. However, it is felt that the delta area of Tamil Nadu which receives sufficient rainfall during the northeast monsoon, higher duty would be reasonable. As such, delta for samba crop allowed in the three regions namely: Old Cauvery delta; Lower Coleroon area and new delta, the average of which comes to 3.5 ft. be allowed for the minor irrigation in that zone below grand anicut.

38. As regards the claim of Tamil Nadu in respect of supplementing 4 TMC of water to Sethiathope area, the same is not being considered, since it involves trans-basin diversion.

39. Adopting the above deltas for main crops and applying the same to the cropped areas worked out on need basis for Tamil Nadu as indicated earlier, the irrigation water requirement of the State in Cauvery basin has

been assessed for all the projects in the same serial order as given in their Exh. TN 1665 and the same is given in the statement below:-

Water requirement of Tamil Nadu in Cauvery Basin

Area in thousand acres, Delta in feet and Water requirement in TMC

S. No.	System	Area with delta						Water requirement
		Paddy				Dry irrigated crop	Total	
		Kuruvai	Samba	Thaladi	Total			
1	2	3	4	5	6	7	8	9
1.	Cauvery delta system	157.50 @4.00	712.17 @3.40	157.50 @2.50	1027.17	-	1027.17	27.44+105.47 +17.15=150.06
2.	Lower Coleroon Anicut (LCA)	7.60 @3.80	124.70 @3.20	7.60 @2.50	139.90	-	139.90	1.26+17.38+0.83 =19.47
3.	Salem Trichy Channels	-	71.30 @4.20	-	71.30	26.18 @2.00	97.48	13.04+2.28 =15.32
4.	Kattalai schemes	-	76.30 @4.20	-	76.30	10.97 @2.00	87.27	13.96+0.95 =14.91
5.	Cauvery Mettur Proj. (G.A. Canal System)	20.00 @4.10	236.00 @3.90	20.00 @3.20	276.00	-	276.00	3.57+40.09+2.79 =46.45
6.	Mettur Canals	-	45.00 @4.20	-	45.00	-	45.00	8.23
7.	New Kattalai High level canal	-	20.60 @4.10	-	20.60	-	20.60	3.68
8.	Pullambadi Canal	-	22.10 @4.10	-	22.10	-	22.10	3.95
9.	Thoppiar Res. Project	-	-	-	-	*5.30 @1.50	5.30	0.35
10.	Kodiveri anicut system	-	24.50 @4.20	-	24.50	2.00 @2.00	26.50	4.48+0.17 =4.65
11.	Kalingarayan anicut system	-	14.00 @4.20	-	14.00	10.60 @2.00	24.60	2.56+0.92 =3.48
12.	Lower Bhavani project	-	103.50 @4.20	-	103.50	103.50 @2.00	207.00	18.93+9.02 =27.95
13.	Other minor schemes	-	-	-	-	8.00 @2.00	8.00	0.70
14.	Old Amaravathy channels	-	31.20 @4.60	-	31.20	4.35 @2.10	35.55	6.25+0.40 =6.65
15.	Amaravathy Reservoir project	-	15.00 @4.60	-	15.00	6.50 @2.10	21.50	3.00+0.59 =3.59
16.	Palar Porandalar Reservoir project	-	-	-	-	9.70 @2.10	9.70	0.89
17.	Vattamalai Karai Odai Res. Project	-	-	-	-	2.50 @2.10	2.50	0.23
18.	Kodaganar Reservoir project	-	-	-	-	9.00 @2.10	9.00	0.82
19.	Nanganjiar Reservoir project	-	-	-	-	6.20 @2.10	6.20	0.57
20.	Other Minor Schemes(Amara-vathy Sub-basin)	-	-	-	-	4.00 @2.10	4.00	0.36
21.	Noyyil river channels	-	14.80 @4.60	-	14.80	2.30 @2.10	17.10	2.96+0.21 =3.17
22.	Athupalayam Reservoir project	-	-	-	-	9.60 @2.10	9.60	0.88
23.	Orathupalayam Reservoir project	-	-	-	-	10.40 @2.10	10.40	0.95
24.	Minor schemes above Mettur	-	-	-	-	*6.00 @1.50	6.00	0.39

1	2	3	4	5	6	7	8	9
25.	Minor schemes below Mettur	-	-	-	-	7.80 @2.00	7.80	0.68
	Total	185.10	1511.17	185.10	1881.37	244.90	2126.27	318.38
26.	Minor Irrigation above G.A.	-	207.57 @4.60	-	207.57	-	207.57	41.59
27.	Minor irrigation below G.A.	-	136.93 @3.50	-	136.93	-	136.93	20.88
	Total Minor Irrigation	-	-	-	344.50	-	344.50	**62.47**
	Reservoir losses	-	-	-	-	-	-	**10.00**
	Total irrigation requirement	**185.10**	**1855.67**	**185.10**	**2225.87**	**244.90**	**2470.77**	**390.85**

*****Dry irrigated khariff crop in Chinnar sub-basin.

Note: 1) Delta has been computed with system efficiency of 65%. 2) Minor irrigation crop area is included in samba crop area.
3) Evaporation losses in reservoirs have been taken as claimed in T.N. Exhibit 1665 page 47, paragraph 16.3.

40. From the above, it would be seen that the total irrigation requirement of Tamil Nadu for providing irrigation to an area of 24.71 lakh acres comes to 390.85 TMC including reservoir losses of 10 TMC.

Assessment of water requirement for Karnataka

41. In the case of Karnataka, they have given the detailed computations of crop water requirement in their Exh. KAR 518, but have repeatedly pleaded that the State relies upon projectwise crop water requirement as indicated in the individual project report (Ref: KAR Note 29, pages 14 & 15; and KAR Note 39, page 1) and given at page 113 of Exh. KAR 518; the information on which has also been furnished in the common format. However, in the Exh. KAR 518 at page 114, the State has also furnished crop water computations in compliance with this Tribunal's order dated 12.11.2002 – these computations are reported to have been done adopting Govt. of India guidelines.

42. As already said earlier, not only the nature of soil of Karnataka is different from Tamil Nadu but also by and large the crops grown are also different. However, paddy and sugarcane which require lot of water are

also being grown in Karnataka. The State of Mysore/Karnataka under the terms of the agreement was allowed to grow sugarcane only over 40,000 acres of land. It appears that this area has been increased to 70,000 to 90,000 acres. It need not be said that in such a situation more water is required because the area stipulated for sugarcane has been increased to more than double. However, while considering in the earlier chapters regarding areas over which Karnataka is entitled to irrigate from the waters of Cauvery and its tributaries, has been limited to the area stipulated in the agreement of 1924 for sugarcane. As such while assessing the water requirement it has to be calculated only with reference to 40,000 acres for sugarcane. Even in respect of paddy, different aspects of the same have been considered emphasizing that Karnataka should grow more semi-dry crop. But some directions in respect of system efficiency and percolation losses for paddy areas need also to be given for Karnataka. These are

1) As mentioned earlier in the case of Tamil Nadu, for all the existing projects the system efficiency is suggested to be improved from 60% (as proposed by the State) to 65%. For the ongoing new projects, a system efficiency of 70% as proposed by the State seems to be in order.

2) As regards the percolation losses for paddy areas, the State has taken 5mm/day, but the same is being modified to 3mm/day, keeping in view the opinion of various experts discussed earlier.

After the above modifications in computation of the delta in respect of Kharif paddy cultivation, the projects within the State of Karnataka in the basin have been divided into two categories.

1) Projects falling above Krishnarajasagara where the rainfall is higher;

2) Those below Krishnarajasagara (including KRS command) where the incidence of rainfall is comparatively less.

This bifurcation has also been applied in the case of anicut channels and minor irrigation areas falling above and below KRS. The sample calculations given by the State at page 115 of Exh. 518 were examined and only two parameters were modified namely: percolation losses and system efficiency. With these modifications, the modified delta for kharif paddy in the existing projects comes to 4.6 ft. as against 6.3 ft. claimed by the State. For the ongoing projects, the delta worked out to 4.25 ft. for the areas falling below Krishnarajasagara including Krishnarajasagara command. A statement of computations is given below:-

Irrigation Delta required for khariff paddy crop
(Period 15th June to 15th November)

S. No.	Particulars	Sample computa-tion for existing KRS project by Karnataka (Exh. 518, page 115)(Delta in mm)	Computation with modification in percolation loss & system efficiency (Delta in mm)	
			For existing projects	For ongoing projects
1	2	3	4	5
I.	**Nursery raising (25 days):**			
i)	Puddling	30	30	30
ii)	E.T. Crop	11	11	11
iii)	Percolation	@ 5 mm/day 13	@ 3 mm/day 8	@ 3 mm/day 8
	Total	54	49	49
iv)	Less E.R.	(-) 12	(-) 12	(-) 12
v)	N.I.R.	42	37	37
II.	**Main field (120 days):**			
i)	Puddling	237	237	237
ii)	E.T. Crop	515	515	515
iii)	Percolation	@ 5 mm/day 600	@ 3 mm/day 360	@ 3 mm/day 360
	Total	1352	1112	1112
iv)	Less E.R.	(-) 242	(-) 242	(-) 242
v)	N.I.R.	1110	870	870
III.	**Total NIR (I+II)**	**1152**	**907**	**907**
IV.	Delta at canal head with system efficiency.	@ 60% 1152 0.60 =1920 **(75.59 inches or 6.3 ft.)**	@ 65% 907 0.65 =1395 ***(54.94 say 55 inches or 4.6 ft.)**	@ 70% 907 0.70 =1296 **#(51.02 say 51 inches or 4.25 ft.)**

Note: *****Delta of 55 inches (4.6 ft.) considered for KRS and existing projects, anicuts and minor irrigation below KRS.
#Delta of 51 inches (4.2 ft.) considered for ongoing projects like Kabini.

43. As regards the areas falling above Krishnarajasagara, sample calculations of Harangi were examined and modified with the same two parameters and the modified delta for kharif paddy works out to 4.3 ft. for existing projects and 4 ft. for ongoing projects as shown in the statement given below:-

Irrigation Delta required for khariff paddy crop
(Period 15th June to 15th November)

S. No.	Particulars	Sample computation for ongoing Harangi project by Karnataka (Exh. 518, page 115) (Delta in mm)	Computation with modification in percolation loss & system efficiency (Delta in mm)	
			For ongoing projects	For existing projects
1	2	3	4	5
I.	**Nursery raising (25 days):**			
i)	Puddling	30	30	30
ii)	E.T. Crop	10	10	10
iii)	Percolation	@ 5 mm/day 13	@ 3 mm/day 8	@ 3 mm/day 8
	Total	53	48	48
iv)	Less E.R.	(-) 19	(-) 19	(-) 19
v)	N.I.R.	34	29	29
II.	**Main field (120 days):**			
i)	Puddling	237	237	237
ii)	E.T. Crop	468	468	468
iii)	Percolation	@ 5 mm/day 600	@ 3 mm/day 360	@ 3 mm/day 360
	Total	1305	1065	1065
iv)	Less E.R.	(-) 232	(-) 232	(-) 232
v)	N.I.R.	1073	833	833
III.	**Total NIR (I+II)**	**1107**	**862**	**862**
IV.	Delta at canal head with system efficiency	@ 70% 1107 / 0.70 =1581 **(62.26 inches or 5.2 ft.)**	@ 70% 862 / 0.70 =1231 **#(48.48 say 48 inches or 4 ft.)**	@ 65 862 / 0.65 = 1326 ***(52.21 say 52 inches or 4.3 ft.)**

Note: *****Delta of 52 inches (4.3 ft.) considered for existing projects, anicuts and minor irrigation above KRS.
#Delta of 48 inches (4 ft.) considered for ongoing projects above KRS like Hemavathy, Harangi, Votehole etc.

Wherever in the project reports the State has demanded lower delta than that worked out from sample calculations, the former value has been adopted.

44. As regards the semi-dry crops which are cultivated both in Kharif as well as in the rabi season, the command of the projects has mainly been divided into two parts:

1) Areas covered by Hemavathy and the surrounding command north of main Cauvery river

2) The areas falling in Kabini command and its surrounding areas south of main river including Arkavathy sub-basin and adjoining areas of Shimsha sub-basin.

45. The delta demanded by the State in Hemavathy project for khariff semi-dry crop is in the range of 13.41 to 15.96 inches for different canal commands (Ref: E-65; page 22&23). However, a delta of 15 inches should suffice which would give at least three waterings of 5 inches each. In this connection, reference has already been made to the experiment conducted in connection with “Sonora 64 wheat-crop” wherein three waterings gave the optimum production and security against vagaries of monsoon etc.

46. As regards the areas falling on the southern side of river Cauvery in the Kabini reservoir scheme and its surrounds, a delta of 18 inches for Kharif semi-dry crop should suffice which will give three assured waterings of 6 inches each, although the State had demanded a water delta of 18.56 inches. (Ref. Exh.518 page 113, item18). In respect of smaller projects, as the State has not indicated any delta separately, therefore, 18” inches as mentioned above is provided. The State has demanded 16.64 inches delta

for Kabini project and 16.84 inches delta for Dev Raj Urs canal which is being allowed.

47. As regards rabi semi-dry crop the State of Karnataka has proposed rabi cultivation, which is normally done in the winter season (North-East monsoon for Cauvery basin) in various projects irrespective of the fact whether they have received adequate rainfall support are not, for example projects located in Shimsha and Arkavathy sub-basins which are in dry zone wherein Karnataka claims that the areas are drought prone, the proposal of the State to raise rabi crop in such areas does not appear to be justified. Also, for rabi cultivation the crop calendar submitted by the State shows crop duration from 1st November to end of February; this period should be advanced by one month and the crop duration should be from 1st October to January end which coincides with the end of the irrigation season and would also receive some rainfall support.

48. In the case of larger reservoir projects namely Krishnarajasagara, Hemavathy, Kabini as also the projects which are located in higher altitude and better rainfall areas like Harangi, Votehole and Yagachi etc some cultivation of rabi crop seems to be in the interest of economic design of the canal system and has been allowed.

49. Keeping in view the above considerations, the seven projects in which rabi cultivation is being allowed are divided into two categories :-

i) KRS, Hemavathy, Kabini and Devraj Urs canal command areas which are located in the maidan area having some-what higher

temperatures for which the State has demanded delta (water depth) in the range of 26 to 27 inches seems to be some what on higher side. For rabi cultivation in these areas a total delta of 24 inches which would give about 4 waterings of 6 inches each should suffice and appears to be reasonable.

ii) As far the second category in which Harangi, Votehole and Yagachi projects fall, their command receives higher rainfall and are also located at higher altitude and witness comparatively lower temperatures; the State has demanded water delta in the range of 28 to 33 inches which is considered to be quite high. Delta of 21 inches in this region which would give at least 4 waterings of 5 inches each should suffice. In this context, it would be pertinent to point out that the State itself has put-forth demand for delta of about 21 inches in respect of Kamasamundra and Hutchanakoppalu lift schemes which are in the vicinity of the above projects. There does not seem to be any reason why a higher delta would be necessary for the Votehole and Yagachi projects. No note has been taken of the two lift schemes namely Kamasamundra and Hutchanakoppalu for water allocation taking into consideration the facts and circumstances of the dispute.

50. As regards the perennial crop, the State is growing sugarcane in Krishnarajasagara project for which they have demanded delta of 9.25 ft. which seems to be much on the higher side. On the other hand, the State of Tamil Nadu while commenting on the high delta demanded by Karnataka for sugarcane crop have computed the water requirement of 6ft. 8.5 inches [Ref: T.N. Statement 31 page 102 para 7(b)]. We feel, delta of 7 ½ ft. could be permitted and the same has been done.

51. The State of Karnataka in their project reports, in particular, Uduthorehalla and Arkavathy reservoir projects and Iggalur Barrage project has indicated requirement of water for Mulberry crop. Also, in the Common Format, they have mentioned about Mulberry gardens in Harangi project. Mulberry crop supports sericulture industry which in turn leads to silk production for which Bangalore is famous. In view of the information in the common format, it is felt that the need for some Mulberry cultivation would be genuine. As such, one TMC of water for Mulberry cultivation is allowed. The allocation of which would be as under:-

i)	Harangi sub-basin	-	0.25 TMC
ii)	Arkavathy sub-basin	-	0.25 “
iii)	Uduthorehalla reservoir project	-	0.25 “
iv)	Iggalur project	-	0.25 “

It may, however, be clarified that this allocation is a supplementation water for Mulberry cultivation.

52. So far as the minor irrigation is concerned, the area has again been bifurcated in two parts namely: above and below Krishnarajasagara and the areas falling above Krishnarajasagara which receive better rainfall, a delta of 4.3 ft. has been allowed and for the areas falling below Krishnarajasagara, a delta of 4.6 ft. has been allowed which is similar to delta allowed for paddy cultivation in Krishnarajasagara project.

53. Based on the above water depths (delta) permitted for various crops, the following water requirement of Karnataka has been worked out for the areas assessed:-

Water requirement of Karnataka in Cauvery Basin

(Area in thousand acres, delta in inches and Water requirement in TMC)

S. No.	Reservoir projects	Area with delta					Water requirement
		Paddy	Perennial	Khariff Semi-dry	Rabi Semi-dry	Total	
1	2	3	4	5	6	7	8
1.	Krishnarajasagar	115.972 @ 55”	40.000 @ 90”	20.000 @ 15”	20.000 @ 24”	195.972	23.11+13.04+ 1.09+1.74 = 38.98
2.	Kanva	--	--	6.365 @18”	--	6.365	0.42
3.	Byramangala	--	--	4.000 @ 18”	--	4.000	0.26
4.	Marconahalli	15.000 @ 55”	--	--	--	15.000	2.99
5.	Hebballa	3.050 @ 55”	--	--	--	3.050	0.61
6.	Nugu	18.110 @ 55”	--	--	--	18.110	3.61
7.	Chikkahole	4.076 @ 55”	--	--	--	4.076	0.81
8.	Mangala	--	--	2.320 @ 18”	--	2.320	0.15
9.	Suvernavathy	9.694 @ 55”	--	7.000 @18”	--	16.694	1.93+0.46 = 2.39
10.	Gundal	5.100 @ 55”	--	2.000 @18”	--	7.100	1.02+0.13 =1.15
11.	Nallur Amanekere	--	--	3.200 @18”	--	3.200	0.21
12.	Hemavathy	13.000 @ 48”	-	442.000 @15”	200.000 @24”	655.000	2.26+24.02 +17.39 =43.67
13.	Votehole	5.500 @ 43.83”	--	--	13.000 @ 21”	18.500	0.87+0.99 =1.86
14.	Yagachi	--	--	31.400 @15”	21.600 @ 21”	53.000	1.71+1.64 =3.35
15.	Kabini	33.000 @ 51”	--	40.000 @ 16.64”	40.000 @24”	113.000	6.10+2.41 +3.48 = 11.99
16.	Harangi	17.067 @48”	--	60.000 @15”	27.828 @21”	104.895	2.97+3.26+ 2.12+0.25* =8.60
17.	Chiklihole	1.275 @48”	--	2.925 @15”	--	4.200	0.22+0.16 = 0.38
18.	Manchanabele	--	--	9.500 @ 18”	--	9.500	0.62
19.	Taraka	--	--	17.400 @18”	--	17.400	1.13
20.	Arkavathy	--	--	7.500 @ 18”	--	7.500	0.49+0.25*=0.74
21.	Iggalur	--	--	3.650 @18”	--	3.650	0.24+0.25*=0.49
22.	Dev Raj Urs Canal	--	--	40.000 @ 16.84”	40.000 @ 24”	80.000	2.44+3.48 =5.92
23.	Uduthorehalla	--	--	16.300 @18”	--	16.300	1.06+0.25*=1.31
24.	Minor irrigation (upto 1990)	Above KRS 176.880 @ 52” Below KRS 153.120 @ 55” 330.000	--	--	--	176.880 153.120 330.000	33.32 30.51 63.83
25.	Anicut channels	Above KRS 106.688 @ 52” Below KRS 89.820 @ 55” 196.508	--	--	--	106.688 89.820 196.508	20.10 17.90 38.00
	Total	**767.352**	**40.000**	**715.560**	**362.428**	**1885.340**	**233.47**
	Res. Losses						(+)17.15
						Grand Total	**250.62**

Note: 1)*Supplementation water for Mulberry cultivation under items No. 16, 20, 21 & 23. 2) Evaporation losses in reservoirs as provided in individual projects have been considered.

The total water requirement of Karnataka for providing irrigation to an area of 18.85 lakh acres works out to be 250.62 TMC.

54. While determining the water requirement of Karnataka and Tamil Nadu, the Assessors had advised that some carry-over storage in the reservoirs of the two States may be provided to take care of any delay in

the onset of south-west monsoon. However, it has been decided in agreement with the stand taken by the State of Tamil Nadu and the State of Karnataka that instead of keeping water for the purpose of carry-over, it is better to allocate that water amongst the parties, keeping in view the principle of equity, for use by the concerned States for any beneficial purposes according to the individual States' own priority. The allocation of such water along with the water for other beneficial purposes shall be dealt with and quantified in the later chapter.

Chapter 4

Domestic and Industrial water requirement of Karnataka and Tamil Nadu from Cauvery Waters

Under the beneficial uses of waters of an inter-State river system, drinking water requirement has been given the first priority not only in our National Water Policy (NWP), but also the Courts of different countries have upheld this principle. It may be pertinent to quote one instance of US Supreme Court - Harris v. Brooks - mentioned in Karnataka compilation no. U, pages 59-67:

> "The result of our examination of the decisions of this Court and other authorities relative to use of riparian proprietors of water in non-navigable lakes and streams, justifies the enunciation of the following general rulings and principles.
>
> *(a)* The right to use water for strict domestic purposes – such as for household use – is supreme to many other uses of water – such as for fishing, recreation and irrigation".
>
> (Ref. *ibid* page 67)

2. National Drinking Water Mission set up by the Government of India in 1986 which was renamed as Rajiv Gandhi National Drinking Water Mission in 1991 in its publication of August, 2005 in Chapter-I Introduction, have mentioned as under:-

> "1.1 Background – Drinking Water Supply is a State subject. Funds have been provided in the budget of the States for drinking water supply right from the commencement of the First Five Year Plan. A National Water Supply and Sanitation Programme was introduced in the societal welfare sector in the year 1954."

3. The Indian Standard – 'Code of basic requirement for water supply, drainage and sanitation' IS.1172-1993 (4th revision) presented by Tamil Nadu in their note no. 34, page 21-22, gives the water supply requirements for residences per head per day for urban communities which is quoted below:-

Water Supply Requirements:

"A minimum of 70 to 100 litres per head per day may be considered adequate for domestic needs of urban communities, apart from non-domestic needs as flushing requirements. As a general rule, the following rates per capita per day may be considered minimum for domestic and non- domestic needs:-

1)	For communities with population up to 20,000 and without flushing system. a) water supply through standpost b) water supply through house service connection.	 40 lphd (Min.) 70 to 100 lphd
2)	For communities with population 20,000 to 1,00,000 together with full flushing system.	100 to 150 lphd
3)	For communities with population above 1,00,000 together with full flushing system.	150 to 200 lphd

Note: – The value of water supply given as 150 to 200 litres per head per day may be reduced to 135 litres per head per day for houses for Lower Income Groups (LIG) and Economically Weaker Section of Society (EWS), depending upon prevailing conditions."

It would be seen that the Indian Standard code divides communities on the basis of population as also by the type of water supply delivery system.

4. 'The Manual on Water Supply and Treatment' (3rd edition) – revised and updated by the Ministry of Urban Development, New Delhi – May, 1999, had given the recommendation in para 2.2.8.3 as under:-

"----------Though the manual on sewerage and sewage treatment recommends a supply of 150 lpcd wherever sewerage is existing/contemplated, with a view to conserve water, a minimum of 135 lpcd is now recommended.

5. The recommended per capita water supply levels for designing schemes are as under:

Sl. No.	Classification of towns/cities	Recommended maximum water supply levels (lpcd)
1.	Towns provided with piped water supply but without sewerage system	70
2.	Cities provided with piped water supply where sewerage system is existing/contemplated	135
3.	Metropolitan and Mega cities provided with piped water supply where sewerage system is existing/contemplated.	150

"

6. Since we do not have the detailed information regarding the population of various towns and cities etc. in the cauvery basin; as also the type of water supply delivery system, we are considering the drinking water requirement of urban population as under:-

(i) 25% of urban population at 135 lpcd

(ii) the remaining 75% of urban population at 100 lpcd

7. As regards, the drinking water supply for rural areas, the Government of India in the National Drinking Water Mission publication, Chapter-I, page 4 para 2.2, have given the norms for providing potable drinking water for human as well as animal population as quoted below:-

“2.2 Norms for providing potable drinking water:

2.2.1 While implementing the Rural Water Supply Schemes, the following norms may be adopted for providing potable drinking water to the population.

40 litres per capita per day (lpcd) for humans to meet the following requirements:-

Purpose	Quantity (lpcd)
Drinking	3
Cooking	5
Bathing	15
Washing utensils & house	7
Ablution	10

2.2.2 In addition, provision should be allowed at 30 lpcd for animals in hot and cold desert/ecosystems in 227 blocks of 36 DDP districts already identified in the States of Andhra Pradesh, Gujarat, Haryana, H.P., J&K, Karnataka and Rajasthan.”

8. Since we do not have livestock figures separately for all the party States and U.T of Pondicherry, we are considering animal population to be equal to the rural human population - although this will be on a liberal side - and are providing 30 lpcd for animals and 40 lpcd for humans aggregating to 70 lpcd as recommended above – para 2.2.1 & 2.2.2.

9. Since the drinking water requirement would be spread over the entire area of the basin, we are of the opinion that it would be reasonable to assess that 50 per cent of the drinking water requirement would be met from the ground water sources as it is generally seen that wells and tube

wells in urban and rural areas cater to substantial requirement of drinking water.

10. It may be mentioned that while calling for information in the common format, States were asked to project their population for the years 2000 and 2025 for working out drinking water requirement. Although the Assessors suggested that drinking water requirement for the projected population for the year 2051 may be considered, but it has been decided in the present case the assessment of drinking water requirement for the year 2011 should suffice.

11. It is important to mention that when water is initially lifted from the source of supply, namely, rivers, lakes, wells etc., the entire water so lifted is not fully consumed when the same is used for domestic purposes. Out of 100 units of water initially lifted for domestic use only about 20 units are consumed and the remaining 80 units come back as return flow into the river basin. This norm has been mentioned in the CFFC Report, TNDC, Vol. XV, page 98, as also in the Godavari Water Disputes Tribunal report - 1979, Vol. I, Chapter-IV, which is reproduced below:-

> "…….We, therefore, propose to make the following provision in our Final Order:
>
> The uses of water mentioned in column (1) below shall be measured in the manner indicated in column (2):-

Use	Measurement
(i) Irrigation use	100 per cent of the quantity diverted or lifted from the river or any of the tributaries or from any reservoir, storage or canal and 100 per cent of evaporation losses in these storages.
(ii) Power use	100 per cent of evaporation losses in the storage.
(iii) Domestic and municipal water supply within the basin.	20 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.
(iv) Industrial use within the basin.	2.5 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.
(v) All uses outside the basin.	100 per cent of the quantity diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.

"

The above observations of GWDT in respect of items (iii) and (iv) were also quoted by Krishna Water Disputes Tribunal in their Further report at page 52.

12. In the case of Karnataka, it may be mentioned that Bangalore which is a metropolitan city is located on the border of Cauvery basin. The information furnished by Karnataka State indicates that 64% of the Bangalore city area lies outside the basin and only 36% of the city area lies within the basin. (Ref: KR note 33, page 14, para 6.10) However, the State of Tamil Nadu has been arguing that only 30% of city area lies in the basin whereas 70% of city area is outside the basin (T.N. Note 34, page 2). Since very accurate determination of the city area is difficult it has been considered that the city area falls - 1/3rd in the basin and 2/3rd outside the basin - which was repeatedly mentioned during the arguments.

13. The Karnataka State in their Exh. E-23 have indicated that existing and ongoing drinking water schemes for the city were for 6.52 TMC and 8.00 TMC totaling 14.52 TMC. This position was indicated to this Tribunal

during June, 1990. However, in the Statement of Case (page 163), the State has demanded ultimate drinking water requirement for Bangalore city to be of the order of 30 TMC. We are considering the existing requirements as indicated in 1990 i.e. 14.52 TMC and given by the State in their Exh. E-23 mentioned above.

14. Since two third of the Bangalore city lies outside the basin, we are considering the drinking water requirement of Bangalore city for its portion of that area only which lies within the Cauvery basin along with the remaining basin area and the drinking water requirement for urban and rural population worked out by projecting population of the basin for the year 2011 adopting the percentage decennial growth for the year 1981-91 census districtwise and the area of each district falling within the Cauvery basin as furnished by Karnataka. As far Bangalore city area within the basin is concerned, the population projection is based on census report of 2001 which was furnished by the State of Tamil Nadu in their note TN 34, page 12, table 4.

15. Twenty five per cent (25%) of the population in the urban areas has been allowed water requirement at 135 litre per capita per day, whereas 75% of urban population has been allowed 100 lpcd. This has been done keeping in view the different categories of cities and towns falling in the cauvery basin. In respect of Bangalore city, area falling within the basin, water @ 150 lpcd has been provided. For urban population the water requirement works out as 8.70 TMC. As regards rural population, water requirement at 70 lpcd has been adopted which gives a water requirement

of 8.52 TMC. The total drinking water requirement for urban and rural population comes to 8.70+8.52=17.22 TMC. Assuming that, 50% of the drinking water requirement will be met from ground water and 50% from surface water, the drinking water requirement to be made available from the river supplies including transit losses would be 8.75 TMC. The consumptive use (@ 20% of the total) for the human population including livestock works out to 1.75 TMC.

16. Similarly, domestic water requirement in respect of Tamil Nadu for its areas lying in the Cauvery basin has been worked out. All assumptions regarding per capita allowance of water etc. have been adopted as in the case of Karnataka, except that the State of Tamil Nadu had furnished details of its 17 districts falling within Cauvery basin with district population as in 2001 census. The State had also given the district -wise decadal growth rate in their document, TN note no. 34, statement-V, page 30, which has been adopted. The total drinking water requirement for the projected population (of 2011) works out to 21.98 TMC. (Rural - 10.88 TMC+ Urban 11.10 TMC). Out of which 50% will be met by the ground water and 50% from surface water; which comes to 10.99 TMC from surface water. The consumptive use @ 20 per cent of the surface water works out to 2.20 TMC which has to be allocated in the share of the State.

Industrial water requirement

Tamil Nadu

17. The State of Tamil Nadu, in their Exh. E-20, page 441 (January, 1993) had initially indicated the existing water requirement for industrial

purposes in the Cauvery basin as 2.22 TMC. However, during March, 1993, they submitted supplementary information in the common format which has been marked as E-21, wherein they gave districtwise details of industrial water requirement in the Cauvery basin aggregating to 4.98 TMC (In the foot note, it is mentioned that this information is in lieu of earlier information). As regards the industrial growth scenario, the State had projected in their document E-20, page 441, the future additional requirement in the year 2001 and 2025 as 5.21 TMC and 11.40 TMC. Thus, indicating the total industrial water requirement of 7.43 TMC during 2001 and 13.63 TMC in 2025. This gives the development ratio of 1.8 times over a period of 25 years. However, in their supplementary document E-21, page 49, their projected total requirement in 2000 is given as 14 TMC which has been increased to 37 TMC for the year 2025 giving a growth ratio of 2.6 times which appears to be ambitious. The industrial development depends on several other sectors as well – specially the energy, infrastructure and massive financial investments etc.; it is felt that the projection made by the State in their supplementary document is much on higher side. As we are projecting industrial water requirement for the year 2011, it is felt that 100% increase in the industrial water requirement than that existing in 1990 should be reasonable. We are, therefore, inclined to assume that the State's industrial water requirement by the year 2011 could be in the range of 4.98 x 2 = 9.96 TMC, out of which the consumptive use @ 2.5% would be of the order of 0.249 TMC, say 0.25 TMC.

18. In addition, Tamil Nadu has given water requirement for existing thermal power station at Mettur (Ref: E-20, page 443) as 54.339 cusecs, out of which 45.282 cusecs is returned back into the river, leaving a consumptive use of 9.057 cusecs, which equals to 0.28 TMC. Thus, the total consumptive use of water for industrial purposes considered for the State of Tamil Nadu works out to 0.25+0.28=0.53 TMC.

Karnataka

19. The State of Karnataka had given their industrial growth scenario in relation to the existing and future requirements for the years 2000 and 2025 AD in the Cauvery basin in their Exh. E-24, page 15, wherein districtwise details are indicated which aggregate to 3.20 TMC as existing industrial water requirement. The projected demand for the years 2000 and 2025 has been indicated as 5.71 TMC and 8.02 TMC giving a growth ratio of 1.4 times. However, during the last several years, it is seen that the industrial development has gathered a good momentum in the State of Karnataka, and since we are considering the industrial water requirement for the year 2011, it seems reasonable that 100% increase from the scenario existing in 1990 as assumed in the case of Tamil Nadu would be reasonable, that gives a water requirement of 3.20x2 = 6.40 TMC. The State has indicated that at present, about 2.58 TMC will be met from the ground water (Ref: E-24, page 15). Thus, the total industrial water requirement in the Cauvery basin of Karnataka would be of the order of 6.40 – 2.58 =3.82 TMC; allowing consumptive use at 2.5% of the total requirement, the consumptive water requirement works out to 0.10 TMC.

20. The domestic and industrial water requirements of the States of Karnataka and Tamil Nadu work out as under:-

Karnataka

(i)	In- basin domestic water requirement	1.75 TMC (consumptive use)
(ii)	Industrial water requirement	0.10 " (")
	Total	1.85 TMC

Tamil Nadu

(i)	In-basin domestic water requirement	2.20 TMC (consumptive use)
(ii)	Industrial water requirement	0.25 " (")
(iii)	Water requirement for Thermal Power	0.28 " (")
	Total	2.73 TMC

Chapter 5

Water requirement for Environmental Protection and Inevitable Escapages into sea

The subject of environmental and ecological protection is very wide and covers land, water and air as existing in the natural conditions. Their balance and purity gets disturbed on account of injudicious use of the available resources by human being. This further gets aggravated by the explosion of population and their distorted life style oriented towards consumerism, which is the main contributing cause of imbalance in the above three important natural elements which sustain all sorts of life. It is because of the importance of maintaining the above natural elements for sustainable and healthy use that our planners made a provision in the Constitution of the country.

2. The State of Tamil Nadu during the course of arguments have submitted a note on "Environmental and ecological needs of Cauvery basin in Tamil Nadu". [Ref. T.N. Note No. 35 dated 9.2.2005] The State has referred to Article 51A (g) of the Constitution of India dealing with Fundamental Duties which states that:

> "it shall be the duty of every citizen of India to protect and improve the natural environment, including forests, lakes, rivers and wildlife and to have compassion for living creatures."

3. However, in the present case we are only to consider the limited scope of maintaining the river regime of the Cauvery system and leaving a large number of activities which cause environmental pollution to be dealt with by the concerned party States. For example, river water pollution on

account of industrial development, deforestation leading to siltation of reservoirs, excessive use of irrigation water causing water-logging and salinity, etc. need to be taken care of under legislation by the State Governments. In the past the development in the water resources sector has not considered the above aspects which unfortunately led to adverse effects of irrigation development like drying of the rivers in the downstream reaches of dams thereby disturbing the river regime lower down, leading to encroachment by public and destruction of several species of flora and fauna, etc. As a result of injudicious application of irrigation waters, fertile lands suffered from water logging and salinity. In the areas along the vicinity of rivers, in the lower reaches away from dams, the ground water levels could not be maintained because of non-replenishments which adversely affected the village population by way of lowering of water level in local wells and/or even some cases drying of the wells. In view of these adverse effects, in the year 1986 Environmental (Protection) Act was enacted. Also guidelines for environmental impact assessment were issued in several sectors of development including the water resources development.

4. The National Water Policy - April 2002, in paragraphs 6.3 and 14.3 provided as under:-

> "6.3 In the planning, implementation and operation of projects, the preservation of the quality of environment and ecological balance should be a primary consideration. The adverse impact on the environment, if any, should be minimized and should be off-set by

adequate compensatory measures. The project should nevertheless, be sustainable."

……

"14.3 Minimum flow should be ensured in the perennial streams for maintaining ecology and social considerations."

5. In the present dispute, this Tribunal has to make apportionment of the available supplies for various beneficial uses amongst the concerned party States, viz. Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry. While doing so, the Tribunal has to take note of the environmental requirements and to reserve some quantity of water for maintaining the river regime in its various reaches right upto the mouth of the river Cauvery. As has already been mentioned, large number of storage reservoirs have come up and are existing in the Cauvery basin wherein large quantities of surface runoff shall be impounded for regulated releases during the crop seasons. During such period, when the crops are on the ground, the regulated releases from the reservoirs will flow into not only in the canal system, but also, in the river lower down which will normally help in maintaining the river regime and its health. However, during the non-irrigation season which coincides with the non-monsoon summer months from February to May conscious efforts have to be made to ensure that there are some minimum flows running in the system particularly downstream of major reservoirs specially KRS, Kabini and Mettur upto the mouth of the river. This will help in maintaining the river regime as also the availability of water running in the river during the dry summer months would benefit the village population for their domestic use, bathing and recreation

needs, etc. all along the river course as also meet the needs of animal population in the surrounding areas.

6. Dr. B.B. Sunderasan, Former Director, National Environmental Engineering Research Institute (NEERI) who also worked as an expert with the World Health Organisation (WHO), appeared before this Tribunal as witness on behalf of the Sate of Tamil Nadu who had stated that lack of adequate river flows is an overwhelming factor contributing to degradation of mangroves in Cauvery estuary; the other factors viz., tidal action and salinity are of minor consequence as mangroves thrive only at the fresh water – sea water interface and neither in totally fresh water nor totally saline waters. Thus, there is an imperative need for making provision for some water to be kept in reserve at appropriate storage sites to be gradually released during the dry months i.e. 1st February to 31st May every year.

7. The State of Tamil Nadu in their Note No.35 have demanded that at least a minimum release of 900 cusecs from Mettur during February to June may be ensured which approximately works out to about 10 TMC of water which should be reserved for this purpose. It has further stated that – "the ecological and environmental needs have to be treated as a common need of the basin and not as a requirement of an individual basin State, where the waters have to be used for maintaining the river's ecology and its estuarine eco-system."

8. The State of Karnataka in its Note No.40 has stated as under:-

> "2.3 The environmental and ecological needs arise in the Cauvery basin of Tamil Nadu from the months of February when the effect of

> north-east rainfall ends. During the months of February to May covering 120 days approximately, Tamil Nadu may require about 500 cusecs of water per day in the river, which works out to 5 tmc in total."

The State has further stated that Karnataka has installed hydro-power plant at Shivasamudram way back in 1902. After generating power on the run-of-the river scheme, 500 cusecs of water goes down to Tamil Nadu during the months of February to May. It has been brought to our notice that right from 1924 onwards a minimum flow of 900 cusecs is being let into the river during non-irrigation months and this can successfully meet the minimum water requirement for environmental purposes. As such we are of the opinion that a quantum of 10 TMC of water be reserved from the common pool to meet the needs of environmental aspects @ 900 cusecs from 1st February to 31st May to be maintained from Mettur reservoir downward in the river Cauvery every year. The proposed Cauvery Management Board shall ensure implementation of this requirement.

Inevitable escapages into the sea

9. The State of Tamil Nadu, during the course of arguments, submitted TN Statement No. 84 on 10.2.06 showing therein "inevitable surplus/outflow at Lower Coleroon anicut". The data furnished pertains to the years 1934-35 to 1995-96, i.e., 62 years. They argued that in the 38 years period i.e., between 1934-35 and 1971-72; the average surplus at Lower Coleroon anicut for the period October to December i.e. North-East Monsoon was 44.718 TMC.

10. Examination of the table indicates that no surplus from Mettur has been reported and obviously the surplus remains confined to heavy flood years only. As such, the State of Tamil Nadu has furnished details only for the surplus from Lower Coleroon Anicut for the months of North-East monsoon period viz. October, November and December. It may be mentioned that during the earlier period i.e. 1934-35 to 1973-74, the flows in the river were unrestricted, as the reservoirs in Karnataka had not been completed; hence the surpluses going into the sea were much more.

11. It appears from T.N Statement 84 (referred to above) that from the year 1978-79 to 1995-96, a period of 18 years, the details of which are given below that during this period Karnataka had started gradually increasing storage in their newly built reservoirs, as a result the outflows did remain restricted except during the flood years.

Surplus outflows at Lower Coleroon Anicut
(October to December)

No.	Year	Surplus in TMC
1	1978-79	50.877
2	1979-80	98.588
3	1980-81	**6.676**
4	1981-82	34.256
5	1982-83	**5.492**
6	1983-84	35.794
7	1984-85	13.368
8	1985-86	7.477
9	1986-87	**3.785**
10	1987-88	7.712
11	1988-89	**4.023**
12	1989-90	**2.773**
13	1990-91	**2.191**
14	1991-92	19.866
15	1992-93	70.585
16	1993-94	102.011
17	1994-95	52.035
18	1995-96	**5.032**

Source: T.N Statement No. 84

12. It is well-known that the rainfall during the North-East monsoon season comes in form of cyclonic storms, with heavy downpours for some days with interspersed dry spell periods. As such, the heavy surface flows during the months of October, November and December in the delta region mostly outflow into the sea as flood flows. The above position has been repeatedly confirmed by the State of Tamil Nadu during the course of arguments as also in their pleadings. They have been contending that rainfall of North-East monsoon is not only erratic but also causes heavy damages to the standing crops in the entire delta area because of its cyclonic nature. This pattern of North-East monsoon and its influence is well accepted by different experts as well. The present claim of Tamil Nadu is that average surplus at lower Coleroon Anicut for the period October to December i.e. North-East monsoon estimated by them as 44.718 TMC may be considered as inevitable escapages into the sea. That does not seem to be tenable, because the bulk of surplus rainfall as a result of North-East monsoon has necessarily to run into the sea in the absence of any storage facilities in that region. Therefore, It is only those escapages which flow down into the sea as surplus at lower Coleroon Anicut during the normal or below normal years of precipitation could be counted as the inevitable escapages. Accordingly, after deleting the flood years and considering seven years during which the surplus at Lower Coleroon Anicut have ranged from 2.191 TMC to 6.671 TMC need to be considered which give an average of 4.28 TMC. As such inevitable escapages below L.C.A. after the Tribunal's order can be reasonably considered to be of the order of not more than 4

TMC during a normal year. Accordingly while making the allocations amongst the party States this quantum of 4.0 TMC of inevitable escapages shall have to be deducted from the normal yield of 740 TMC available for apportionment.

Chapter 6

Apportionment of the share of the State of Kerala and the Union Territory of Pondicherry in the Waters in river Cauvery

The claim of the State of Kerala

The State of Kerala came into existence comprising of the territories of the then State of Travancore-Cochin and the Malabar district which was transferred to the State of Kerala from the existing State of Madras under the provisions of the States Reorganization Act 1956. The district of Malabar which was transferred from Madras State included parts of the two important tributaries of Cauvery, namely: Kabini and Bhavani. The third tributary of Cauvery namely: Pambar was already existing within the erstwhile State of Travancore-Cochin. Thus, the Cauvery river basin within Kerala occupies three pockets namely: Kabini sub-basin – 1,920 sq km (Wynad district), Bhavani sub-basin–562 sq km (Palghat district) and Pambar sub-basin – 384 sq km (Idukki district), total 2,866 sq km. These are hilly areas and inhabited by substantial tribal population.

2. Kabini river is formed by the confluence of Mananthavady and Panamaram rivers. Other tributaries namely: Bhavanipuzha, Karapuzha and Narasipuzha originate in the western ghats and flow through Kerala State. Bhavanipuzha joins the main river near the State border and from this confluence point, Kabini flows along the State border for about 12 km and then takes a northern direction and flows through Karnataka to join the Cauvery. Noolpuzha, one of the main tributaries does not join Kabini within Kerala. This tributary originates in Tamil Nadu, enters Kerala and

flows towards north to join Kabini in Karnataka where it is known as Nugu river. The yield of Kabini sub-basin in Kerala is reported as 96 TMC as agreed to by the three States. (Ref: KL Vol. 2, Exh. 26, page 93)

3. Bhavani river rises in the Nilgiri district of Tamil Nadu and after draining about 78 sq km, enters Kerala. Within Kerala, Bhavani river is joined by major tributaries like Varagar and Siruvani rivers. Varagar has also its origin in Nilgiri district as two streams known as East Varagar and West Varagar, draining a catchment of 44 sq km in Tamil Nadu. The yield from Bhavani basin according to State of Kerala is 36 TMC.

4. The third tributary of Cauvery namely, Pambar is joined by several tributaries within Kerala before it enters Tamil Nadu. Vattavada river originates in Kerala and after flowing for about 13 km within the State, enters Tamil Nadu where it is known as Tennar. Pambar and Tennar join within Tamil Nadu to form Amaravathy river. The yield of Pambar according to Kerala is 15 TMC.

5. After the transfer of the areas aforesaid from State of Madras, the State of Kerala started examining the possibility of utilizing the waters of the Kabini and Bhavani for the purposes of irrigation and hydro-electricity. It staked its claim for apportionment of the waters in the Cauvery basin. But because of the agreement of the year 1924 between the then State of Madras and the then State of Mysore, the State of Kerala contends that no importance was attached to the claim of the State either by the two States or by the Government of India. In this connection several letters were written by the Government of Kerala to the two State Governments

and Government of India pointing out that after reorganization of the State, the State of Kerala was entitled to utilize the waters of rivers Kabini and Bhavani. In that connection it was also pointed out that Kerala was contributing to Cauvery 147 TMC out of 740 TMC of the total Cauvery waters. The State required the waters for development of irrigation and hydel projects.

Now the question of the share to which the State of Kerala is entitled under the principles of equitable apportionment of the waters of inter-State river Cauvery is to be examined.

6. While considering the claim of the State of Kerala, CFFC (TNDC Volume XV at page 109) has stated as under:-

> "KERALA
>
> A perusal of the chapters under Introduction and under Future Projects will show that Kerala has claimed utilization of 5910.38 M.cu.m. (208.7 TMC) from the Kabini, Pambar and Bhavani lying within their territory. Of this, 1435.82 M.cu.m. (50.7 TMC) is proposed to be diverted to the west for power production and incidental irrigation and the remaining 4474.56 M.cu.m. (168.7 TMC) for consumptive use in the basin.
>
> The water for consumptive use would be mostly for raising three crops of paddy in the existing areas and new areas to be converted from the forests, plantations, etc. This will account for 80000 hectares (2,02,000 acres) and about 3174.84 M.cu.m. (112 TMC) of water.
>
> In this context it may be mentioned that the existing three-cropped area in the State as a whole is 2590 hectares (6400 acres).

The studies carried out by the Committee show that so far as the first and second crops are concerned, the requirements of irrigation would be only nominal. A chart showing the weekly evapo-transpiration and rainfall is attached. From this it is seen that rainfall is so evenly distributed over the months of May to November and in excess of evapo-transpiration and that only occasional assistance by artificial irrigation would be required in the event of some failures in small periods. It, therefore, appears that the demand for irrigation water during the first two crops is excessive.

So far as the diversion of waters from the East to the West for production of power is concerned, this is a policy matter on which the Committee can offer no observations."

7. Before this Tribunal, in the statement of case filed on behalf of the State of Kerala, in paragraph 2.10, it has been stated:-

"2.10 NEED TO USE CAUVERY WATER

2.10.1 Agriculture is the basic occupation of the people in the Kabini, the Bhavani and the Pambar Basins. The main crop in the low elevation is paddy where as in the middle and higher elevations it is the plantation crops. In the absence of assured water supply from irrigation projects, excepting a few minor irrigation works here and there serving limited ayacut, the agricultural crops in Cauvery basin in Kerala are dependent on the seasonal rainfall. Prior to the integration of States in 1956, Madras State to which Malabar belonged neglected the development of Malabar area and took no interest in the exploitation of Cauvery water for the development of irrigation or power in the Malabar region. After Malabar came over to Kerala, the following schemes were submitted by the State to Government of India for approval, for the development of irrigation in the two Cauvery Basins in Malabar, but excepting one project viz. Karapuzha in Kabini basin, no other scheme was approved by

Government of India, obviously because the dispute on sharing of water was pending:-

(1) Karapuzha
(2) Noolpuzha
(3) Thirunelli
(4) Manjat
(5) Thondar
(6) Banasurasagar (Multipurpose)
(7) Manantoddy (Multipurpose)
(8) Attappady
(9) Kerala Bhavani (Multipurpose)

2.10.2 It is this historical fact which resulted in a situation when despite availability and potential to use Cauvery water the Malabar area of Kerala could not take up irrigation projects for the benefit which is normally enjoyed by riparian State. Therefore no claim vested in prior user can be founded to the detriment of Kerala State."

8. Before this Tribunal, the State of Kerala in their Statement of Case have submitted demand of water as under:-

(in TMC)

		Kabini Sub-basin	Bhavani Sub-basin	Pambar Sub-basin
(A)	**Irrigation**			
a)	Projects	28.9	6.8	3+0.1*
b)	Minor Irrigation	4	1.5	0.6
(B)	**Domestic Water Supply**	3	1.5	1
(C)	**Industrial Uses**	5	1.5	1
(D)	**Trans-basin Diversion**			
a)	Mananthavady	16	-	-
b)	Banasurasagar	5	-	-
c)	Kerala Bhavani	-	14	-
	Total	**61.9**	**25.3**	**5.7**
	GRAND TOTAL : 92.9 TMC			

*Evaporation loss of Pambar Hydro-Electric Scheme. Note: i)In addition to above, 1.3 MC of water is being drawn by Tamil Nadu through Siruvani dam in Bhavani sub-basin for water supply of Coimbatore city. ii) Non-consumptive use of 5.6 TMC in Pambar hydro-electric project of Kerala, will ultimately flow down to Tamil Nadu. (Source: Kerala's Statement of case – pages 31 & 32)

9. Out of the above total demand of 92.9 TMC of water, a substantial quantity of 35 TMC is demanded by Kerala for trans-basin diversion to generate hydro-power. The State of Kerala in their Statement of Case (page 47 onwards) have pleaded before this Tribunal that contribution of the Cauvery basin from the State of Kerala is about 20% of the total yield of 740 TMC and considering the peculiar needs of Kerala as an over populated and industrially underdeveloped State, its reasonable share of water works out as 99.8 TMC (including non-consumptive use of Pambar H.E. Scheme – 5.6 TMC and Siruvani Water Supply Scheme for Coimbatore – 1.3 TMC in addition to their claim of 92.9 TMC). The State has emphasized that it is entitled to the use of the Cauvery water for irrigation within the State for paddy crop wherever possible and plantation crops in the hill slopes, in addition to the use of such water for the generation of hydro-electric power. Further, the claims of Tamil Nadu and Karnataka States are based upon earlier agreements (1892 and 1924) to which Kerala or the erstwhile State of Travancore, was not a party and hence not bound by such claims.

[Emphasis supplied]

Stand of Tamil Nadu on Kerala demand

10. The State of Tamil Nadu while arguing its demand of water as also areas under irrigation had briefly indicated their stand. Shri Vaidyanathan, the learned senior counsel during the course of arguments on Group-III Issues had submitted Tamil Nadu Statement 1 on 11.8.2004 wherein he

had suggested “order of priority in meeting the irrigation demand of the crop area of the basin States”. His observation is reproduced below:-

> “4. For the State of Kerala, the minor irrigation area of 0.534 lakh acres given in the report of CFFC will get second priority over areas under the ongoing and proposed projects excluding the areas under trans-basin project, 2.590 lakh acres will get Priority-V.”

Tamil Nadu has further elaborated their stand in respect of the Kerala State in their Statement No. LIV (54) dated 9.2.2005 which is as below:-

TOTAL DEMAND

(INCLUDING IRRIGATION REQUIREMENT FOR THE GROSS AREAS IRRIGATED UNDER PRIORITY-I TO IV AND THE OTHER SECTORAL NEEDS OF THE PARTY STATES)

S. No.	Sector	Kerala	
		Area in Lakh acres	Water reqd. In TMC
1	2	8	9
A	Domestic and livestock need		
	i) In basin		0.600
B	Environmental/Ecological Needs		0.000
C	i) Irrigation requirement for the area under Priority - I to IV	0.534	4.000
	ii) For Kerala as per Agreement of 1969		3.100
	iii) Evaporation losses in the reservoirs		0.000
D	Industrial & Power		0.620
	Total		8.32

Source: Row-A(i): As per TN Note No. 34
Row-B: As per TN Note No. 35
Row-C: As per TN Statement No. Annexure 53 & 54
Row-D: As per TN Note No. 36

11. From the above stand of Tamil Nadu, it would be seen that as regards the area under existing irrigation, they seem to agree to 0.534 lakh acres with a water requirement of 4.00 TMC as was indicated in the CFFC report in 1972. In addition, Tamil Nadu is referring to an agreement of 1969 entered between the State of Kerala and Tamil Nadu in connection with the Siruvani Dam from where Tamil Nadu was to draw

1.3 TMC of water for drinking purposes of Coimbatore city. With this agreement, there are two schedules and appendix:-

Schedule I – Deals with the details of Siruvani Drinking Water Supply Scheme.

Schedule II –Deals with the constitution, functions and powers of the Joint Control Board for the Siruvani Drinking Water Supply Project.

Appendix – Enumerates the decisions taken during the meeting of Chief Ministers of Kerala, Tamil Nadu and Union Minister of Irrigation & Power held on 10.5.1969 regarding the Parambikulam Aliyar Project and other river water questions of Kerala and Tamil Nadu. The paras relating to the Bhavani and Pambar basins are reproduced below:-

> "II- Bhavani basin:
>
> Kerala will utilize 2.5 TMC of water in the Bhavani basin for irrigating Attappady Valley lands, after the construction of Siruvani reservoir.
>
> III- Pambar basin:
>
> Kerala will utilize 0.6 TMC of water in Pambar Valley to irrigate lands in Kerala."

12. It appears that Shri Vaidyanathan has interpreted the above two provisions as if these are the total allocations of water allowed to Kerala under the agreement namely: 2.5 TMC in Bhavani and 0.6 TMC in Pambar = 3.1 TMC which he has indicated in his Statement No. LIV. Thus, he arrives at the total water requirement of Kerala as 7.1 TMC. Besides, he has also indicated in his above referred statement 0.6 TMC for in basin requirement for domestic and live stock need and 0.620 TMC for industrial

and power requirement. The aggregate being 8.320 TMC. (Ref: KL Vol. 2, Exh. 9, pages 31-40)

13. The stand taken by Tamil Nadu does not appear to be justified on the following grounds:-

i) In respect of Kabini, they are not considering any claim of Kerala for developing major, medium and minor schemes beyond 4 TMC which Kerala was using as early as 1972.

ii) Regarding Bhavani sub-basin, the provision refers to use of 2.5 TMC of water for irrigating Attappady valley lands which lie in Siruvani river area , whereas the learned Counsel has assumed this to be the allocation for the entire Bhavani sub-basin for Kerala.

iii) As regards Pambar sub-basin, the provision of use of 0.6 TMC of water in Pambar valley to irrigate lands is also a decision arrived at in the meeting of the Chief Ministers.

iv) In the same Appendix, in para 6, it has been mentioned that “the question of Kabini and allied matters will be further discussed between the Kerala and Tamil Nadu.”

14. It would be pertinent to refer to the relevant clauses of the agreement which are as follows:-

“(c) WHEREAS the Government of Tamil Nadu now want to augment the supply of drinking water to the Coimbatore Municipal Town;

(d) WHEREAS the Government of Tamil Nadu have sought the permission of the Government of Kerala to construct a new Dam downstream of the existing dam at Muthukulam mentioned above with adequate storage capacity to supply a quantity not exceeding 1,300 M. cft. annually to the Coimbatore Municipal Town for drinking water supply purposes;

(e) AND WHEREAS the Chief Ministers of the State of Kerala and the State of Tamil Nadu met in conference on May 10, 1969 and came to a settlement regarding the construction of the dam and diversion of the water for the said purpose.

(f) Now these presents witness and it is hereby mutually agreed as follows: -

(i) The expression "Coimbatore Municipal Town" used in this agreement shall mean the area notified as such under the Tamil Nadu District Municipalities Act, 1920.

(ii) Nothing contained in this agreement shall prejudicially affect the respective rights of the Government of Kerala or the Government of Tamil Nadu to the Cauvery river system in general or the claims of the respective Governments for the water from Bhavani Basin in particular.

Explanation:- The Cauvery River system mentioned in this clause shall mean and include the river Cauvery and all its tributaries"

[Emphasis supplied]

15. Clause II of Annexure refers to the use of 2.5 TMC of water for irrigating Attapady valley lands which lie in Siruvani river area and clause III refers to 0.6 TMC of water in Pambar valley on the basis of discussion between the Chief Ministers of Kerala and Tamil Nadu and the Union Minister of Irrigation and Power held on 10.5.1969. Clause f(ii) to the said agreement clarifies in clear and unambiguous terms that the said arrangement shall not prejudicially affect either of the parties in respect of final allocation of water of river Cauvery. The said clause shall have an overriding effect to any administrative decision taken by the Chief

Ministers. The aforesaid clause is virtually a *non-obstante* clause, which overrides whatever has been said in the Agreement. The terms mentioned in annexure to the agreement were not made part of the Agreement. In that view of the matter the claim of Kerala for apportionment is no way eclipsed by the agreement in respect of Coimbatore Municipal Town Drinking Water Scheme. As such, it becomes clear that the issue was under the process of discussions and negotiations and not a final agreement on the allocation of inter-State waters, also Karnataka was not a party in these discussions/negotiations. The question of apportionment of water has to be considered on merit. However, it is made clear that any decision by the Tribunal on question of apportionment shall not affect the agreement between the State of Kerala and Tamil Nadu so far as the release of water for Coimbatore Municipal Town is concerned.

Stand of Karnataka on Kerala demand

16. The State of Karnataka during their final arguments on the water demand by Kerala specifically raised the following points:-

i) Kerala gets sufficient rain during south-west and north-east monsoons. Therefore, the first two paddy crops namely: Virippu and Mundakan do not need any irrigation support as claimed by Kerala.

ii) The proposed summer paddy crop should not be allowed.

iii) Since 1975, the overall area under paddy cultivation in the State has been declining.

iv) Although in the Statement of Case, Kerala has emphasized the need for encouraging plantation crops which give better

economic return and are more labour intensive whereas in the project reports the Kerala State has demanded water only for paddy cultivation and not for plantation crop.

v) Kerala State as a whole has sufficient hydro-power potential in their large number of west flowing rivers, as such, trans-basin diversion from east flowing rivers namely: Kabini and Bhavani of Cauvery basin which is a water deficit basin, should not be allowed.

17. In the above connection, first reference was made by Karnataka to the evidence of Dr. Gopalakrishnan (Witness No.1 for Kerala) who during his cross-examination stated as follows:-

"Q.273: From 1975-76 to 1995-96, during the 20 year period, the rice area has declined and if you look at 1995-96, it is 471.

A: Correct.

Q.274:Correspondingly, if you look at the third column, the gross cropped area, which was 2,447 in 1962-63, has increased in 1995-96 to 3,048. Right?

A: Yes.

Q.275; If you see Karnataka Exhibit No. 459, "Agricultural Statistics at a glance-1999, in 1996-97, the area under rice in Kerala was 0.42 million hectares. Right?

A: According to this Exhibit No.459.

Q.276: In 1997-98, there is a further decline to 0.40 million hectares. Do you see that?

A: Correct.

Q.277: Please see page 21 of your affidavit. In the last portion, you have given the same figures. The decline in production area from 8.75 in 1973-74 to 4.31 in 1996-97. These figures are the same what I have given to you in K.R. Ex. Nos. 458 and 459. If you want, you can compare it. Please see KR Ex.

No.458 first. You come to the year 1973-74. The area under rice is 875 thousand ha. Right?

A: Correct.

Q.278:So what you have mentioned in KR Ex.No.458 is the same as what you have mentioned in paragraph 2.42 of your affidavit. Right?

A: Yes.

Q.291: Would it be correct to say that even though the gross cropped area has increased, the area under rice has declined?

A: Has declined.

Q.292: You agree that Kerala's economy is much better today than it was 25 years ago.

A: Yes.

Q.293: Would you therefore share the view that despite the best efforts of the government, rice production has been on the decline?

A: Yes, as the data shows.

Q.294: Correspondingly the area under plantation crops and the production of plantation crops have increased in the same period.

A: Yes.

Q.295: Therefore, this shift from rice to plantation crops has been going on for at least 25 years now.

A: Exactly.

Q.296: From 1975 onwards.

A: Yes

Q.304: Do you agree that this shift from rice to plantation crops, cash crops, is in the right direction and is beneficial to those who are engaged in agriculture?

A: No, as a matter of fact I would say that it is not beneficial. Rice requires a lot of labour. Not labour but wages. To cultivate

> one hectare about 150 labourers are required. But for other crops, coconut and all that, it may be 9 or 10 and all that. More intensive labour crop is rice. So when the rice area declines, the labour employment opportunities also decline."

18. The attention of the witness was also drawn in Question No. 264 in respect of Karnataka Exhibit No. 458 "Report of the Expert Committee on Paddy Cultivation in Kerala" published in July 1999 (KAR. Vol. 58/A, page 16) which was appointed by the Government of Kerala, which he admitted. In the said Report there is a detailed discussion about the decline in the area of paddy which started from 1977-78. The relevant part is as follows:-

> "6.2.2 Given the continuing trend in the decline of area under rice, it has already lost its prominent place in the cropping pattern of Kerala. In 1975-76 area under rice accounted for 30 percent of the gross cropped area, it declined to 24 percent in 1985-86 and to just 15 percent in 1995-96 (Table 6.3)"
>
> ……..

19. In the said Report, Table 6.3 which shows that how paddy cultivation in the State had declined from 8,03,000 ha. to 4,71,000 ha. In the said Report at paragraph 6.2.4 it has been said as follows:-

> "6.2.4 Therefore the decline in per capita employment proved to be the price that the agricultural labourers as a class had to pay for their "class action" through trade unions for increasing wages and non-wage benefits. That the agricultural labour as a class could not improve their economic condition till the mid seventies (despite marked improvement in their social condition and institutionalization of reasonable norms for conditions of work) has been borne out by a number of studies."

20. Reference was also made to “Kerala State Resources Based Perspective Plan 2020 AD” published in the year 1997. (KAR Vol. 58/A, page 87). From Table D of the said Report it was pointed out that between1992-93 and 1994-95, there has been decline in the productivity of rice. After the table, it has been said:

> “It is therefore apparent that more and more farmers are going in for more remunerative crops like coconut, rubber, pepper etc. at the expense of food crops like rice and pulses.”

After that, at page 88, it has been said that reasons for the shift from cultivation of labour intensive seasonal crops to less labour intensive crops and plantation crops are:-

> “1. Decrease in availability of farm labour.
> 2. Price fluctuations with unfavourable trends during years of high production.
> 3. Higher profits from cultivation of crops like pepper, coconut, arecanut and rubber.
> 4. Drudgery of farm operations in wetlands.
> 5. High market value of reclaimed paddy lands.
> 6. Lack of infrastructure facilities in rice fields viz. assured water supply, management of irrigation water, poor communication network, mechanization for small holdings viz. power tiller, tractors, threshing & winnowing machines to reduce the cost.
> 7. Supply of inputs at reasonable price at the proper time.
> 8. Assured reasonable price for produce.
> 9. Comparatively low productivity of food crops."

21. The Question No. 937 and 938 with the reply thereof are reproduced:-

"Q.937: You have stated earlier in your testimony that there are two reasons for shifting from rice area into plantation and cash crops. One is high cost of labour and the other is unremunerative price for rice. Do you agree that this is what you have stated in your testimony?

A: Yes.

Q.938: Are you aware of any other reason why this shift has come about on a very large scale? You have said it yourself that it is now less than 50 per cent of the rice area, which was there earlier. From 1975 the decline started and today it is less than 50 per cent of the area. Are you able to attribute any other reason for that?

A: Mainly these are the two factors. Another one is the difficulty of getting labour. Youngsters are not interested to work as farm labour."

It may be pointed out that the publications referred to above; and the cross examination of Dr R. Gopalakrishnan relate to the paddy area through out the State. As such we have to examine what is the proportion of decline in the paddy area within the Cauvery basin which is in the part of the State of Kerala.

22. Then a grievance was made by the aforesaid State that the State of Kerala within its Cauvery basin proposes to have three crops in all the projects conceived, paddy-vegetables-paddy. The second paddy crop is a summer crop. Our attention was also drawn to the project reports of various schemes of Kabini basin, Bhavani basin and Pambar basin from which it appears that three crops viz. paddy–vegetables–paddy or, paddy–paddy–paddy are proposed to be grown.

23. It would be pertinent to refer to the deposition of Dr. E.J. James, 4th witness of Kerala who was cross-examined by Karnataka, and he had given comments on the subject of decline in rice cultivation pointed out to him, as under:-

> "Q:173. Has the area of rice cultivation declined in the Cauvery basin or in Kerala, in spite of the steps taken, after the report of the Expert Committee on paddy cultivation?
>
> A: The area under rice cultivation has declined in Kerala since independence. It has declined mainly because of two reasons. One is the population density. Secondly, slowly people have a tendency to go in for plantation crops.
>
> Q: 175. You said just now that the area of rice cultivation has declined over the years. But the gross area cultivated is increasing. Is that right?
>
> A: Yes. May I add one remark here with your permission? Wherever the rice is irrigated and encouragement is given to the farmers, the area under paddy cultivation has picked up. Where irrigation is not provided, the rice cultivation has come down. There is one more thing. In irrigated conditions, the yield has also gone up considerably because they have started cultivating high yielding varieties of paddy. They have found that with irrigation the yield has gone up considerably. Now they have come down. The high yielding varieties would require not only irrigation but also regular supply of fertilizers and other inputs……..
>
> Q:184: If you see for Kerala in column 2, for the period 1991-92, the area in thousand hectares is 541. For the period 1995-96, it is 471, where we have stopped in the previous chart, if you recall. Proceeding further in the years upto 1999-2000 it has come down to as much as 350. So, in total perspective, it starts from 803 in 1962-63, as you saw in the previous exhibit, and it has come down to 350, which is less than 50 per cent.

A: Yes. I have a few things to add here. One is that I will have to study thoroughly this article, before I comment authentically on this. As a scientist, I cannot just take a page and say that. I thought that the gross area under paddy cultivation has gone up because of two rice crops, because while the gross area has gone up, the net area has come down. So, rice cultivation has flourished in irrigable land and it has declined in areas, which are not irrigated. You have shown the data after 1995. I feel one interesting thing is that thereafter no project has been sanctioned to Kerala. No project has been commissioned in Kerala after that period. Naturally, if more irrigation projects were sanctioned to Kerala, not only the gross area but also the net area would have gone up considerably, as far as rice cultivation is concerned."

24. The above observations of Dr. James are corroborated in the Kerala Economic Review 2000 by the State Planning Board as under:-

"4.159 Paddy continued to be the major crop supported by irrigation during 1998-99, accounting for 47 per cent of the gross area irrigated……. Despite drastic reduction in the area under paddy, the area under irrigation for the crop remained more or less constant. This shows that the shift in area from rice cultivation is more in the un-irrigated tract." (Ref: ibid, page 81)

In the above connection, it is also noticed that the Kerala State Planning Board in their report had observed that wherever irrigation supplies are not available, the extent of area under cultivation has declined and Dr. James has also deposed that keeping in view the acute food shortage, the State of Kerala is providing several incentives to the farmers for paddy cultivation and if irrigation supplies as have been planned under the

various projects proposed by Kerala are constructed, paddy cultivation will receive a boost which would be in the larger interest of the State.

25. It was also pointed out that Karnataka State while framing Kabini reservoir project had reserved about 26.8 TMC of water in the Kabini sub-basin for utilisation by Kerala State. On a query, whether this reservation was only for Kabini sub-basin or also included Bhavani and Pambar sub-basin areas, the learned senior counsel, Shri Javali confirmed that 26.8 TMC was considered by Karnataka only for Kabini and for Bhavani and Pambar sub-basins requirement would be in addition to this quantum.

26. The learned senior counsel for Kerala State mentioned that Kerala was not in existence at the time of execution of 1924 Agreement between Mysore and the then State of Madras and as such, was not a party to 1924 Agreement. Kerala came into being as a result of reorganization of States in November, 1956. The State of Kerala in their Statement of Case page 6, para 1.6 have pleaded as under:-

> "1.6 Alongwith States' reorganization, the question of reallocation of Cauvery water among the basin States should have been settled, or at least an interim allocation should have been made so that each State could plan its schemes. But this was not done. While Kerala was barred from taking up any scheme in the basin, Tamil Nadu proceeded with new constructions utilizing Cauvery water for extending irrigation. The Mettur high level canal scheme, the New high level Kattalai canal and the Pullambadi Scheme were taken up and the Govt. of India cleared these projects in 1956-57 even without consulting other riparian States. The State of Karnataka objected to these schemes but the objections were ignored. In turn, Karnataka also embarked on new irrigation

> projects utilizing Cauvery water even without clearance from the Govt. of India……. In 1968, the Union Minister for Irrigation & Power called a meeting of the Chief Ministers of Karnataka and Tamil Nadu for discussion and clearing certain Karnataka projects. Although Kerala is a riparian State making substantial contribution of water to the Cauvery basin, it was not invited or consulted in this matter. Kerala protested against this……. Kerala was investigating certain projects for utilizing Cauvery water within its territory. Since Kerala apprehended that unilateral action of the downstream riparian States in withdrawing water from Cauvery would prejudicially affect its interest, it also addressed the Govt. of India in October, 1970, to constitute a Tribunal under the Inter-State Water Disputes Act, 1956 to adjudicate the dispute between the riparian States about the distribution of Cauvery water."

Based on the material submitted before this Tribunal and the arguments advanced, stand of the State of Kerala is that the State stands on different footing and deserves special consideration.

27. It is seen that the State of Kerala as early as 1959 wrote to the then Madras Govt. vide their letter dated 21.3.1959 (TN Exh. No.646) that it has come to the notice of the Govt. of Kerala that Kundah project of Madras Govt. envisages construction of two dams on the Varagar river for diverting water to Kundah basin. Kerala pointed out that from time immemorial some land in Attappady valley (Bhavani sub-basin) was being irrigated with water from Varagarpallam stream and as such, Kundah project, as envisaged, will result in considerable loss to Kerala State in the Attappady valley. Similarly, in the year 1961, the State of

Kerala wrote to the Govt. of Mysore vide their letters dated 19.7.1961 and 8.9.1961 pointing out to the construction of Kabini dam by Karnataka that:

> "Being an Inter-State river, this Government is naturally anxious to see that the implementation of the project does not in any way affect the natural interests of the State and that no portion of its territory is submerged by putting up the reservoir as proposed by the Govt. of Mysore". (Ref: TN Vol. IX, page 251, Exh. 647 and page 252, Exh. 648)

28. Also, the Govt. of Kerala wrote to the Govt. of Tamil Nadu seeking details of existing and future projects on the Cauvery river vide their letter dated 26.10.1961 (Ref: TN Vol. IX, page 253, Exh. 649). Thereafter, there is a series of correspondence made by the State of Kerala with the party States as well as Govt. of India. In this connection, Kerala has pointed out to Govt. of India's letter dated 11.2.1970 (Ref: TN Exh. 662) by which Dr. K.L. Rao, the then Minister for Irrigation & Power wrote to Shri C. Achutha Menon, Chief Minister of Kerala referring to the discussions with the Ministers of Tamil Nadu and Mysore and representatives of the Govt. of Kerala regarding Cauvery waters wherein it was decided that proposals for further action to be taken on the Hemavathy, Harangi and Kabini projects will be forwarded to the State Governments for their consideration. In the Minutes of Meeting, it has been mentioned under Kabini project that the requirement of Kerala from Kabini shall be considered by a Committee; further an assurance was given as under:-

"Govt. of India will issue a letter to all State Governments reiterating that the construction of new projects should not be taken up or proceeded with without the clearance of the Planning Commission."

29. The Chief Minister of Kerala wrote to the Minister of Irrigation, Govt. of India vide his letter dated 19th March, 1970 (Ref: TNDC Vol. IX, Exh. 664, page 275) wherein it was emphasized that –

i) Tamil Nadu and Mysore have implemented schemes without the concurrence of the State of Kerala which have adverse affect on Kerala's interests.

ii) Kerala had repeatedly made requests to the State of Mysore and State of Tamil Nadu regarding those schemes but the information was not being furnished.

iii) The State of Kerala seeks the equitable apportionment of the Cauvery waters before any new schemes are cleared.

iv) The fact finding machinery may be set up to make a detailed and comprehensive study in respect of Cauvery basin etc.

30. The contention of Kerala is that as no definite decision in respect of Kerala projects was coming forth, the Kerala Govt. wrote to the Govt. of India for setting up a Tribunal and referring Cauvery dispute to them. Kerala has referred to their letter dated 22.10.1970 (Ref: TNDC Vol. IX, Exh. 625, page 186) addressed to the Govt. of India on the subject "allocation of waters in the Inter-State river Cauvery and its tributaries –

reference to the Tribunal" wherein the State pointed out that it has number of useful schemes for utilizing waters of Kabini, Bhavani and Pambar and that a dozen schemes both for irrigation and power have so far been prepared to utilize about 90 TMC of water and further investigations are going on. The State emphasized the absolute need and justification for developing the hilly region of Wynad and Attappady which were under-developed etc. They referred to the voluminous correspondence in the above connection besides the continuation of inter-State negotiations for amicable settlement of the Cauvery dispute under the aegis of Govt. of India. [Emphasis supplied]

31. Karapuzha Irrigation project was the first scheme of Kerala approved by the Govt. of India in April, 1978 which they have since completed. It is worthwhile to mention the reasons given regarding necessity of the scheme in their project report at page 8, para 8, item d, which states as follows:-

> "d. Necessity of the Project:
>
> Agriculture has to be developed as the only source of existence of the local people. At present, generally, only one crop of paddy is cultivated. This is mainly because, rainfall is available only for one crop and the duration of the crop is very long. Hence the agricultural labourers get employment for a short period in one year and they get no employment during other periods. By adopting new high yielding varieties of paddy, it is possible to raise two crops of paddy easily. But this new pattern requires irrigation

during the early parts of the first crop i.e. during May-June and also during the second crop period. The aim of the project is to provide this irrigation facility. This will increase the employment potential considerably. The land owners are also benefited as the production of rice increased considerably. The development of infrastructure such as construction of new roads, bridges, buildings etc. will open out new fields of activities which will help developing the area considerably."

This project was technically examined in Central Water Commission before it was given investment clearance by the Planning Commission, Govt. of India. [Emphasis supplied]

32. As regards the other scheme namely: Banasurasagar Irrigation project, the same was refused permission by the Central Water Commission in June, 1979 on the ground that the inter-State dispute has not yet been settled. Likewise, there are several other projects namely: Mananthody Hydro-electric Project, Attappady Irrigation project, Pambar Hydro-electric Project etc. which were refused permission by the Govt. of India between 1980 to 1990. The State of Kerala had also furnished a long list of 19 projects to CFFC in the year 1972. (Ref: TN Vol. XV, Exh. 840, page 40). Had some of the above projects been cleared by the Competent Authority, the State of Kerala would have definitely succeeded in construction of some of them as they have completed Karapuzha Irrigation project. Due to non-clearance of their projects, the

State has a small area of about 53,400 acres under minor irrigation which was reported to the CFFC in the year 1972.

33. The data furnished by the State before this Tribunal also indicates that so far the development of irrigation has remained confined to minor schemes, the statement given below shows that a total of 109 minor schemes in Kabini, 73 in Bhavani and 21 in Pambar, total 203 reported to be either existing or under progress:-

Classification of Minor schemes in Cauvery Basin in Kerala

S. No.	Sub-Basin	Number of Minor Schemes in range (in Acres)				Total	Remark
		0-50	51-100	101-200	201-above		
1	Kabini	62	22	15	10	109	Minor Scheme completed and under progress
2	Bhavani	56	6	6	5	73	
3	Pamber	8	8	5	-	21	
	Total	126	36	26	15	203	

(Source: Exhibits E-51 to 53)

It is interesting to note that the size of these projects is in the following ranges:-

126 schemes covering less than 50 acres of land. 36 schemes covering area between 51 to 100 acres. 26 schemes covering an area of 101 to 200 and about 15 schemes covering area above 201 acres each.

34. It is an accepted fact that while making equitable apportionment of the waters of any inter-State or inter-National river, past utilisation is one of the factors to be considered. The Helsinki rules (1966) mention the factors on the basis of which reasonable and equitable shares in the waters of the

inter-State/inter-National river are to be determined. Even at the cost of repetition, the relevant parts of Article IV and V are mentioned hereunder:-

Article IV

"Each basin State is entitled, within its territory to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.

Article V

I. What is a reasonable and equitable share within the meaning of article IV to be determined in the light of all the relevant factors in each particular case?

II. Relevant factors which are to be considered include, but are not limited to:

1. ----------

2. The hydrology of the basin, <u>including in particular the contribution of water by each basin State</u>;

3. ----------

4. <u>The past utilization of the waters of the basin, including in particular existing utilization</u>;

5. <u>The economic and social needs of each basin State</u>;

6. ----------

7 ----------

8. ----------

9. ----------

10. ----------

and

11. ----------

[Emphasis supplied)

III. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. <u>In determining what is reasonable and equitable</u>

> share, all relevant factors are to be considered together and a conclusion reached on the basis of the whole. ……..”

[Emphasis supplied]

In view of the above, all relevant factors specified in Article V of the said Rules have to be considered and taken note of while apportioning the equitable share of the different States.

35. A reference to the Kerala’s Statement of Case page 31-32, indicates that the demand made in respect of the waters of Cauvery by Kerala State in the three sub-basins is in respect of the following:-

	Water demand in TMC
1. Multi-purpose projects for hydro-power generation and incidental use for irrigation outside the Cauvery basin involving trans-basin diversion.	35.0
2. Medium irrigation schemes for covering areas within the basin.	38.8
3. Minor irrigation works (existing, ongoing & proposed).	6.1
4. Domestic water supply (ultimate requirement).	5.5
5. Industrial uses (ultimate requirement).	7.5
6. Non-consumptive use for Pambar Hydro-electric Scheme within the basin.	5.6
7. Committed utilisation for Siruvani drinking water supply for the benefit of Tamil Nadu.	1.3
Total	99.8

We now proceed to examine the above demands of the State of Kerala for various uses as indicated above.

Hydro-Power Generation

36. So far the question regarding the trans-basin diversion of the waters of Kabini and Bhavani from the eastern side of the ghats to the western side of ghats for generation of power is concerned different aspects have to be taken into consideration. It is often the approach of a State in which lies part of the basin of an inter-State river to utilize the water of such basin in the manner it decides including by trans-basin diversion. But this concept is a misnomer. Even the excess water in that part of the basin has to be utilized in such a manner as not to affect the rights of user of such water by other lower riparian States especially when there is so much of scarcity of water against the demands made by the riparian States for their utilization within the basin. The water of an inter-State river is meant for use by all the riparian States according to reasonable needs and necessity of each State within the basin. In this background no State can be allowed to take water outside the basin as a matter of right so as to jeopardize and affect the right of other States.

37. Irrigation has always been given higher preference over generation of hydro electricity unless water is surplus and does not affect irrigation in the basin. National Water Policy of the year 2002 while indicating the priority and importance to be given to the water use in the basin, it has been said:-

> "**Water Allocation Priorities**
>
> In the planning and operation of systems, water allocation priorities should be broadly as follows:

- Drinking water
- Irrigation
- Hydro-power
- Ecology
- Agro-industries and non-agricultural industries
- Navigation and other use.

However, the priorities could be modified or added if warranted by the area/region specific considerations."

(Ref: TN Compilation No. VI at page No.23)

38. Mr Raju Ramachandran, the learned senior counsel arguing for the State of Kerala submitted in support of his claim for trans-basin diversion that from the language of Section 3 of the Inter-State Water Disputes Act, 1956, the Tribunal has to take into account the necessity and need of the whole State. As such, if there is necessity of water in areas outside the basin, then the Tribunal can allow trans-basin diversion. The argument appears to be against the spirit of the Inter-State Water Disputes Act and the reference made to this Tribunal. The reference made to this Tribunal by the Govt. of India says as under:-

"New Delhi, 2nd June, 1990.

In exercise of the powers conferred by sub section (i) of section 5, of the Inter-State Water Disputes Act 1956 (33 of 1956), the Central Government hereby refers to the Cauvery Water Disputes Tribunal for adjudication, the water disputes regarding the inter-State river Cauvery, and the river valley thereof, emerging

from letter No.17527/K2/82-110 dated the 6th July, 1986 from the Government of Tamil Nadu (copy enclosed).

By order and in the name of
The President of India."

39. Apart from that, if it is accepted that while determining the equitable share of a particular riparian State, even the shortage of water in the neighbouring basin which is outside the basin in question, is to be considered then in that event the Tribunal will have to determine, the need and necessity of the neighbouring basins along with water resources available therein. This will lead to an anomalous position because no evidence is available before this Tribunal in respect of other areas/basins of the State falling outside the Cauvery river basin. Mr. Ramachandran, further based his claim on the general principle of trans-basin diversions especially on the ground that Mananthavady and Kerala Bhavani Schemes are technically very attractive and can be compared only to Sabarigiri and Idukki of Kerala State where the availability of fall for generation of power is 2460 and 2165 ft. respectively, and it will be a waste of opportunity not to generate hydro-power through the schemes in which nature has bestowed great advantage and are vital for enhancing power availability in the northern region of Kerala specifically erstwhile Malabar region which is deficient in power.

40. If there is a conflict between the requirements for irrigation and for hydro-electricity, preference needs to be given to irrigation, in the basin in view of conditions prevailing in India. There are substitutes for electricity

generation by way of thermal power, nuclear power, solar power, but there is no substitute for water which is to be utilized by different States in the basin for the purpose of agriculture. In Helsinki Rules of 1966, reference has been made to basin States but this process of diversion cannot be executed by any one of the riparian States at the cost of other lower riparian States affecting their irrigation, economy and social needs.

41. The Krishna Water Disputes Tribunal has considered the question of diversion of the Krishna Water outside the Krishna basin, in detail in Chapter XIII of the Report. From a reference to page 128 (page 88 of the TN Compilation No. XI,) it shall appear that the Tribunal observed:

> "The preponderance of opinion seems to indicate that diversion of water to another watershed may be permitted, but normally, in the absence of any agreement, the prudent course may be to limit the diversion to the surplus waters left after liberally allowing for the pressing needs of basin areas. In general, basin areas are more dependent on the water than other areas. Maximum economic benefit can rarely be achieved by ignoring the pressing needs of the areas of origin and permitting development elsewhere."

At page 137 of the Report (Page 97 of the TN Compilation), the Tribunal said:

> "The available river supplies in the Krishna basin are insufficient to satisfy the demands of all the existing uses and the projected additional uses as well. The river Krishna commands extensive irrigation potential along the natural course of the river. The demands for the pressing needs of irrigation alone are so large that they cannot be wholly satisfied from the river supplies. Until irrigation from the new projects is fully developed, it may be

possible to allow westward diversion of some additional water for purposes of power production. But upon full development of such irrigation, it will be impossible to satisfy the demands of the irrigation projects as well as the additional demands for the westward diversion schemes. There is a clear conflict of interest between claims of down stream irrigation and power development by westward diversion of water. The question is whether; - in allocating the waters of the river Krishna, the claims of power production by westward diversion of water should be allowed at the expense of irrigation."

42. Regarding preference between the irrigation and Hydro-power at page 139 (TN Compilation page 99) it has been said:

"For irrigation use, there is no substitute for water, but power may be generated from coal, oil, nuclear energy and other sources, In general, whenever production of hydro-electric power interferes with irrigation and the two uses cannot be reconciled, increasing priority may have to be given to irrigation. Rapid growth in population calls for increased food production which in turn calls for intensified irrigation."

43. The Narmada Water Disputes Tribunal in their report have also quoted the above observation of KWDT at para 10.10.3 of their report. From pages 128 and 129 (pages 88 and 89 of the TN Compilation), it shall appear that some diversion outside the basin which was in existence since long had been conceded by all parties as such were not disturbed. In this connection, it is relevant to quote paragraphs 5.21 and 5.22 of the Report of the Irrigation Commission, Volume I, page 90:-

Paragraph 5.21:

"Multipurpose river valley projects offer the best use of surface water resources; but apart from situations where both power generation and irrigation may be possible; there may be other cases in which a choice has to be made between the use of water either for irrigation or power generation. The Western Ghats offer sites with high heads for the generation of cheap hydro-electric power by diverting westwards the waters of east flowing streams. In Maharashtra parts of the waters of the Koyna, a tributary of the Krishna, has already been partly diverted westwards to generate hydro-electric power at Koyna power station, which has an installed capacity of 560 M.W. In such cases, where a choice is involved, priority has to be determined not only by economic considerations, but by recognition of the fact that irrigation is possible only by the use of water, whereas power can be generated from alternative sources such as coal, gas, oil and atomic fuel."

Paragraph 5.22:

"In view of the overall capacity of water resources, we recommend that wherever a choice has to be made between irrigation and power generation, preference should be given to irrigation. The east flowing rivers rising in the Western Ghats traverse areas which have low rainfall and suffer from water scarcity. The needs of these areas should receive priority. It is interesting to note that the United States Bureau of Reclamation considers irrigation of paramount importance in the planning of multi-purpose projects, and nowhere in its policy-making legislation does the Bureau accord recognition to power production as a function superior to the use of water for irrigation."

44. In New Jersey v. New York 283 U.S. 336 (1931) at p. 343, the U.S. Supreme Court observed:

> "The removal of water to a different watershed obviously must be allowed at times unless States are to be deprived of the most beneficial use on formal grounds.
>
> Diversion of water from one river basin to another is viewed with distrust and resisted by the basin population."
>
> [Emphasis supplied]

45. In University of Colorado Law Rev 527, Lawrence J. Mac Donnel, Director National Resources Law Center, University of Colorado School of Law and Charles W. Howe, Professor of Economics, University of Colorado, Boalder, in their Article titled 'Area of Origin Protection in Trans-basin Water Diversions, An Evaluation of Alternative Approaches' 1986 (Ref: KAR Compilation S-30 at page 539) it has been said:-

> "Economically Efficient Trans-basin Diversion – We start by considering the conditions that must exist if an out of-basin transfer project is to be considered economically desirable. Three conditions are required: (1) the transfer must be the least-cost alternative for providing that quantity of water (of comparable reliability) to the users; (2) the benefits to the users of the transferred water must exceed: (a) losses to the area of origin (including downstream basins to which it may be tributary); plus (b) transfer-related construction and operation costs; and (3) no one should be made worse-off by the project. Although these conditions seem self-evident, they require careful explication so they can be properly translated into operational guidelines."
>
> [Emphasis supplied]

46. Apart from the legal position, regarding trans-basin diversion, on behalf of the State of Karnataka, it was urged that from the records and evidence adduced on behalf of the State of Kerala, it shall appear that there is no such power shortage which can be said to be a ground for diversion of water from sub-basins of Cauvery like Kabini and Bhavani, outside the basin towards the western side of the ghats. First reference was made to the affidavit of KL Witness 2, Shri Balakrishnan Nair. He has given the details of Mananthavady and Kerala Bhavani Multipurpose Projects. The former is planned to generate 598 million units of electricity annually with an installed capacity of 225 MW and Kerala Bhavani to generate 387 million units of electricity with an installed capacity of 150 MW. Both these projects involved trans-basin diversion towards west of the Cauvery basin in Kerala. (Ref: Affidavit of Shri R. Balakrishnan Nair, page 4)

47. The Government of India had set up an Expert Committee in 1973 headed by Sh. C.C. Patel the then Additional Secretary, Ministry of Irrigation and Power alongwith Sh. P.R. Ahuja and Sh. B.R. Palta eminent engineers as consultants and others to study the report of CFCC and suggest the scope of economy in the use of Cauvery water. The Committee's report entitled "Appraisal of availability and requirements of Cauvery Waters" is placed before this Tribunal as Exh. B-I by the Ministry of Water Resources, Govt. of India. In the said report the observations of the Expert Committee regarding Mananthavady and Kerala-Bhavani projects are quoted below:

"3.7.3 Kerala

The State have proposed Mananthoddy Multipurpose Project in the Kabini sub-basin, Kerala-Bhawani, Panthanthodu and Pamber-Bhawani in the Bhawani sub-basin involving transfer of the Cauvery Waters outside the basin. Since the basin itself is short of water, such transfers are not desirable……." (Ref: ibid Exh. B-I, Page.20)

So far as the Cauvery basin is concerned, because of shortage of water, against demands by each riparian State, no note can be taken of claims made by the States for apportionment of water in respect of any trans-basin diversion already made or proposed to be made for any purpose.

48. In answer to Question No.255, Shri Balakrishnan Nair after looking into the Annual Report prepared for the year 1990-91 has agreed that considering the vagaries of monsoon which affects any hydro-electric system, the State of Kerala has been considering about the thermal power stations.

49. After looking KAR exhibit 488 which is an extract from Kerala State Electricity Boards Annul Plan prepared in April 1999 for the year 1998-99, the Witness No. 2 admitted in reply to Question 340 that in that report it has been said at page 45, paragraph 3.2 as under:-

"Kerala Power system being mostly hydro based is subject to vagaries of monsoon resulting in power cuts and cyclic load sheddings. A reliable power system must have a hydro-thermal mix of at least 60:40. ……."

50. The second witness on behalf of the State of Kerala, in reply to Q. 341 and after looking into Karnataka Exh.489 (KAR Vol. 59, page 35) which is an extract from the Government of India publication, Central Electricity Authority, Southern Regional Electricity Board, Annual Report 1999-2000, wherein 17 hydro projects are mentioned admitted that all these are on west flowing rivers. On behalf of the State of Kerala, second witness has admitted that there are 17 hydro projects on west flowing rivers.

51. Karnataka Volume No.59 at page 36 there is a statement titled 'Installed capacity as on 31.03.2000 and generation for the year 1999-2000 in the Southern Region" at Columns 2 , 4 and 6, the details of projects on the west flowing rivers, effective capacity and the total at the end of the year respectively have been given. According to the aforesaid statement, the following are the 17 projects on the west flowing rivers:

1. Kuttiyadi
2. Sholayar
3. Poringalkuthu
4. PLBE
5. Pallivasal
6. Sengulam
7. Panniar
8. Neriamangalam
9. Sabarigiri
10. Idukki
11. Idamalayar
12. Kallada
13. Peppara

14. Madupatty
15. Lower Periyar
16. Malampuzha
17. Kakkad

Further the Witness has admitted in the answer to Q. 342 that column No. 6 of the publication aforesaid of the Central Electricity Authority, Southern Regional Electricity Board, Annual Report 1999-2000, shows the 17 hydro projects and the installed capacity as 1745 MW. Further in answer to Q. 343 to 348 he admitted that if all the figures are added at on completion of all projects i.e. by 2005, the total installed capacity for generation of power shall be 4830.85 MW and that is without taking into consideration Mananthavady and Kerala Bhavani projects.

52. From answer to Q.535 to 536, it shall appear that he admitted the contribution from Mananthavady and Kerala Bhavani put together shall be only little about 5%. However, he asserted in answer to Q. 537 that even 5% is not small in power generation planning. In reply to Q 295 regarding Economic Review 1999, prepared by the State Planning Board (Marked Karnataka Exh. 484) he has admitted the same. It has been said that the growth of hydel power continued at a reasonable rate till 1976 when Idukki Power Project was commissioned. Since then further hydro development has been held up somewhat due to environmental consideration. Because of that the State has to increasingly turn to thermal power and its share from Central sector thermal/nuclear power plants for meeting its growth demand. Further in that repot it has been said at paragraph 54 of page 38:

> "By the end of the next financial year, 2000-2001, it is expected that the State will be able to achieve self-sufficiency in power by and large and thus reduce its dependence on power import."

In reply to Q 300, he said:

> "I endorse that addition of thermal stations has resulted in improving power supply."

53. Shri K. E. Damodaran Nayanar KL W.3 has stated in his Affidavit that in Malabar region the only generating station in this region is Kuttiyadi with an installed capacity of 75 MW. Then he has stated that there was a proposal to augment generation at Kuttiyadi station by using 5 TMC of Cauvery water from Banasurasagar. During cross-examination in Q. 17 his attention was drawn to Economic Review 2000 published by Government of Kerala, Department of Planning, Karnataka Exhibit No 497, paragraph 1.43 mentions as under:

> "1.43 Power situation has considerably improved in the State during the last three years. Power cut and load shedding have been completely withdrawn. Note has to be taken however, that per capita consumption of electricity in the State during 1998-99 was 278 KWH, which is far below the national average of 334 KWH for 1998-99. However, in 1999-2000, per capita consumption in the State has gone upto 300.56 KWH. Dependence on hydro-electric power and the undue delay in commissioning of the projects already taken up for implementations have to be reviewed to take appropriate measures to ensure adequate power supply. In view of the resource constraints faced by the State Government, it has been decided to mobilize funds for the massive investment required for setting up power plants. To involve the private sector in power development, initiatives taken so far has borne fruit."

In paragraph 5.1 of the same publication it has been said :

> "With this increase and improvement in the overall performance, the State has been able to achieve self-sufficiency in power and withdraw the power cuts and load shedding."

Paragraph 5.10 of the Publication says: -

> "5.10 Although Kerala has achieved significant growth in Power Sector in the last few years it cannot be overlooked that power development in Kerala is constrained by several factors. The State's only resource for power generation is hydro-power. The hydro potential of the State is estimated to be 4500 MW of which 40% has already been exploited. Most of the attractive sites are already developed. The development of the remaining sites is fraught with environmental concerns and has to be planned and implemented carefully."

54. As regards the Pambar hydro-electric project for which the Kerala State has demanded 5.6 TMC, it may be mentioned that the claim could be only for non-consumptive use i.e. reservoir losses of 0.1 TMC. As regards 5.6 TMC of non-consumptive use, this water will gradually flow downstream in the river for use in lower areas including those in Tamil Nadu. In this connection, it would be important that the regulation of this hydro-power reservoir of Pambar is done in such a way so that the seasonal irrigation requirement of irrigation downstream of this scheme is not affected and for that, both Kerala and Tamil Nadu shall have to agree on the schedule of releases from the reservoir; failing which, the Cauvery Management Board which we propose in subsequent chapters, will have to deal with that matter.

55. Regarding the remaining hydro-electricity projects planned and conceived by the State of Kerala which involve trans-basin diversion of the waters of the river Kabini and Bhavani, while considering the question of apportionment of the waters of an inter-State river normally trans-basin diversions are not allowed unless the yield of the basin is sufficient so as not to affect the requirement of different riparian States in the basin. The restriction in respect of trans-basin diversion has been examined in detail in earlier chapter of this Volume. In view of the above position, it is not possible to allocate water for Mananthavady, and Kerala Bhavani multipurpose scheme involving trans-basin diversion.

Demand for irrigation, domestic and industrial water uses

56. The State of Kerala have submitted data in respect of their projects in the Common Format as also separately by way of individual project reports which have also been marked as exhibits before this Tribunal. There are some variations in the figures given in the individual project reports vis-à-vis Common Format Data and the demand given in the Statement of Case. However, since project reports furnish better technical details, we have examined the same for assessing the viability, reasonableness of the area, justification of cropping pattern as well as water demand.

57. An examination of the project details has brought out following aspects:-

1) Out of the irrigation schemes projected before this Tribunal, only one scheme i.e. Karapuzha project had been approved by the

Govt. of India. The extract from Govt. of India's letter of 19th April, 1978 is reproduced below:-

> "2. The acceptance of this project in the Cauvery basin is further subject to the Inter-State understanding of August 1976 regarding utilization of Cauvery waters and the utilisation from the above project shall not exceed 2.80 TMC." (Ref:KL Vol. 3, Exh. 29)

2) Although in the Statement of Case and the affidavits of the witnesses, the State has been emphasizing on spice and plantation crops but while placing the demand for water, they have only submitted their requirement for mainly paddy and vegetable crop besides indicating demand for domestic and industrial uses. Also, there are some hydro-power projects which involve inter-basin transfer of water.

It would be interesting to refer to Kerala's Statement of Case page 25, para 2.7.2 reproduced below:-

> "2.7.2 Development of agriculture, particularly plantation crops which give large scale employment, is a worthwhile economic activity that can be taken up in the Cauvery basin region, and adjoining areas, in order to improve the economic conditions of the people there. Plantation crops like coffee, cardamom, arecanut, coco and pepper require water throughout the year, particularly during the summer months, and are very sensitive to drought. Unlike seasonal crops, once the plantation crops are affected by drought it require about five years or more to raise new crops and bring them to yielding stage. Water resources can be exploited for maximum production when applied to plantation crops since the

economic benefit per unit of water from plantation crops is much more."

It appears that though plantation crops require water throughout the year, requirement is critical particularly during the summer months, as the plantation crops are said to be very sensitive to drought. As such, we are considering the demand as placed by the State Govt. before us because it appears that for the spice and garden crops normally their water requirement is met with from the rain water except in some cases of short fall during summer months and once the projects are in position, the small requirement of plantation crops could be met with from the reservoir storages for which provision of 5% of the irrigation requirement in reservoir projects has been made as a safeguard to meet emergency requirements of plantation crops as and when necessary.

3) As regards culturable command area (CCA) and ayacut under individual projects, it is noticed that invariably the extent of proposed ayacut is much less than the CCA. This appears to be so, because of the physical nature of the area which is undulating in character. The State has reported that the main crop in the low elevation areas is paddy, whereas in the middle and higher elevations, it is the plantation crops. Taking this situation in consideration, attempt has been made to assess reasonable needs of the State so that irrigated area equal to the culturable commanded area could be allowed.

4) The State has proposed two paddy crops and one vegetable crop for the Kabini sub-basin. However, it is seen that in case of first crop “Virippu” which is raised during May to September, bulk of its water requirement is met with from south-west monsoon precipitation. This is mostly a rainfed crop. The second crop “Mundakan” is raised from end of September to end of January i.e. the winter season when some rainfall from northeast monsoon provides support. This is their principal irrigated paddy crop. The third crop “Puncha” is grown from January end to early May mainly as a summer crop. Although, the State Govt. has proposed raising first crop i.e. Virippu and summer paddy crop i.e. Puncha, but summer paddy cannot be allowed because of non-availability of rainfall support. The first crop needs little support of artificial irrigation. The second crop namely: Mundakan which succeeds Virippu as a transplanted crop, this needs artificial irrigation although it receives some support from northeast monsoon.

The Govt. of India while sanctioning Karapuzha project has also allowed these two paddy crops with a water delta of 1.38 ft. and 4.38 ft. As regards the summer season, it is suggested that vegetable crop which the State proposes to raise during the winter season could be shifted to the summer season and grown in patches where residual moisture from the previous paddy crop is available and if needs further support that could be taken from ground water.

5) In the case of Bhavani sub-basin, the State has proposed three paddy crops in their Attappady project which does not seem to be justified. Since Bhavani sub-basin receives rainfall during southwest monsoon which is weaker, only one paddy crop is being allowed during northeast monsoon, whereas the proposed paddy crop during southwest monsoon has been suggested to be replaced by any semi-dry crop.

Similarly, in the case of Pambar sub-basin, although the State has proposed two paddy crops, the same has been restricted to one paddy and one semi-dry crop.

6) No lift irrigation for raising paddy cultivation seems justified.

7) It is also noticed that the demand for domestic and industrial water use is excessive. The State has submitted its demand for the entire population @ 120 litres per capita per day (LPCD). However, it is considered reasonable to limit this demand only for 30% population which might be in the towns and the rest to be covered under rural category including live-stock.

8) Similarly, the State has placed excessive demand for industrial use which has been restricted to 33% of the quantity of the existing actual utilisation for projected development till 2011.

Keeping in view the above broad considerations and the fact that contribution of Kerala in the yield of the basin is almost one fifth and also the ground realities that the State has substantial tribal population in Cauvery basin area where the individual holdings are small, the

reasonable water requirement based on the socio-economic needs, agro-climatic conditions and the availability of land for cultivation have been worked out and projectwise details thereof are discussed below:-

Kabini sub-basin

58. The State has placed demand for irrigation and hydro-power including trans-basin diversion through twelve projects out of which Mananthavady and Banasurasagar involve hydro-power generation, with trans-basin diversion of water. Banasurasagar project also caters to in-basin irrigation needs of an area of 6,916 acres.

Out of the remaining ten projects for irrigation, one project namely; Karapuzha medium irrigation project is reported to be under construction since 1974; this project is duly approved by the Govt. of India. Another project namely Banasurasagar project (dam component) is under construction as Kuttiyadi augmentation project by the Kerala State electricity board as a hydro-power project.

1.Karapuzha Project

59. This approved project covers a CCA of 13,800 acres with an ayacut of 11,500 acres. The proposed net irrigation covers the entire ayacut of 11,500 acres. The approved project allows two paddy crops namely; khariff paddy (Virippu-period May to September) in 11,500 acres and second crop of rabi paddy (Mundakan-period October to February) in the same area i.e. 11,500 acres (total 23,000 acres – gross irrigation). This gives an intensity of irrigation as 166% when compared to CCA. The water requirement under this project including lake losses has been limited

to 2.8 TMC as provided in the clearance letter. (Ref. KL Vol. 3, Exh. No. 29 front page – letter of acceptance dated 19.4.78)

60. The examination of the remaining nine projects shows that the season of first paddy crop (i.e. Virippu) as mentioned in the project reports (submitted before the Tribunal) has been delayed by two months i.e. instead of crop period being from May to September, it has been shown as July to November. Similarly, the second crop of paddy (i.e. Mundakan) is proposed to be taken in the summer season from February to May and during the intervening period between November and February which is normally Mundakan season, they are proposing to raise vegetable crops. As is well known, raising of paddy crop during summer season consumes lot of water and is also without any support from rainfall, as such, there have been recommendations of the National Commission of Agriculture, 1976 as well as the Irrigation Commission, 1972 that paddy crop should not be raised during summer season, when there is no support from rainfall. Also by projecting three crops as mentioned above in their projects in the Kabini sub-basin, the State of Kerala has indicated a very ambitious plan.

61. Keeping in view the fact, that the hilly region of Kabini sub-basin is inhabited by substantial tribal population and has so far been under-developed, being without any reasonable irrigation facilities, it seems worthwhile to allow two paddy crops namely: Virippu and Mundakan as already approved by the Govt. of India in the case of Karapuzha project. This also appears to be justified because during the south-west monsoon

season from May to September when Virippu crop is raised, there is very good support from the rainfall and only minimum support from artificial irrigation is needed, which is limited to 1.38 feet of delta (water depth). But in the Mundakan season i.e. from October to February, when second paddy crop is raised, as already permitted by the Government of India in the Karapuzha project, support from irrigation is required which would be of the order of 4.38 feet delta.

As regards the vegetable crop which the State has proposed as a third crop, the same could be taken in those valley areas where there is residual soil moisture supported by ground water exploitation.

2. Noolpuzha Project

62. This is a medium project covering a CCA of 15,438 acres. The gross irrigated area under two paddy crops of 4,994 acres each would be 9,988 acres giving an annual intensity of irrigation as 65% of CCA with water requirement of 1.25 TMC. (Ref: KL Vol. 12, Exh. No. 38).

The crop-wise water requirement as approved by the Government of India in the case of Karapuzha project has been allowed whereas area under lift irrigation in paddy crops as also area proposed under vegetable as a third crop has been deleted with the suggestion that wherever feasible, vegetable crop during summer season may be grown in the valley bottoms keeping in view the availability of soil moisture and support from ground water.

3. Banasurasagar Multi-purpose Project

63. Banasurasagar is a multi-purpose project comprising (i) a composite dam 2081 ft. long with maximum height as 113.3 ft., (ii) a

diversion tunnel, 9.2 ft. (2.85 m) ‘D’ shaped and 4.68 km long, connecting the augmentation reservoir and Kuttiyadi reservoir, and (iii) 5 radial gates of size 36 ft. x 21 ft. (10.97 m x 6.4 m). Its power component has been named as Kuttiyadi augmentation scheme whereby the water stored in the reservoir on Karmanthodu river, a tributary of Kabini, is proposed to be diverted to the existing Kuttiyadi hydro-electric scheme by means of a tunnel to increase the power potential. In addition, the scheme aims at irrigating some area in its own basin (within Kabini sub-basin) limited to utilization of 1.7 TMC, whereas 5.0 TMC will be taken outside Kabini sub-basin into the Kuttiyadi river basin. (Ref.: KL Vol. 4, Exh. No. 30, pages 2, 38 & 41, paras 5.1.0 & 5.2.6).

It may be mentioned that Kuttiyadi hydro-power project is in operation since 1972 but with the meagre storage capacity. The augmentation reservoir would divert 4.4 TMC as planned (Ref: ibid, pages 2 & 36, Table 4-A). This project is reported to have been technically cleared from the various departments of Central Water Commission and Central Electricity Authority during the year 1982. However, because of the inter-State angle the project was not cleared by the Central Government. The State Government has reported that the scheme had been undertaken outside the plan with the Kerala State Electricity Board’s resources during 1982, with an estimated cost of Rs. 34.04 crores. (Ref.: KL Vol. 4, Exh. 30, preface, page 1)

During cross examination, Mr. R. Balakrishnan Nair, witness on behalf of the State of Kerala, had mentioned that there has been

substantial progress on the construction of the main dam whereas the tunnel has been completed and is in operation. Water is being diverted from the reservoir through this tunnel keeping in view the available storage during construction period. (Ref.: Deposition of Sh. R. Balakrishnan Nair, Vol. I, Q. No. 96).

The irrigation component of the project, which benefits areas in Cauvery basin, covers a CCA of 9,880 acres out of which net irrigated area is 6,916 acres with a gross irrigated area of 8,151 acres, which gives annual intensity of irrigation as 83% of CCA and a water requirement of 0.84 TMC. In this project, the first paddy crop cultivation which is sown during the period of south-west monsoon has been shown as limited to 1,235 acres, whereas the summer paddy has been shown as 6,916 acres. Actually, the summer paddy area should have been sown as first crop paddy namely Virippu and the area of about 1,235 acres could be raised as second paddy crop i.e. Mundakan. The reasonable requirement has been worked out keeping in view the above cropping system, which comes as 0.84 TMC.

During the hearing of the proceeding it was brought to the notice that the State of Kerala has been diverting about 5 TMC of Cauvery water from the river Kabini to augment Kuttiyadi hydro-power scheme. During the course of cross-examination of Shri R. Balakrishnan Nair, second witness on behalf of the State of Kerala, the witness has admitted to such a diversion as is evident from the following:-

"Q: 93 In your affidavit, are we right in understanding that there is no reference to Banasurasagar and diversion to Kuttiyadi? Are we right in saying that you have not chosen to make any statement because if you were associated, we should have expected reference to that in your statement. In other words, you have not given evidence in respect of Banasurasagar and diversion to Kuttiyadi.

A: I have not mentioned it here, no.

Q: 96 You did not mention because…….

A: I did not feel it necessary. That is all. In Banasurasagar, diversion was already taking place and in Pambar, there was no diversion at all. At the time of testifying before the Tribunal, Banasurasagar diversion was almost implemented. That was 1995-97. And in Pambar, there was no water being taken consumptively for use in Kerala. It was entirely let into Tamil Nadu……."

In earlier chapter the question of trans-basin diversion has been considered and examined in detail and taking the facts and circumstances of the present case, it has been held that trans-basin diversion for any purpose cannot be taken note of. Accordingly the claim on behalf of the State of Kerala for 5 TMC of water for trans-basin diversion made by it during the pendency of the proceedings before this Tribunal cannot be considered for purposes of water allocation.

4. Manjat Irrigation Project

64. This is a minor project which proposes to cover a CCA of 4,730 acres with a net irrigated area of 1,136 acres by flow irrigation. The project envisages construction of three dams which will submerge an area of 365.34 ha. (902 acres). The project does not seem to be viable,

as it provides for three crops in an area of 1,136 acres each, and other three crops under lift irrigation covering an area of 3,507 acres each, which appears to be too ambitious. As such, this project has not been considered. (Ref.: KL Vol. 23, Exh. No. 49).

5. Thirunelly Project

65. This is again a medium project covering a CCA of 14,326 acres. The net irrigation under flow has been indicated as 9,690 acres and gross irrigation as 16,112 acres. However, as in Banasurasagar project, the first paddy crop has been projected for a larger area of 9,690 acres during summer season, whereas lesser area of 6,422 acres has been projected for second crop, actually this should have been in the reverse order.

Accordingly, for working out the reasonable water requirement, an area of 9,690 acres is being considered for first paddy crop namely Virippu, and an area of 6,422 acres for second paddy crop namely, Mundakan. The water requirement for both these crops would work out to 1.81 TMC with an overall intensity of irrigation as 112% of CCA for flow irrigation. The lift irrigation proposed under this project is 1,536 acres to be brought under each of the two paddy crops which has not been considered. (Ref.: KL Vol. 6, Exh. No. 32).

6. Thondar Irrigation Project

66. This is a medium irrigation project covering a CCA of 8,892 acres out of which net irrigation is projected in an area of 6,953 acres with a gross irrigation of 13,906 acres, giving an annual intensity of irrigation as 156% of CCA. However, for working out reasonable water requirement,

an area of 6,953 acres under each of the first and second crops has been allowed giving water requirement of 1.75 TMC. (Ref.: KL Vol. 16, Exh. No. 42).

7. Peringottupuzha Irrigation Project

67. This is again a medium irrigation project with a CCA of 11,856 acres and net irrigation of 9,794 acres, out of which 4,360 is lift irrigation. Thus the net flow irrigation is for 5,434 acres only, which could be brought under cultivation for two paddy crops giving a gross irrigation of 10,868 acres. This gives an intensity of irrigation as 92% of CCA and water requirement of 1.37 TMC. (Ref.: KL Vol. 15, Exh. No. 41).

8. Kallampathy Irrigation Project

68. This is a medium irrigation project covering a CCA of 13,585 acres out of which 9,880 acres is projected as net irrigation for raising two paddy crops giving gross irrigation of 19,760 acres and annual intensity of irrigation as 145% of CCA with water requirement of 2.49 TMC. (Ref.: Vol. 10, Exh. No. 36).

9. Kadamanthodu Irrigation Project

69. This is a medium irrigation project covering a CCA of 15,561 acres with a net irrigation of 6,052 acres in which two paddy crops are projected giving gross irrigation as 12,104 acres and an intensity of irrigation as 78% of CCA and water requirement of 1.53 TMC. (Ref.: KL Vol. 17, Exh. No. 43).

10. Cheghat Irrigation Project

70. Although, this is a minor irrigation project covering proposed CCA of 3,952 acres the same does not seem to be viable because the project

proposes construction of a dam to the height of 27.5 m having a submergence of 477 acres to benefit an area of 1,062 acres by gravity irrigation. The project is seen to be ambitious to cover an area of 2,569 acres by lift irrigation. Therefore, the project has not been considered. (Ref.: KL Vol. 22, Exh. No. 48).

11. Chundalipuzha Irrigation Project

71. This is a medium project covering a CCA of 7,459 acres with net irrigation in 5,187 acres by flow irrigation. An area of 1,351 acres proposed by lift irrigation is not being allowed. It may be mentioned that in this project the summer paddy has not been considered and instead that very area is allowed under Mundakan season i.e. second paddy crop. The flow irrigated area for two paddy crops gives a gross irrigation of 10,374 acres which has been allowed with water requirement of 1.31 TMC. (Ref.: Vol. 13, Exh. No. 39).

Mananthody Multi-purpose Project

72. This being a Trans-basin hydro-electric project proposing diversion of 16 TMC of Cauvery water has already been dealt with under hydro-power generation.

Minor Irrigation Schemes

73. Ninety seven minor irrigation works including small lift schemes are reported as complete upto 1990 covering an area of 6,136 acres; and nineteen minor irrigation works including lift schemes are reported to be in progress in 1990 covering an area of 2,612 acres. The individual minor schemes cover area in the range from 9.0 acres to 300 acres; bulk of

schemes being below 100 acres and only one scheme covering 800 acres (Ref. KL Vol. 25, Exh. 51, pages 29 & 31). Besides, the State Government had indicated to C.F.F.C. that there are large number of small temporary diversion schemes for which proper statistics are not available. (Ref. KL Vol.40, Exhibit 111 page 21). In addition, minor irrigation works covering an area of 5,085 acres (2058.7 ha) were to be investigated as in 1990. (Ref. KL Vol. 25, Exh. 51, page 31 Item 104). Thus on completion of ongoing schemes the total area covered under minor irrigation works in Kabini sub-basin would be 8,748 acres; without taking into consideration the area yet to be investigated. The State Govt. in the data furnished in the year June, 1992 had indicated that minor irrigation schemes covering an area of 5,085 acres in the Kabini sub-basin are proposed to be investigated but, so far, after a lapse of over a decade, the State has not reported to this Tribunal as to how many of those schemes have been investigated and taken up for execution. As such, we are unable to allocate water for the same. Keeping in view the large spread of small minor irrigation works including temporary diversions which the ryots put up for irrigating lands, by construction of numerous temporary bunds across large number of water courses for which data is not available, although water is being drawn from the river system, it would cover that water withdrawal, if for identified minor irrigation works, two paddy crops are allowed as demanded by the State. For the minor irrigation works with water delta of 2.68 ft. (812.49 mm) for the first crop and 4.01 ft. (1214.78 mm) for the second crop has been demanded for the entire area including that yet to be investigated. The

water requirement for this entire area has been indicated as 4.00 TMC. (Ref: Exh. 51, page 7, para 3.3.3). Allowing the delta as indicated by the State of Kerala, the water requirement for the allowed area (which includes completed and ongoing schemes only) works out to be 2.55 TMC instead of 4 TMC demanded by the State.

74. The statement below gives the details of water requirement of Kabini sub-basin:-

Irrigation water requirement of Kabini sub-basin

Area in 000 acres
Delta in feet
Water requirement in TMC

S. No.	Name of Project	Water demand as per Statement of Case	CCA	Area with delta (Assessed as reasonable)			Water requirement
				Paddy			
				Virippu	Mundakan	Total	
1	2	3	4	5	6	7	8
1.	Karapuzha	2.80	13.80	11.50/1.38	11.50/4.38	23.00	0.69+2.19=2.88 limited to 2.80
2.	Noolpuzha	3.70	15.44	4.99 "	4.99 "	9.98	0.30+0.95=1.25
3.	Banasurasagar	6.70	9.88	6.92 "	1.24 "	8.16	0.51+0.33=0.84
4.	Manjat	2.20	4.73	-	-	-	-
5.	Thirunelly	3.50	14.33	9.69 "	6.42 "	16.11	0.58+1.23=1.81
6.	Thondar	2.70	8.89	6.95 "	6.95 "	13.90	0.42+1.33=1.75
7.	Peringottupuzha	4.00	11.86	5.43 "	5.43 "	10.86	0.33+1.04=1.37
8.	Kallampathy	3.20	13.59	9.88 "	9.88 "	19.76	0.60+1.89=2.49
9.	Kadamanthodu	1.10	15.56	6.05 "	6.05	12.10	0.37+1.16=1.53
10.	Cheghat	1.50	3.95	-	-	-	-
11.	Chundalipuzha	2.50	7.46	5.19 "	5.19 "	10.38	0.32+0.99=1.31
12.	Emergency requirement for plantation crops @ 5% of crop water requirement	-	-	-	-	-	0.75
13.	Reservoir losses	-	-	-	-	-	0.98
	Sub-Total Maj. & Med. Proj.	**33.90**	**119.49**	**66.60**	**57.65**	**124.25**	**16.88**
14.	Minor Irrigation	4.00	-	-	-	17.50	2.55
	Total	**37.90**				**141.75**	**19.43**

Note: 1) In all projects, delta for Virippu (mostly rain-fed) and Mundakan (principal crop) has been taken as per Karapuzha project approved by CWC.
2) Reservoir losses have been taken to be 8% of water requirement of the projects, for all projects on the basis of Karapuzha project; reservoir losses for Karapuzha and Banasurasagar projects a included in the water requirement.

Bhavani sub-basin

75. In the Bhavani sub-basin, the State of Kerala has placed demand before this Tribunal for five projects including Kerala Bhavani multi-purpose project. (Ref: Statement of case – page 31).

1. Attappady Irrigation Project

76. The Attappady irrigation project is reported to have been prepared in the year 1976 and submitted to Central Water Commission. It remained under technical scrutiny between the State Govt. and the C.W.C. However in 1982, the Central Water Commission informed the State, that the clearance to the project was pending for want of agreement on Cauvery waters. The Attappady project envisages a masonry dam across the Siruvani river. This would be a second dam located downstream of the already existing small dam across Siruvani river constructed to supply 1.3 TMC of water for drinking purpose to Coimbatore city under a bilateral agreement between Tamil Nadu and Kerala. (Ref: KL Vol. 2, Exh. 19, page 29). The CCA of the project is 10,737 acres. The net irrigated area under Attappady project would be 10,737 acres with a gross irrigation of 20,694 acres. The cropping pattern proposed under the project is quite diversified. The diversified cropping pattern would be as under (Ref: KL-5, Exh. 31, page 10):-

Crop		**(Area in acres)** (Exh.31 page 10 as proposed)	**Area in acres** (as allowed)
1)	Paddy (3 crops)	11,115	3705 (Single Crop)
2)	Vegetable Crops I, II, III 563 acres each	1689	1689
3)	Sugarcane	1976	1976
4)	Banana	3073	3073
5)	Groundnut	1420	5125 * (3705+1420)
6)	Cotton	679	679
7)	Maize	371	371
8)	Chilly	371	371
	Total	**20694**	**16989**

(*1st paddy crop replaced by groundnut)

The water requirement as indicated by the project report including three paddy crops was 4.5 TMC which has been restricted to 2.87 TMC deleting the summer paddy crop and also substituting the khariff paddy with semi-dry crop (groundnut), keeping in view the inadequacy of rainfall because in the Bhavani sub-basin, the southwest monsoon is weak. This project appears to be an important project of the State in the Bhavani sub-basin, which will mainly benefit the tribal population. The State Government has reported that the project has been included in the Master Plan for the development of the tribal area but is pending for want of resolution of inter-State water issue. The project report also indicates that protected drinking water to two important villages in the valley is also envisaged under this project. The quantity of drinking water demanded is 0.058 TMC. (Ref. Kerala Vol.5, Exh. 31).

Kerala Bhavani Hydro-power Project

77. This trans-basin multi-purpose hydro-power project proposing diversion of 14 TMC of Cauvery water, has been dealt with earlier under hydro-power generation.

2. Panthanthodu Project

78. This is a minor irrigation project which was envisaged in 1973. Through this project, small quantity of water from Cauvery basin was proposed to be transferred to Anamooli project in the adjoining Thenkara valley. The Anamooli project was originally irrigating only 500 acres with its own water, whereas through this minor project, additional 1600 acres were brought under paddy cultivation utilizing 4.13 feet depth of water for the crop which gives a water requirement of 0.29 TMC. (Ref: Kerala Vol.32, Exh. 60)

The State has a proposal to further enhance the scope of irrigation under this project by diverting some additional water from Kerala Bhavani multi-purpose project as and when implemented. The reservoir of Kerala Bhavani project would submerge the existing diversion structure of Panthanthodu scheme. Since trans-basin diversion of water to the extent of 14 TMC has not been considered from a water short Cauvery basin, further extension of irrigation as proposed by Kerala does not arise.

3. Thudikki and Arali Irrigation Project

79. In the Statement of Case, Thudikki and Arali have been shown as separate projects whereas the project report combines them into one project submitted vide Kerala Vol. 24, Exh. 50. The combined project falls in minor category. The CCA under this project is reported as 2,218 acres.

The net irrigated area being 1976 acres, with a gross irrigated area of 3,952 acres which comprises of two paddy crops namely; Virippu and Mundakan in an area of 1,976 acres each, giving an annual intensity of irrigation as 178% of CCA. Since the southwest monsoon in Bhavani sub-basin is weaker, raising paddy during that season does not seem to be advisable. Hence, it is suggested that Virippu could be substituted with groundnut which needs less water. The water requirement for this project would be 0.572 TMC.

Minor Irrigation Schemes

80. In the Statement of case the Kerala Government have projected water requirement of 1.5 TMC for minor and small lift irrigation works in the Bhavani sub-basin. (Ref. page 31 para 2.11.8 item A-6). In all, 73 works have been listed covering an area of 5,128 acres (2,076.15 ha.). The list includes existing, under progress and projected schemes. No separate details have been furnished for different categories of schemes apart from this there are number of temporary diversions for which data is not available. (Ref.: KL Vol. 25, Exh. 52, page 51 to 71)

Two crops of paddy are to be raised in these minor irrigation schemes for which a delta of 4.58 ft. (1389 mm) and 4.74 ft. (1435 mm) respectively has been demanded and water requirement indicated as 2 TMC. (Ref. KL Vol. 25, Exh. 52 page 49).

Though, Bhavani sub-basin receives rainfall during both the monsoon seasons namely: southwest monsoon and northeast monsoon but the rainfall pattern in this basin is deficient in comparison to that of

Kabini sub-basin. As such, single paddy crop during Mundakan season appears to be reasonable. As regards the demand of the State for second paddy crop, the same does not seem to be justified and the State may raise semi-dry crop during south-west monsoon with 1.25' delta. The reasonable requirement works out to 1.28 TMC.

81. The statement below gives the details of water requirement of Bhavani sub-basin:-

Irrigation water requirement of Bhavani sub-basin

Area in 000 acres
Delta in feet
Water requirement in TMC

S. No.	Name of Project	Water demand as per Statement of Case	CCA	Area with delta (Assessed as reasonable)				Water requirement
				Khariff semi-dry & misc.	Mundakan	Pere-nnial crop	Total	
1	2	3	4	5	6	7	8	9
1.	Attappady	4.50	10.74	8.23 @1.98	3.71 @4.93	5.05 @6.20	16.99	0.71+0.80+ 1.36= 2.87
2.	Panthanthodu	1.10	4.20	-	1.60 @4.13	-	1.60	0.29
3.	Thudikki-Arali	1.20	2.22	1.98 @1.72	1.98 @4.93	-	3.96	0.15+0.42 =0.57
4.	Emergency requirement for plantation crops @ 5% of crop water requirement.	-	-	-	-	-	-	0.19
5.	Reservoir losses	-	-	-	-	-	-	0.32
	Sub-Total Maj. & Med. Proj.	**6.80**	**17.16**	**10.21**	**7.29**	**5.05**	**22.55**	**4.24**
6.	Minor Irrigation	1.50	-	-	-	-	10.26	1.28
	Total	**8.30**					**32.81**	**5.52**

Note: Reservoir losses have been taken to be 8% of the water requirement of the reservoir projects.

Pambar sub-basin

82. The State of Kerala have submitted demand for five projects in Pambar sub-basin out of which, one is hydel project and the remaining

four are irrigation projects. Only one project namely - Thalayar is a medium irrigation project and the remaining three viz. Chengalar, Vattavada and Chambakkad are minor irrigation schemes.

1. Thalayar Project

83. The CCA under Thalayar project is 5,483 acres with net irrigated area of 2,989 acres and gross irrigated area as 5,459 acres that is the intensity of irrigation being nearly 100% of CCA. The proposed cropping pattern is (i) Khariff paddy crop (Virippu) in 2,470 acres and (ii) Rabi paddy (Mundakan) also in 2,470 acres, besides sugarcane in 519 acres. As in the case of Bhavani sub-basin, the southwest monsoon in Pambar sub-basin is also weak, as such, it would be advisable to replace Virippu paddy and sugarcane by groundnut. The water requirement for this project would be 0.78 TMC. (Ref.: KL Vol. 20, Exh. 46).

2. Chengalar Project

84. The Chengalar is a tributary of Thalayar and in the lower reaches the latter joins Pambar. Pambar and Tenar join within Tamil Nadu territory to form Amaravathy river. The CCA under the project is 4,841 acres with gross irrigated area of 4,048 acres giving an intensity of 84% of CCA. The entire irrigated area is proposed under sugarcane crop which needs to be replaced by Mundakan paddy. The water requirement of this project would be 0.80 TMC. (Ref.: KL Vol. 21, Exh. 47).

3. Vattavada Project

85. The Vattavada is a tributary of Pambar. It originates in Kerala and enters Tamil Nadu where it is known as Tenar. The Vattavada project covers a CCA of 3,409 acres. The net irrigated area is 1,848 acres and

the gross irrigated area is 3,696 acres giving an intensity of irrigation as 108% of CCA. Two crops of paddy namely; Virippu and Mundakan are proposed under this project, these crops could be revised as groundnut and Mundakan paddy.

Although, the State has proposed the third vegetable crop during summer season in the entire area but the same cannot be permitted for obvious reasons. The areas under vegetable cultivation, if at all could be in those pockets of the ayacut where soil moisture is available and is supported by ground water. The water requirement under this project would be 0.52 TMC. (Ref. KL Vol. 19, Exh. 45)

4. Chambakkad Project

86. This is again a minor scheme which although covers an area of about 1,927 acres as of CCA but the area proposed under net irrigation is only 124 acres because bulk of area is under forest cover. This gives an annual intensity of 13% only of CCA. The net irrigated area is proposed to be sown twice under paddy crops namely; Virippu and Mundakan, which needs to be revised by groundnut & Mundakan paddy giving gross irrigated area as 248 acres. The water requirement in this project will be 0.03 TMC. Water for the third crop namely; summer vegetable cannot be permitted and the vegetable could be grown wherever feasible in those portions of the command, where soil moisture is available to be supported by ground water. It may be mentioned that under this minor irrigation scheme, no storage is proposed but water is to be directly lifted from the weir, though the extent of lift involved has not been indicated in

the project report. This project ought to have been included under minor irrigation schemes. (Ref: KL Vol. 18. Exh. 44)

Pambar Hydro-electric Project

87. Besides the above four irrigation schemes, the State Government has submitted a project report for Pambar hydro-electric project which involves non-consumptive use of water from Pambar river to the extent of 5.6 TMC. However, an evaporation loss from the reservoir under this scheme is reported to be of the order of 0.1 TMC which will be consumptive use to be included in the water demand of the State. Since the bulk of the supply is non-consumptive and within the Cauvery basin, the same could be considered. However, since the water released down-stream the Pambar river after generation of power is to flow to Tamil Nadu into their Amaravathy reservoir, the State of Kerala and Tamil Nadu shall have to jointly agree to the schedule of water releases from Pambar hydro-electric project so that it does not affect the irrigation lower down in an adverse manner. (Ref.: KL Vol. 35, Exh. 74).

Minor Irrigation Schemes

88. In the Statement of Case the Kerala Government has indicated water requirement for minor and small lift irrigation works as 0.6 TMC. (Ref.: page 32, para 2.11.9, item A-6). The State Government have furnished details of 21 minor irrigation schemes covering an area of 1,585 acres (say 642 ha) and they have also reported, that an area of 1,722 acres (say 698 ha) would be covered through sprinkler irrigation in tea estates. Thus total area of 3,307 acres (1,339 ha.) would be under minor irrigation works in

Pambar sub-basin. (Ref.: KL Vol. 25, Exh. 53, pages 93-97). In addition, there may be temporary diversions from small streams as in Kabini and Bhavani sub-basins for which data is not available.

Two paddy crops are proposed to be raised under minor and lift irrigation schemes for which delta of 4.48 ft. (1359.4 mm)and 4.34 ft. (1315.75 mm) has been demanded covering an area of 1585 acres (642 ha.), whereas for sprinkler irrigation in 1722 acres (698 ha.) with water delta of 0.49 ft. (150 mm) has been indicated. Thus the total requirement of water is indicated as 0.64 TMC. (Ref: KL Vol. 25, Exh. 53, page 91). In this sub-basin also, it would be reasonable to consider only single paddy crop in 1,585 acres and one semi-dry crop during south-west monsoon; besides sprinkler irrigation in 1,722 acres with a delta of 4.48', 1.25' and 0.49' respectively. This gives a water requirement of 0.44 TMC as against 0.64 TMC demanded by the State Govt.

89. The statement below gives the details of water requirement of Pambar sub-basin:-

Irrigation & Hydro-power water requirement of Pambar sub-basin

Area in 000 acre
Delta in fe
Water requirement in TM

S. No.	Name of Project	Water demand as per Statement of Case	CCA	Area with delta (Assessed as reasonable)			Water requirement
				Khariff semi-dry & misc.	Mundakan	Total	
1	2	3	4	5	6	7	8
1.	Thalayar	1.50	5.48	2.47 @1.72	2.99 @4.71	5.46	0.18+0.60=0.78
2.	Chengalar	0.60	4.84	-	4.05 @4.71	4.05	0.80
3.	Vattavada	0.30	3.41	1.85 @1.72	1.85 @4.71	3.70	0.14+0.38=0.52
4.	Chambakkad	0.60	1.92	0.12 @1.72	0.12 @4.71	0.24	0.01+0.02=0.03
5.	Emergency requirement for plantation crops @ 5% of crop water requirement	-	-	-	-	-	0.10
6.	Pambar H.E.	0.10	-	-	-	-	0.10
7.	Reservoir losses	-	-	-	-	-	0.18
	Sub-Total Maj. & Med. Proj.	**3.10**	**15.65**	**4.44**	**9.01**	**13.45**	**2.51**
8.	Minor Irrigation	0.60	-	-	-	4.89	0.44
	Total	**3.70**				**18.34**	**2.95**

Note: Reservoir losses have been taken to be 8% of the water requirement of the reservoir projects.

Domestic water requirement

90. For working out the domestic water requirement, the Assessors had taken the population census of 1991 into consideration and projections were made for the year 2051 i.e. the domestic water requirement, about 45 years from now was taken for making provisions. However, it has been decided to consider the projection for 2011 while considering the domestic and industrial water requirements. As regards the ratio of urban and rural population, about 70% of the projected population has been taken as rural and the remaining 30% as urban.

The State of Karnataka had raised a point that the projection should be static because Kerala is gradually going down in population growth; whereas the learned senior counsel for the State of Kerala emphasized that the sub-basin areas of Kabini, Bhavani and Pambar are located in high lands where gradually the people from the lower and middle level regions are migrating because of pressure on land in the lower and middle regions. As such, the decennial growth of population should not be disturbed and adopted as given in the States documents. Therefore, adopting that decennial increase rate, the population has been projected.

As regards the drinking water requirement, although the State has demanded at a flat rate of 120 litres per capita per day (LPCD) for the entire population but it would be reasonable to bifurcate the demand between rural and urban areas. As such, for 30% urban population, the demand as placed by the State at 120 LPCD has been considered and for the rural population including live-stock, the requirement has been restricted to 70 LPCD of the population (human being 40 LPCD + cattle 30 LPCD). Working on the above norms, the drinking water requirement for Kabini, Bhavani and Pambar sub-basins comes to 0.97 TMC, 0.45 TMC and 0.11 TMC, total 1.53 TMC.

The above requirement would be the total quantum of water which would be initially drawn by the State from the river system; whereas the actual consumptive use out the above would be limited to only 20%. The rest 80% will gradually flow back into the system over period of time. Therefore, the allocated share would be limited to only 20% ie. 0.20 TMC,

0.09 TMC and 0.02 TMC, total 0.31 TMC for the three sub-basins.

Industrial water requirement

91. As regards industrial water requirement of Kerala, the existing industrial water use for different types of industries in Kabini sub-basin namely: small scale, large and medium scale, khadi village industries, seri-culture etc. has been indicated by the State as 0.50 TMC (Ref: E-95, page 51-56). This requirement is assumed to increase by another 33% in quantity by the year 2011. Total requirement works out to (0.52+0.17) 0.69 TMC. Although this quantity of 0.69 TMC will be initially lifted by the concerned authorities for different types of industries, the consumptive use out of that would be limited to only 2.5% (this norm was assumed by the Godavari Tribunal with the consent of the parties concerned – Ref: Further report of GWDT Chapter VII, Clause-III, page 25). Working on the above lines, the industrial water need for Bhavani sub-basin and Pambar sub-basin would be 0.21 and 0.26 TMC each, giving a total initial requirement of 0.69 + 0.21 + 0.26 = 1.16 TMC, but the consumptive use which would be debitable to the share of the State would be limited to 2.5% of 1.16 TMC i.e. 0.04 TMC only. The rest will flow back over the time into the system.

Share in balance water

92. After providing water for various beneficial uses to all parties to the dispute, it transpired that there is saving of 45.08 TMC of water. This balance water is decided to be distributed in the proportion of 1991 in-basin population of the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry. While total in-basin population of the parties is

295.39 lakhs as mentioned elsewhere, Kerala's in-basin population is 9.87 lakhs (Kabini 6.05 + Bhavani 2.99 + Pambar 0.83). The share of Kerala in the balance water comes out to 1.51 TMC (Kabini 0.91 + Bhavani 0.45 + Pambar 0.15 = 1.51) which the State may use keeping in view States' own priorities in the public interest.

93. The overall water requirement of Kerala in respect of irrigation, domestic supply, industrial use and hydro-power is given in the following statement:-

Total Water Requirement of Kerala

Area in 000
Water in

S. No.	Particulars	CCA	Crop Area					Water Requirement
			Virippu	Khariff semi-dry & misc.	Mundakan	Perennial Crop	Total	
1	2	3	4	5	6	7	8	9
A	Irrigation:							
A-1	Major & Medium Projects							
	(i) Kabini sub-basin	119.49	66.60	-	57.65	-	124.25	16.88
	(ii) Bhavani sub-basin	17.16	-	10.21	7.29	5.05	22.55	4.24
	(iii) Pambar sub-basin*	15.65	-	4.44	9.01	-	13.45	2.51
	Sub-Total (A-1)	**152.30**	**66.60**	**14.65**	**73.95**	**5.05**	**160.25**	**23.63**
A-2	Minor Irrigation							
	(i) Kabini sub-basin	-	-	-	-	-	17.50	2.55
	(ii) Bhavani sub-basin	-	-	-	-	-	10.26	1.28
	(iii) Pambar sub-basin	-	-	-	-	-	4.89	0.44
	Sub-Total (A-2)	**-**	**-**	**-**	**-**	**-**	**32.65**	**4.27**
	Sub-Total -A (A-1+A-2)						**192.90**	**27.90**
B	Domestic Water Supply/ Consumptive use @ 20%							
	(i) Kabini Sub-basin	-	-	-	-	-	-	0.97/0.2
	(ii) Bhavani Sub-basin	-	-	-	-	-	-	0.45/0.(
	(iii) Pambar Sub-basin	-	-	-	-	-	-	0.11/0.(
	Total-B	-		-	-	-	-	**1.53/0**
C	Industrial Uses/ Consumptive use @ 2.5%	-	-					
	(i) Kabini Sub-basin		-		-	-	-	0.69/0.(
	(ii) Bhavani Sub-basin	-	-		-	-	-	0.21/0.(
	(iii) Pambar Sub-basin	-	-		-	-	-	0.26/0.(
	Total-C	-			-	-	-	**1.16/0**
D	Share in balance water	-	-					
	(i) Kabini Sub-basin		-		-	-	-	0.91
	(ii) Bhavani Sub-basin	-	-		-	-	-	0.45
	(iii) Pambar Sub-basin	-	-		-	-	-	0.15
	Total-D	-			-	-	-	**1.51**
	Total (A+B+C+D)	**27.90 + 0.31 + 0.04 + 1.51 = 29.76 Say 30.00 TMC**						

Note: *Includes 0.10 TMC reservoir losses in Pambar H.E. project.

94. It would be seen that the area of 53,400 acres as existing under minor irrigation during the year 1972 has now come down to 32,650 acres. In this connection, it may be mentioned that some of the existing minor irrigation area has got covered under the proposed medium irrigation projects in all the three sub-basins. In this context, it would be pertinent to refer to the remarks of the Expert Committee in Exh. B-1, page 19, which are reproduced as under:-

> "The bulk of the ayacut under the existing and future minor irrigation schemes in Kerala is taken to be ultimately merged in the ayacut under their proposed major and medium irrigation projects."

95. Further, it would be seen that in the Kabini sub-basin, water requirement has been worked out as 19.43 TMC including reservoir losses for irrigation covering a gross area of 1,41,760 acres, for Bhavani sub-basin irrigation water requirement is 5.52 TMC covering a gross area of 32,800 acres and for Pambar sub-basin, water requirement is 2.95 TMC covering a gross area of 18,340 acres. The reasonable water requirement of Kerala for irrigation works out to 27.90 TMC covering a gross area of 1,92,900 acres (1,41,760 + 32,800 + 18,340). The total water requirement of Kerala for all beneficial uses works out to 29.76 TMC, Say 30.00 TMC.

It is clarified that the Tribunal is only allocating water based on the needs which have been worked out keeping in view the various projects of Kerala regarding water requirement. This does not amount to sanction of any project by the Tribunal; as such clearance of the project under the

requirement of law, i.e. clearance under Forest and Environment Act, etc. needs to be obtained by the State Government in respect of not only irrigation but for any developmental activity affecting the forest area or environment.

96. The sub-basinwise break-up of water requirement would be as under:-

	Irrigation	Drinking	Industry	Share in balance water	Total
(i) Kabini sub-basin	19.43	0.20	0.02	0.91	20.56
(ii) Bhavani sub-basin	5.52	0.09	0.01	0.45	6.07
(iii) Pambar sub-basin	2.95	0.02	0.01	0.15	3.13

Since water accounting shall be done at inter-State contact points the allocation should be preferably be made in whole numbers, thereby the share of each sub-basin shall be as under:

Kabini sub-basin	21 TMC
Bhavani sub-basin	6 TMC
Pambar sub-basin	3 TMC
Total	30 TMC

97. The State of Kerala has been allocated a total of 30 TMC of water as indicated above. The State of Kerala may take some time to utilize its full allocated share and some unutilized water from its share will be flowing in Kabini, Bhavani and Amaravathy reservoirs. The claim of Tamil Nadu was that it was cultivating prior to 1974, an area of second crop 1,82,500 acres in the old delta, 23,200 acres in Lower Coleroon Anicut System and

46,600 acres under Cauvery Mettur Project, and further 28,500 acres for double crop in non-delta area, totaling 2,80,800 acres (Ref: Tamil Nadu Statement No.5 dated 13.8.2004, No. 1-C dated 5.10.2004 and Response of the State of Tamil Nadu to the reports of the Assessors). We had not taken note of this claim of Tamil Nadu for the purpose of apportionment. In view of this, the unutilized water from Kerala's share is being permitted to be used by Tamil Nadu, till such time Kerala uses its allocated share of water. The temporary arrangement of use by Tamil Nadu of the unutilized water from the share of Kerala shall not confer any right whatsoever on Tamil Nadu.

Claim of the Union Territory of Pondicherry for Karaikal region in the waters of Cauvery river system

98. Karaikal region which is a part of the Union Territory of Pondicherry is situated on the South Coromandel Coast. Three sides of Karaikal region are bounded by Tanjore district of Tamil Nadu and on the East by the Bay of Bengal. The breadth East to West is about 13.7 km and the length North to South is about 18.7 km. The soil is mostly sandy and lands are fertile. The total geographical area of Karaikal region is 14,920 hectares (ha) of which 10,990 ha (27,000 acres) are under cultivation. The economy of the region is predominantly agriculture. The region is fully covered by a network of seven distributaries of the river Cauvery and therefore, Karaikal region forms part of the Cauvery delta at the tail end of the river system. Due to close proximity to sea the ground water is generally brackish and unsuitable for drinking or irrigation purposes.

99. In paragraph 4 of the statement of claim of the Union Territory of Pondicherry, it has been stated: -

> "4. It is respectfully submitted that the cropping pattern and the water requirements of Karaikal region are as follows: -

S. No.	Crop	Area (hectares)	Water Requirement (Mcft.)
(1)	Samba (Single Crop)	4760	3006
(2)	Kuruvai (Khariff double crop)	6230	2868
(3)	Thalady (Rabi - double crop)	6230	3366
		Total	9240"

100. The total area converted into acres shall be 42,533 acres. The total water requirement has been estimated at 9.355 TMC including 115 mcft for drinking water supply.

101. Karaikal which forms a part of the U.T. of Pondicherry was under French Administration for many years but a riparian area so far as the Cauvery basin is concerned. Shri A. S. Nambiar, Learned Senior Advocate representing Union Territory of Pondicherry pointed out that the agreement dated 18.2.1924 had been entered into between the then Government of Madras and the Government of Mysore in connection with the construction of the Krishnarajasagar dam and both the Governments recognized and took into consideration the interest and rights of the French Territory so far as the Cauvery water was concerned. In this connection reference has been made to a Press Communiqué issued by the State of Madras dated 3.7.1924 in respect of Cauvery Agreement. (Ref: Statement of Case – Annexure VI). A reference was also made to a letter No. 1202.A I. dated 06.09.1926 written by the Governor of Madras to the Governor of French Settlements in India, Pondicherry, in which the State of Madras gave an undertaking that supply of Cauvery water to the Pondicherry for Karaikal area shall not be less than what has been found sufficient in the actual practice, as the object of Mettur Project was to improve the existing cultivation under the Cauvery which included the French Territory of Karaikal (Ref: ibid, Annexure viii, p. 20). The U.T. of Pondicherry has also sought a direction from this Tribunal against the State of Karnataka as well as the State of Tamil Nadu saying that they be enjoined to meet the

requirement of Karaikal region in the Union Territory of Pondicherry from July onwards every year.

102. The learned Counsel appearing on behalf of the State of Karnataka took a stand that the Union Territory of Pondicherry has not proved on the basis of any material before this Tribunal that the ayacut is 27,000 acres and with the double crop, the gross cropped area shall be 42,533 acres. According to the State of Karnataka although the ayacut is 27,000 acres but the official records of the Union Territory of Pondicherry will show that between 1968 and 1972 and even thereafter the area including double crop never exceeded about 35,000 acres. Therefore, an excess claim has been made for the second crop for about 8000 acres.

103. In this connection our attention was also drawn to the only witness examined on behalf of the Union Territory of Pondicherry – Mr. Laurent Saint Andre. He admitted in reply to Question No.30, that for 1972-73, the total comes to 35,187 acres and for 1973-74 it comes to 35,043 acres in answer to Question No.31. The same witness in answer to Question No.99 has said that the ayacut is 27,000 acres and the double crop was also existing since time immemorial. It will be relevant to refer to Question No.111:

> "Q.111. Your claim of 42,000 and odd comes to an irrigation intensity of 57.5% more than the ayacut because you are demanding 42,000 and odd on 27,000. Is that correct?
>
> A: 27,000 is the net area irrigated and gross area is 43,000. "

104. But the remarkable aspect of the dispute about the area under cultivation in the Union Territory of Pondicherry, is that in the Rejoinder filed on behalf of the State of Karnataka to the statement of the case of Pondicherry, there is no denial of the area claimed by Pondicherry in its statement of case. In the Rejoinder against paragraph 4 it has been simply stated as under:

"Para 4

The case of Pondicherry is that it has the following crop pattern and water requirements.

Sl. No.	Crop	Area (Hectares)	Water requirement (Mcft.)
1.	Samba	4760	3006
2.	Kuruvai (Khariff double crop)	6230	2868
3.	Thalady (Rabi double crop)	6230	3366
			9240 "

105. In other words in reply to Paragraph 4, the State of Karnataka has simply reproduced the paragraph 4 of the pleading of the Pondicherry. The only denial is in paragraph 4.3 which is reproduced below:

> "4.3. Karnataka does not admit the above crop pattern and its water requirement. In its averments from para 15.1 to 15.8 of its Statement of Case filed before the Tribunal, Karnataka has convincingly described the necessity of change of crop pattern to make effective use of the existing rainfall pattern for the crop growth rather than depending on releases from the upstream reservoirs. It is stated in para 15.3 as below:
>
> > '… the entire Cauvery delta needs to have only one rice crop during August-December and by introducing other light irrigated crops in rotation on residual moisture/supplemental

irrigation with ground water, it could increase the total agricultural production/income…'."

106. Section 58 of the Evidence Act is as follows:-

"S.58. Facts admitted need not be proved. – No fact need be proved in any proceeding which the parties thereto or their agents agree to admit at the hearing, or which, before the hearing, they agree to admit by any writing under their hands or which by any rule of pleading in force at the time they are deemed to have admitted by their pleadings:

Provided that the Court may, in its discretion, require the facts admitted to be proved otherwise than by such admissions."

[Emphasis supplied]

107. Apart from our conclusion on basis of the pleadings referred to above, it has rightly been pointed out on behalf of the Union Territory of Pondicherry that before C.F.F.C. while indicating the area of utilization at different point of time the same areas of about 43,000 acres had been shown. In TNDC Vol. XIV, at pages 200, 205, 209 and 214, in the data given to C.F.F.C., it has specifically been mentioned that for the year 1901 in respect of Karaikal region that 27,000 acres was having the first crop and in 16,000 acres there was second crop, the total being 43,000 acres. Again in respect of the year 1928, the same area has been mentioned in respect of Karaikal. The area under Cauvery water as in 1956 again for the Karaikal was for 27,000 and 16,000 by way of first and second crop has been shown. In respect of 1971 for Karaikal, area has been shown as for the first crop 27,000 and second crop 16,000. From TNDC Volume XV, page 20 it appears that as per direction given by the CFFC, data were

furnished by the different Governments in respect of utilization and the areas under irrigation. The CFFC had also directed to exchange the data at the request of the party States. There is no dispute on the data furnished by the three States, viz. Tamil Nadu, Mysore/Karnataka and Kerala. Tamil Nadu furnished the data even in respect of Karaikal region. Copies thereof were exchanged. At no stage any objection was raised on behalf of the State of Mysore/Karnataka that the Tamil Nadu had furnished wrong data in respect of Karaikal region before the CFFC. Thus since the stage of the furnishing of the data to the CFFC during 1972 till the counter filed by Karnataka before this Tribunal in the year 1991, there has been no denial about the claim made on behalf of the Union Territory of Pondicherry that they are having first crop in an area of 27,000 acres and second crop in 16,000 acres, the total of which comes to 43,000 acres.

108. So far as the Union Territory of Pondicherry is concerned, it has already been mentioned that it has its own compulsions in as much as there is no scope for any extension of area beyond 27,000 acres. In this background, the claim of Union Territory for second crop is being allowed, keeping in view the geographical and climatic conditions and soil features of the territory.

109. The State of Tamil Nadu while arguing its demands of water as also area under irrigation had briefly indicated their stand in respect of Union Territory of Pondicherry. For Pondicherry, Tamil Nadu worked out the crop water requirement as per the duty adopted for Cauvery delta system in

Tamil Nadu. Tamil Nadu gave the details of area as well as water requirements according to them in respect of Union Territory of Pondicherry in their statement No.54 as follows:

TOTAL DEMAND

(Including irrigation requirement for grass areas irrigated under Priority I to IV and other sectoral needs of the party States)

Sl. No.	Sector	Pondicherry	
		Area in lakh acres	Water required in TMC
(1)	(2)	(3)	(4)
A	Domestic and livestock need		0.356
B	Environmental/Ecological Needs		0.000
C	Irrigation requirement for the area under Priority – I to IV	0.430	6.840
D	Industrial & Power		0.070
	Total	0.430	7.266

110. From the stand of Tamil Nadu it would be seen that they seem to agree to 0.43 lakh acres of gross irrigated area in Pondicherry. The need for total water requirement indicated by Tamil Nadu is 7.266 TMC.

Crop Water Requirement of Pondicherry

111. In their statement of case, Union Territory of Pondicherry had indicated the water requirement of Karaikal region to be 9.24 TMC. During the course of arguments, this Tribunal directed the party States vide its order of 12.11.2002 to indicate the minimum crop water requirement considering the scientific advancement which has led to improved efficiency in water use. In pursuance to that order, Union Territory of Pondicherry also filed the information vide their Exhibit No.41, Vol. 5 on 20.12.2002. In para 2, their claim is elaborated as under:-

> "2. …….that an extent of 17220 Hectares are put under paddy cultivation in Karaikal region of Pondicherry every year. This 17220 Hectares comprises of 6230 Hectares of Kuruvai, the same 6230 Hectares of Thaladi and the remaining 4760 Hectares of Samba which area is used for a single crop. For cultivating these 17220 Hectares the farmers need at the moment 8.296 TMC of water. This is calculated on the basis of irrigation efficiency of 85%. The total population of Karaikal as per the 2001 census is 170,640 and their domestic water requirement for drinking etc. works out to 0.2 TMC per month making the total requirement of water at 9.355 TMC."

112. It is seen that the extent of area under Kuruvai, Samba and Thaladi crops works out to 15,388, 11,757 and 15,388 acres respectively. Thus, first crop area is 27,145 acres (15,388 Kuruvai area + 11,757 Samba area) and second crop area 15,388 (Thaladi area) acres total being 42,533 acres for which water requirement has been indicated as 8.296 TMC.

113. Karaikal ayacut area is limited to 27,000 acres only and whole area is proposed to be brought under cultivation of first crop. Also, the cropping pattern is such that well before the harvesting of the first crop viz. Kuruvai ends, nursery of Thaladi crop has to be sown. As such, it is obvious that for sowing nursery of Thaladi (second crop), some area is appropriately left vacant from the available ayacut of 27,000 acres. In this area, farmers may grow vegetables or other semi-dry crop as per their choice and requirement which will mature well in time to permit agricultural operations for Thaladi crop namely: raising of nursery for the Thaladi crop.

114. Karaikal region of Union Territory of Pondicherry is situated at the tail end of Tamil Nadu delta system and in practice it can be taken to be natural extension of the Cauvery delta system of Tamil Nadu. As such, cropping pattern as well as water requirement for the crops have to broadly match those in the delta system. However, since the Karaikal region is in the close proximity of the sea, the effect of seawater on the cultivable area is a matter which needs special consideration. In order to keep the brackish water well below the crop root zone, liberal provision of the irrigation water seems necessary. It is a redeeming feature that the North East monsoon helps in leaching the salt deposited over land as well as in the sub-soil. Keeping in view these parameters for the purposes of our consideration, we are inclined to agree with the cropping pattern for which the extent and water requirement is given below:-

Statement showing cropping pattern, extent of area and water requirement

S. No.	Crop	Period	Area (in acres)	Water requirement (in TMC)
1.	Kuruvai	20th June – 30th Oct.	16,000*	2.921
2.	Samba	1st August – 28th Dec.	11,000	1.667
3.	Thaladi	20th Sept. – 2nd Feb.	16,000	1.759
	Total		43,000	6.347 Say 6.35 TMC

*An area of 1,000 acres from Kuruvai is taken to be under other semi-dry crop and would be available for raising nursery of Thaladi crop.

Domestic and Industrial Water Requirement

115. The total population of the Karaikal region of Union Territory of Pondicherry for the years 1991 as well as 2001 is available in the records before this Tribunal. Utilizing this information, the projected population for

the year 2011 has been considered for determining the domestic water requirement. Considering that the ratio of urban to rural population to be 35:65 and taking the urban domestic water supply requirement as 120 Ltrs per capita per day (lpcd) and that for rural population including livestock as 70 lpcd, domestic water requirement works out as 0.225 TMC. Although, as per norm, 80% of the domestic water supply is to be considered to return back to the river system, but in the case of Karaikal region, this norm can not be applied because the total quantity of water lifted or diverted from the river will not return back to the river system but will flow into the brackish sub-soil or into the sea. Hence, full quantity of domestic water needs is considered as the requirement of Union Territory of Pondicherry which works out to be 0.225 TMC.

Industrial water requirement

116. The Union Territory of Pondicherry while submitting the Common Format has indicated the present water demand for industries to be 34 Mcft. (0.034 TMC). Considering that by 2011 the industrial water demand would have increased by about 33%, water requirement for industrial use works out as 0.045 TMC. As in the case of domestic water requirement, industrial water taken for use from the river system will not return to the river system for subsequent use and hence, the full quantity is being earmarked for such use. Thus the total water requirement for domestic and industrial supply works out as (0.225+0.045 TMC) 0.27 TMC.

117. The overall water requirement of Karaikal region of Union Territory of Pondicherry in respect of irrigation, domestic water supply and industrial use is given in the following statement:-

Total water requirement of U.T. of Pondicherry

Area in 000 acres
Water in TMC

	Particular	Net irrigated area	Gross Irrigated area	Water requirement
(A)	Irrigation:			
	(a) Kuruvai	16.00	16.00	2.921
	(b) Samba	11.00	11.00	1.667
	(c) Thaladi	16.00	16.00	1.759
	Total (A)	43.00	43.00	6.347 say 6.35
(B)	Domestic water supply	--	--	0.225
(C)	Industrial use	--	--	0.045
	Total (B+C)	--	--	0.270
	Grand total (A)+(B)+(C) 6.35+0.27=**6.62 TMC**			

118. As it has been decided that balance water of 45.08 TMC be distributed among the parties based on their population in the year 1991, the share of Pondicherry with a population of 1.46 lakh (Ref.E-97, page 23) works out to 0.22 TMC. Thus, the total allocation of water for Pondicherry works out to 6.62 + 0.22 = 6.84 TMC say 7 TMC.

119. It may, however, be clarified that the above requirement of Karaikal needs to be delivered at the seven locations at the inter-State crossing points (between Tamil Nadu and Karaikal) of seven rivers, namely: Nandalar, Nattar, Vanjiar, Noolar, Arasalar, Thirumalairajanar and Pravadayanar. As regards the monthly delivery of supplies to be made by Tamil Nadu to the Union Territory of Pondicherry, it is understood that both the parties have an established arrangement which is reported to be

working satisfactorily and the same should continue. However, in the event of any disagreement, the matter shall be resolved by the Cauvery Management Board.

Chapter 7

Final determination of the share of the waters of river Cauvery among the States of Kerala, Karnataka and Tamil Nadu and the Union Territory of Pondicherry and monthly schedule of releases

It has been discussed in the earlier chapters as to how the total yield of the Cauvery river system has been determined to be about 740 TMC at 50% dependability, whereas the riparian States have been claiming different quantity of waters for their State since 1972 before the C.F.F.C. and thereafter, the total whereof comes to more than 1200 TMC. That is why at the initial stage of the hearing of this dispute and during consideration of all the different aspects thereof it was a challenge to the Tribunal in the sense as to how to adjust the equity among the different riparian States, viz, Kerala, Karnataka and Tamil Nadu and the Union Territory of Pondicherry and to allocate their equitable shares with the limited yield of 740 TMC.

2. After examination of the matter in detail with the help of the Assessors and on hearing the parties on those questions, it appeared that there is no other way to solve this issue except to put certain limitations and restrictions while working out the shares of different States, the sole purpose being that as far as possible one crop must be grown in each field and water should be made available for the same. Keeping this object in view the six limitations have been prescribed and those have been dealt in detail in Chapter 1 of this Volume under the heading ‘Crops and crop water requirement in Tamil Nadu and Karnataka in the Cauvery basin’. So far the water requirements of the State of Kerala and the Union Territory of

Pondicherry are concerned, they have been dealt with separately in the preceding chapter.

3. Our Assessors had advised that 10 TMC each as carry-over storage in the reservoirs of the two States may be provided to take care of any delay in the onset of south-west monsoon. However, on consideration of different aspects including the submission of Karnataka and Tamil Nadu, it has been decided that instead of keeping water for the purpose of carryover, it is better to allocate water amongst the parties keeping in view the principle of equity for use by the concerned States for any beneficial purposes according to the individual State's own priority. On final calculation it has been found out that because of the limitations prescribed, another amount of 25.08 TMC has become available. Thus the total being 45.08 TMC. (20+25.08 TMC). Thereafter question arises as to how to allocate this water amongst the parties. On this aspect we are of the view that this water should be allocated to them on the basis of population of the three States and the Union Territory of Pondicherry. The following table gives details of population of the four claimants on the basis of 1991 Census:

In-basin population of the party States in Cauvery basin
(1991- Census)

S. No	State	Population (in lakhs)	Reference
1.	Kerala	9.87	Census Report 1991 (For the percentage area falling in Cauvery basin)
2.	Karnataka	115.56	-do-
3.	Tamil Nadu	168.50	Information in common format Vol.III, E-20, page 440
4.	Pondicherry	1.46	Technical data submitted by State, E-97, page 23
Total		295.39	

4. If the aforesaid quantum of 45.08 TMC is distributed on the basis of population, then the share of Tamil Nadu shall be 25.71 TMC, Karnataka 17.64 TMC, Kerala 1.51 TMC and the Union Territory of Pondicherry 0.22 TMC. It need not be impressed that this amount of water is beyond the assessed requirement of water for irrigation, drinking, industrial purpose, environmental protection etc. As such this allocation of water to the three States and the Union Territory of Pondicherry can be used for any beneficial purposes according to individual State's own priority. The utilization of this quantity of water has to be left to the States concerned, since all eventualities which may develop in future cannot be foreseen. Any direction for utilization of the above quantity cannot be given so as to bind the future uses. Based on the aforesaid computations, the final allocated share of the parties works out as under:-

Area in lakh acres
Water requirement in TMC

	States				Total
	Kerala	Karnataka	Tamil Nadu	UT of Pondicherry	
i) Area	1.93	18.85	24.71	0.43	45.92
ii) Irrigation requirement	27.90	250.62	390.85	6.35	675.72
iii)Domestic and Industrial water requirement projected for 2011	0.35	1.85	2.73	0.27	5.20
iv) Water requirement for environmental protection	-	-	-	-	10.00
v)Inevitable escapages into sea	-	-	-	-	4.00
vi) Share in balance water	1.51	17.64	25.71	0.22	45.08
Total	29.76	270.11	419.29	6.84	740.00
Say	30.00	270.00	419.00	7.00	726+14 =740

5. The final allocated shares of the parties would be as under:-

1.	Kerala	30 TMC
2.	Karnataka	270 “
3.	Tamil Nadu	419 “
4.	Union Territory of Pondicherry	7 “.
5.	Environmental protection	10 “
6.	Inevitable escapages into sea	4 “
		740 TMC

The water requirement for irrigation, drinking purposes, industrial purposes, and environmental protection, etc have already been apportioned and quantified for all the party States under those heads. Today, all eventualities and circumstances which may develop and arise in future after the Tribunal is dissolved cannot be conceived and any direction thereof in respect of utilization cannot be given.

Monthly schedule of flows at inter-State contact point between Karnataka and Tamil Nadu

6. After having apportioned the annual shares in the waters of river Cauvery, the next important question for determination is the schedule of monthly flows at inter-State contact points, so that the parties concerned are in a position to receive timely supplies for successfully raising crops in the different crop seasons.

7. It appears to be an admitted position that for the fields in which paddy is grown by the State of Tamil Nadu, the nurseries are put in the field between middle of June to middle of July. The areas over which first the seedlings are grown is about 1/10 of the total area in which transplantation is done from last week of July onwards. As such, the

requirement of water for Tamil Nadu between June and July is primarily for the nursery in which the seedlings are grown. Only during trans-plantation and thereafter water is required which means in August (last week of July - August) and onwards.

8. There is no dispute that in Tamil Nadu, first Kuruvai is grown which is harvested in September followed by Thaladi in the same field which is harvested in January - February. The main crop Samba is transplanted in the month of August - September and is harvested in December.

Keeping this in view, the schedule has been prepared as to how the releases shall be made from mid-June to end of January that is the agricultural season so that the interests of both the States of Tamil Nadu and Karnataka are taken care of.

9. Taking note of all facts and circumstances so that in normal years there should not be any difficulty on the part of the State of Karnataka to release water as determined by this Tribunal the monthly schedule of release of water has been prepared, which would also meet the requirements of Tamil Nadu.

10. The shares of each State and the U.T. of Pondicherry would need to be measured at suitable inter-State contact points. The following inter-State contact points have been identified –

i) Between Kerala and Karnataka : Kabini reservoir site

ii) Between Kerala and Tamil Nadu –

a) For Bhavani sub-basin : Chavadiyoor G.D. site
It is reported that Chavadiyoor gauge site was being operated by the State of Kerala which could be revived for inter-State observations.

	b)	For Pambar sub-basin	: Amaravathy reservoir site
iii)		Between Karnataka and Tamil Nadu	: Billigundulu G.D.site/any other site on common border

The present identified inter-State contact point is Billigundulu gauge and discharge site which is maintained by the Central Water Commission – an independent Organisation of the Central Govt., having due expertise in the river gauging techniques. The State of Tamil Nadu has been pressing for considering Mettur reservoir as the inter-State measuring point; whereas Karnataka has been advocating the retention of Billigundulu gauge and discharge site which is located in the common boundary between two States and is maintained by Central Water Commission. In our opinion, gauge & discharge observation station where direct observations are made would be better than a reservoir site where the measurements are taken in an indirect way. However, if there are any deficiencies in the vicinity of the present gauging site as pointed out by Tamil Nadu, the Central Water Commission may take note of the same and take appropriate steps to rectify such deficiencies to the satisfaction of the Regulatory Authority. If the Regulatory Authority so desires, the Central Water Commission, in consultation with the State Governments, may establish new gauge and discharge station on the common border. The States, if so desire, would be at liberty to post their representatives for joint-gauging observations at the gauge & discharge site alongwith the staff of the Central Water Commission.

iv) Between Tamil Nadu and Pondicherry :Seven contact points

Karaikal region of UT of Pondicherry is located within the Cauvery basin. This small area receives water since a long time through seven different streams traversing the area.

11. It may be mentioned that in the Cauvery basin, the major shareholders are two States namely: Karnataka and Tamil Nadu which have been allocated 270 and 419 TMC respectively, whereas, the State of Kerala has been allocated a total of 30 TMC of water for the three sub-basins viz: Kabini sub-basin – 21 TMC, Bhavani sub-basin – 6 TMC and Pambar sub-basin – 3 TMC. Since, full use of allocated waters by the State of Kerala may take some years until the proposed irrigation projects of the State come into existence, till then, the unutilized water will be flowing to the lower States namely: Karnataka and Tamil Nadu, and that water will be flowing into the existing reservoirs of Kabini, Bhavani and Amaravathy from which the distribution is to be monitored by the Cauvery Management Board, keeping in view the decision of the Tribunal.

12. As regards the UT of Pondicherry, its annual allocation is 7 TMC to be delivered by the State of Tamil Nadu over a period of one year at seven different contact points as mentioned above. In the past also, the State of Tamil Nadu has been delivering supplies through these contact points as per mutually established system, and no difficulty has been reported, as such, the same procedure settled by the parties between themselves could continue. However, in the event of any disagreement, the matter

shall be resolved by the Cauvery Management Board in consultation with Central Water Commission.

13. In view of the above position, we find that specifying monthly schedule of flows which would be required to be delivered by Karnataka to Tamil Nadu at inter-State contact point during a normal year would suffice.

14. As regards the flow required to be delivered at the inter-State site, the same is worked out as given below:-

				TMC
1)	The total yield of the basin at 50% dependability.		-	740
2)	Yield at Mettur reservoir. (Ref: TNDC Vol.XV, page 87 and TN Statement No.57, item 1 dated 10.2.2005)		-	508
3)	Yield generated in Tamil Nadu area above Mettur reservoir. (Ref: TN Statement No.57, item 4 and TN Statement 86, item 1)		-	25
4)	(a)	Yield available below Mettur (740–508) (Ref: TN Note 46, Annexure-3, page 54; TN Statement 83, item 1)	-	232
	(b)	Deducting following uses:-		
		i) Allocation to Kerala in Bhavani sub-basin - 6 TMC		
		ii) Allocation to Kerala in Pambar sub-basin - 3 "		
		iii) Allocation to UT of Pondicherry - 7 "		
		iv) Inevitable escapages into sea - 4 "		
		20 "	-	20
	(c)	Balance available for use in Tamil Nadu (232–20)	-	212
5)	Total of water available for use in Tamil Nadu (212+25)		-	237

15. The allocated share of Tamil Nadu is 419 TMC. Thus, the balance 182 TMC (419-237) is to be made available at the inter-State contact point. In addition, an allocation of 10 TMC for environmental protection is also to be made available at that point. Thus, the total delivery which the Karnataka State is to make available at the inter-State border would be (182+10) 192 TMC.

16. The annual quantum of water which shall have to be delivered by the State of Karnataka at the inter-State contact point comprises of three components:-

i) Flows coming in the river Cauvery from the uncontrolled catchment of Kabini sub-basin downstream of Kabini reservoir, the catchment of main stream of Cauvery river below Krishnarajasagara, uncontrolled flows from Shimsha, Arkavathy and Suvernavathy sub-basins and various other small streams.

ii) Regulated releases from Kabini reservoir; and

iii) Regulated releases from Krishnarajasagara reservoir.

17. It may be mentioned that the extent of uncontrolled catchment from below KRS and Kabini reservoirs up to Billigundulu - is of the order of over 22,000 sq km. (Source: Karnataka Pl.-I, pages 21 & 22 and E-68, page 3) In a normal year (yield with 740 TMC), it has been estimated by our Assessors that this uncontrolled catchment can contribute about 80 TMC. As regards the Kabini reservoir, its annual yield is about 98 TMC (yield accepted by the parties), the bulk of which comes during the southwest monsoon season. The Kabini reservoir has a small storage capacity of about 16 TMC i.e. about 1/6th of its annual yield. After meeting

the requirements of Kerala, the reservoir can be filled four times mostly during the southwest monsoon season. It has also been estimated by our Assessors that the Kabini arm during a normal year after meeting the Karnataka requirements would contribute about 60 TMC to meet the downstream requirements at Billigundulu. As far the Krishnarajasagara reservoir is concerned, the bulk of the requirements of Karnataka are to be met from Hemavathy, Harangi and Krishnarajasagara reservoirs, as such, about 52 TMC of water would have to be made available by the State of Karnataka through regulated releases from Krishnarajasagara to reach the inter-State contact point.

18. It may be mentioned that at inter-State contact point, 192 TMC is to be maintained in a normal year and if there is any deficiency in the quantum of inflows mentioned above, it will be open to the Cauvery Management Board/Regulatory Authority to suitably adjust the flows.

19. The monthly schedule of deliveries has been prepared in consultation and on the basis of advice given by our Assessors at the present identified site, namely: Billigundulu, would be as under:-

Month	TMC	Month	TMC
June	10	December	8
July	34	January	3
August	50	February	2.5
September	40	March	2.5
October	22	April	2.5
November	15	May	2.5
		Total	192 TMC

Note (i) The annual total of 192 TMC comprises of 182 TMC from the allocated share of Tamil Nadu and 10 TMC of water allocated for environmental purpose.

(ii) The monthly releases shall be broken in 10 daily intervals by the suggested Regulatory Authority while implementing the schedule.

20. It may be mentioned that irrigation requirements of the parties have been worked out for the crops to be raised during the whole year in all their projects and water has accordingly been provided for them in various reservoirs.

21. Here, it deserves mention that we have, as stated earlier, directed that whole of unutilized water out of State of Kerala's allocated share of 30 TMC would go to Tamil Nadu till such time the former State develops its own potential to use the same. We, however, make it clear that Kabini's flows of this unutilized water from Kerala to Tamil Nadu will be in addition to the flows of 192 TMC as per monthly schedule (during a normal year-yield 740 TMC), which we have ordered to be delivered at Billigundulu/or any other appropriate gauging station on Karnataka-Tamil Nadu common border as discussed earlier.

22. The Central Water Commission shall establish additional gauging stations as required at feasible sites at/near the border of Kerala and Karnataka, where Kabini and its tributaries enter Karnataka so as to monitor inflows from Kerala. The Cauvery Management Board/Regulatory Authority shall also set-up its machinery and devise method to determine quantum of unutilized water to be received from Kerala by Tamil Nadu through Kabini and its tributaries, and ensure delivery thereof in Tamil Nadu at common border.

23. The Regulatory Authority shall also monitor flows from KRS reservoir as also from Kabini and other tributaries meeting Cauvery below KRS up to Billigundulu site.

24. Since Kerala and Karnataka areas, as also upper reaches of Bhavani sub-basin are mainly dependent on the southwest monsoon, the water required for crops during the rabi season in those areas has been provided for in the respective reservoirs. Similarly, the contribution of northeast monsoon which mainly supports the delta and other areas of Tamil Nadu as also to some extent provides support to the upper reaches of the basin, in contiguous areas of Amaravathy, Bhavani, Kabini and Krishnarajasagara reservoir project commands has also been taken note of while working out the crop water requirements of the crops to be raised in those regions.

25. The question of distress was being raised during the arguments by the party States, specially, Karnataka and Tamil Nadu. Karnataka's argument was based on the apprehension that if occurrence of southwest monsoon is below normal and the northeast monsoon is above normal, the waters cannot be brought upstream to Karnataka area and as such, the crops in the upper region of basin will suffer. It may be clarified that the crops of the upper basin areas, mostly receive support of artificial irrigation from the southwest monsoon and as mentioned above, while working out the crop water requirement, provision has already been made from the availability of southwest monsoon water in the reservoirs to meet the annual requirements of those areas. Further, there would also be

some good years bringing in more than 740 TMC of water. We have suggested mechanism for implementation of the order of the Tribunal and that suggested authority will take care of conserving water during good years in the designated reservoirs and also devise conservation of water by the party States in the remaining reservoirs (capacity – 3 TMC and above), and during a deficit year permit withdrawals keeping in view the shortfall in total availability. Similarly, if the northeast monsoon happens to be below normal, it would be feasible, as also justified to provide some water from the storages in the upper regions for saving the crops of the lower region of the basin. This task has to be carried out by the Cauvery Management Board after assessing the extent of distress.

26. It may be made clear that the above schedule of deliveries relates to a normal year, which has been considered as an year giving total annual yield of 740 TMC at 50% dependability; but it is very important to note that the above schedule is a theoretical computation based on the crop water requirement of different projects and the computed withdrawals therefor, alongwith the data of inflows into the various reservoirs as furnished by the party States in the common format. It is common knowledge that rainfall during any monsoon season varies in space and time, besides variation in its intensity, duration, number of rainy days etc. Further, since the total catchment area of Cauvery basin is over 81,000 sq km, the occurrence of rainfall and its pattern in different sub-basins cannot be predicted. For example: during a month, there may be heavy rainfall in the Hemavathy sub-basin and deficit rainfall in Kabini sub-basin and vice-

versa. As such, it would be a rare year in which the pattern of flows in different sub-basins would tally with the flows considered for working out the above schedule; due to this variation, the contribution of each and every tributary cannot be precisely predicted and there would certainly be some variations from year to year. We have, therefore, separately suggested a mechanism - Cauvery Management Board/Regulatory Authority which would monitor with the help of Cauvery Regulation Committee and the concerned State Authorities, the available storage position in the Cauvery basin alongwith the trend of rainfall and make an assessment about the likely inflows which may be available for distribution amongst the party States within the overall schedule of water deliveries suggested above.

27. The total yield of the Cauvery basin areas within the States of Karnataka, Kerala and Tamil Nadu, and Union Territory of Pondicherry, at 50% dependability, has been assessed at 740 TMC. Each of the party State has been allocated share of water, taking into consideration the total available yield generated in Cauvery basin.

28. In case the yield is less in a distress year, the allocated shares shall be proportionately reduced amongst the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry by the Regulatory Authority.

29. It may also be mentioned that the month of June, specially, would be crucial because the irrigation season starts from 1st of June, as also

normal date of onset of southwest monsoon in Kerala is 1st of June; as such, any delay in the on-set of southwest monsoon would affect the inflows, and consequently schedule of releases from Krishnarajasagara and Kabini reservoirs. It would, therefore, be advisable that at the end of May each year, as much storage as is possible during a good year, should be consciously conserved, as that will help in adhering to the schedule of monthly deliveries. However, if there are two consecutive bad years, it would cause distress which shall have to be appropriately tackled by the Cauvery Management Board/Regulatory Authority by relaxing the schedule of deliveries and getting the reservoirs operated in an integrated manner through the States concerned to minimize any harsh affect of a bad monsoon year. In view of such practical difficulties, the Cauvery Management Board/Regulatory Authority shall have the liberty to alter monthly and/or ten-daily schedule of releases while making effort to meet the seasonal allocations for the crop as far as possible, in consultation with the party States.

30. Although, the monthly schedule has been worked out as indicated above, but keeping in view the likely variations in the monthly rainfall and consequent inflows from various tributaries, we suggest that the entire spectrum of monthly availability of storages and rainfall pattern in different sub-basins should be critically monitored by the Cauvery Management Board/Regulatory Authority vis-a-vis the schedule of monthly flows to be delivered at Billigundulu/inter-State contact point for a period of 5 years and whatever adjustment that may be needed in the monthly schedule

could be worked out in consultation with the party States and help of Central Water Commission for future adoption without changing the annual allocation amongst the parties.

31. It is important to mention that although the contribution of flows from the three sources is based on the analysis of available data of rainfall and inflows in different tributaries spread over various sub-basins of the Cauvery basin, but, as the Cauvery basin extends far and wide, the flows would be subject to variation depending upon the occurrence of rainfall in different sub-basins. It would be appreciated that there is no control of human being on the happenings in nature and we have only to make an attempt to make beneficial use of the available quantum of flows in any year and to distribute the same for the benefit of the basin as a whole by integrating the releases from different storage reservoirs.

32. For ensuring uninterrupted delivery of allocated shares to the parties concerned, we hereby direct that no upper riparian State shall take any action so as to affect the scheduled deliveries of water to the lower riparian State. However, the States concerned can by mutual agreement and in consultation with the Regulatory Authority make any amendment in the pattern of water deliveries.

33. Before we go to the final order , it will be only just and proper to mention that Shri J.I. Gianchandani, former Director General, National Water Development Agency; and Shri S.R. Sahasrabudhe, former Commissioner, Ministry of Water Resources, had been appointed as

Assessors to advise the Tribunal. They have helped and assisted the Tribunal with eminence.

Chapter 8

Machinery for implementation of Final Decision/Orders of the Tribunal

After having apportioned the shares of the waters of river Cauvery amongst the States of Kerala, Karnataka and Tamil Nadu and the Union Territory of Pondicherry, the next question which assumes importance is as to how the decision of the Tribunal shall be implemented from time to time. All efforts have been made to allot in the share of different States and the Union Territory, water for fulfilling at least their minimum requirements.

2. From the records, it appears that from time to time, the parties to the dispute especially, the State of Tamil Nadu had to approach the Supreme Court for a direction against the State of Karnataka to comply with the interim order passed by this Tribunal fixing a schedule for release of the water in different months of the year. It also appears that on most of the occasions, the State of Karnataka came up with the plea that because of the insufficient rainfall during the period concerned, it had not been possible for them to comply with the interim order strictly by releasing the quantity of water as directed.

3. Initially, no machinery was provided under the Act for implementation of the decision or orders passed by the Tribunal. The Narmada Water Disputes Tribunal realizing that there may be controversy in respect of implementation of its decision, and with the consent of party States gave several directions (Narmada Water Disputes Tribunal Report

Volume No.II, chapter XX, pages 152-158). The decision was given in December, 1979. A new Section 6A was introduced in the Inter-State Water Disputes Act, 1956 by Act 45 of 1980 with effect from 27-8-1980 for giving effect to the decision of a Tribunal. Section 6A is as follows:-

> "6A. (1) Without prejudice to the provisions of Section 6, the Central Government may, by notification in the Official Gazette, frame a scheme or schemes whereby provision may be made for all matters necessary to give effect to the decision of a Tribunal.
>
> (2) A Scheme framed under sub-section (1) may provide for:-
>
> (a) the establishment of any authority (whether described as such or as a committee or other body) for the implementation of the decision or directions of the Tribunal.
>
> (b) the composition, jurisdiction, powers and functions of the authority, term of office and other conditions of service, the procedure to be followed-by and the manner of filling vacancies among the members of the authority.
>
> (c) the holding of a minimum number of meetings of the authority every year, the quorum for such meetings and the procedure there at.
>
> (d) the appointment of any standing, ad hoc or other committees by the authority.
>
> (e) the employment of a Secretary and other staff by the authority, the pay and allowances and other conditions of service of such staff.
>
> (f) the constitution of a fund by the authority, the amounts that may be credited to such fund and the expenses to which the fund may be applied.
>
> (g) the form and the manner in which accounts shall be kept by the authority.

(h) the submission of an annual report by the authority of its activities.

(i) the decisions of the authority which shall be subject to review.

(j) the constitution of a committee for making such review and the procedure to be followed by such committee; and

(k) any other matter which may be necessary or proper for the effective implementation of the decision or directions of the Tribunal.

(3) In making provision in any scheme framed under sub-section(1) for the establishment of an authority for giving effect to the decision of a Tribunal; the Central Government may, having regard to the nature of the jurisdiction, powers and functions required to be vested in such authority in accordance with such decision and all other relevant circumstances, declare in the said scheme that such authority shall, under the name specified in the said scheme, have capacity to acquire, hold and dispose of property, enter into contracts, sue and be sued and do all such acts as may be necessary for the proper exercise and discharge of its jurisdiction, powers and functions.

(4) A scheme may empower the authority to make, with the previous approval of the Central Government, regulations for giving effect to the purpose of the scheme.

(5) The Central Government may, by notification in the official Gazette, add to, amend, or vary, any scheme framed under sub-section (1).

(6) Every scheme framed under this section shall have effect notwithstanding anything contained in any law for the time being in force (other than this act) or any instrument having effect by virtue of any law other than this Act.

(7) Every scheme and every regulation made under a scheme shall be laid, as soon as may be after it is made before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the scheme or the regulation or both Houses agree that the scheme or the regulation shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that scheme or regulation."

4. On behalf of the State of Tamil Nadu, it was urged that the Tribunal should constitute an authority having the power to monitor on day to day basis, the different reservoirs in the States of Kerala, Karnataka and Tamil Nadu and to give appropriate directions in respect of the implementation of the decision of this Tribunal so far the shares of the different riparian States are concerned. In that connection, it was pointed out that after the final award, a fresh scheme has to be framed in place of the scheme framed in the year 1998 for implementation of the interim order of this Tribunal.

5. After the introduction of Section 6A quoted above, the situation has changed. Section 6A (1) in clear and unambiguous words says:-

"6A(1) without prejudice to the provisions of section 6, the Central Government may, by notification in the official Gazette, frame a scheme or schemes whereby provision may be made for all matters necessary to give effect to the decision of a Tribunal.

6. Thus the power to frame schemes, if any, in respect of implementation of the decision of the Tribunal now has been vested in the Central Government by the Parliament. Similarly, under sub-section 3, the Central Government has to decide about the powers and functions to be vested in such an authority for implementing the decision of the Tribunal. Section 6A(7) provides that every scheme and every regulation made under a scheme shall be laid before each House of the Parliament and the scheme is subject to any modification that may be made by the Parliament. If any modification is made at the instance of the Parliament, only such modified scheme shall be given effect to.

7**.** There is another aspect of the matter. Section 6 of the Inter-State Water Disputes Act has been amended by Act 14 of 2002 with effect from 6-8-2002 which is as follows:-

> "6(2) The decision of the Tribunal, after its publication in the Official Gazette by the Central Government under sub-section (1) shall have the same force as an order or decree of the Supreme Court.

The effect of the aforesaid amendment of section 6(2) shall be that any part of the decision of the Tribunal shall have the same force 'as an order or decree of the Supreme Court'. In that background, if the Tribunal gives different direction in connection with framing of the scheme for implementation of its decision then that being a part of the decision of this Tribunal shall in view of the Section 6 (2) become an order or decree of the Supreme Court. In that view of the matter, how the part of the decision relating to the framing of the schemes and establishment of an authority to

give effect to the decision of the Tribunal can be considered by both the Houses of the Parliament for purpose of modification or otherwise under Section 6A (7). This may create an anomalous situation. The order or decree of the Supreme Court can not be examined for purpose of modification by the two Houses of the Parliament.

8. Krishna Water Disputes Tribunal (1976) expressed the view that decision of a Tribunal contemplates for effective utilization of the waters as determined by the Tribunal and for that purpose, direction can be given for setting up a machinery and guidelines for the working of such machinery. It observed:-

> "……. The water disputes are bound to differ from river to river. In determining the respective rights of the contending parties, a multitude of factors has to be considered and while in a given case, an injunction restraining the upper States from utilizing more water than a particular quantity may be sufficient; in any other case further directions may have to be given. The decision of a Tribunal contemplates that for effective utilization of the waters of a river, a machinery is to be set up which will allocate water from year to year to the contending parties and the States concerned can not without the assistance of such machinery by their own acts give effect to the decision of the Tribunal, the provisions relating to the setting up of a machinery become an integral part of the decision of the Tribunal. ……." (Ref: KWDT report Vol. II, page 164 left col.)

9. The Narmada Water Disputes Tribunal (1979) expressed the opinion:-

> "……. In our opinion, the express power granted to the Tribunal by the Parliament to investigate the Water Dispute between the States and give a binding decision thereon involves by necessary

implication that the Tribunal is granted the power to do everything which is indispensable for carrying out its decision. ……."

[Emphasis supplied]

(Ref: NWDT report Vol. II page 130, Rt col.)

10. It was after the decision of the Narmada Water Disputes Tribunal 1979 that the Parliament by Inter-State Water Disputes Amendment Act 45 of 1980 inserted section 6-A in the Act. The Statement of objects and reasons given in the Amending Act refers to the decision of the Narmada Water Disputes Tribunal as cause for introducing Section 6-A in the Act.

11. Section 6-A provides for establishment of an Authority for the implementation of the decision of the Tribunal. There are two aspects, one is laying down effective guidelines for implementing the decision and second establishment of an Authority and its functioning. There is no bar that the Tribunal can not lay down guidelines to the proposed Authority to implement the decision of the Tribunal effectively.

12. In Jamaluddin Ahmed Vs. Abd. Saleh Narjmuddin, AIR 2003 S.C. 1917 (1922), the Supreme Court referred to Justice G.P. Singh's Principle of Statutory Interpretation wherein the observation of Lord Reid in Wiseman Vs. Boardman (1971) AC 297, 308 was quoted "<u>If a Statute is passed for the purpose of enabling something to be done, but omits to mention in terms some detail which is of great importance (if not actually essential) to the proper and effectual performance of the work which the statute has in contemplation, the Courts are at liberty to infer that the Statute by implication empowers that detail to be carried out.</u>"

[Emphasis supplied]

13. The Inter-State Water Disputes Amendment Act, 1980 does not provide for details in regard to constitution of the Machinery and its functions, the Tribunal has implied power to make recommendations in this respect. The Tribunal, considering various aspects can make recommendations for implementing its decision.

14. For this purpose, we recommend that Cauvery Management Board on the lines of Bhakra Beas Management Board may be constituted by the Central Government. In our opinion, the necessity of setting up a suitable mechanism is of utmost importance; besides whatever machinery is set up should be adequately empowered to implement the Tribunal's decision, as otherwise, we are afraid our decision would only be on a piece of paper.

15. The mechanism shall have to be independent in character comprising of technical officers from the Central Government and representatives from the Governments of the party States on the lines of Bhakra Beas Management Board (BBMS), to achieve objective of the distribution of waters as per equitable shares determined by the Tribunal.

16. Since the implementation of the final award of the Tribunal involves regulation of supplies from various reservoirs and at other important nodal points/diversion structures, it would be imperative that the mechanism (Cauvery Management Board) is entrusted with the function of supervision of operation of reservoirs and with regulation of water releases therefrom with the assistance of Cauvery Water Regulation Committee (to be constituted by the Board).

Constitution of the Cauvery Management Board

An inter-State forum to be called “Cauvery Management Board” (hereinafter referred to as the “Board”) shall be established for the purpose of securing compliance and implementation of the final decision and directions of the Cauvery Water Disputes Tribunal (hereinafter referred as the “Orders”).

The Board shall have perpetual succession and a common seal and shall by the name sue and be sued.

The Board shall be under the control of the Government of India, Ministry of Water Resources.

Composition of the Cauvery Management Board.

1. The Cauvery Management Board shall consist of a whole time Chairman and two whole time Members to be appointed by the Central Government.

The post of whole time Chairman shall be held by an Irrigation Engineer of repute of the rank of Chief Engineer having not less than 20 years experience in the field of water resources management.

2. One whole time Member shall be an Irrigation Engineer of not below the rank of Chief Engineer having sufficient field experience in the operation of reservoirs and management, maintenance and operation of large irrigation projects for a period not less than 15-years.

3. The Second whole time Member shall be an agricultural expert of repute specially in Agronomy with a field experience of not less than 15-years.

The tenure of the Chairman and the two whole time members shall be for a period of three years extendable to five years.

4. Two representatives of the Central Government shall be of the rank of Chief Engineer/Commissioner to be nominated by the Ministry of Water Resources and Ministry of Agriculture respectively. They shall be part time Members of the Board.

5. A representative each of the State Governments of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry shall be nominated by the respective Governments, they shall be part time members of the Board. The State representative shall again be an Irrigation Engineer of the rank of Chief Engineer, Irrigation/Water resources/Public Works Department as the case may be, nominated by the respective State Governments.

6. Vacancies of Members: On any vacancy occurring in the offices of the Members, the appropriate appointing authority shall appoint a person to such vacant office.

7. Secretary of the Board: An Irrigation Engineer not belonging to any party State, and not below the rank of a Director/Superintending Engineer shall be appointed by the Board. He shall not have voting right.

8. Quorum and Voting: Six members shall form a quorum and the concurrence of the majority shall be necessary for the transaction of the business of the Board except such business as the Board may from time to time prescribe as routine. The Members shall have equal powers.

The next meeting will be held within three days if the meeting is postponed for want of quorum and for that meeting quorum will not be necessary.

Headquarters of the Board

The Board shall determine the place of its headquarter after consultation with party States and with the approval of the Government of India.

Disposal of business by the Board

(a) On the following matters, the Board shall record its decision by a Resolution at a meeting in which the Chairman and all the members from the party States are present:-

(i) Framing of Rules of Business;

(ii) Delegation of functions to a Member or Secretary or any official of the Board.

iii) Categorizing any part of the business of the Board as of a formal or routine nature.

(iv) Any other matter which any of the four party States require that it shall be decided at a meeting of the Board.

(b) Chairman of Board can invite representatives from Central Water Commission, National Institute of Hydrology, Indian Agricultural Research Institute (IARI) and/or any other agency including universities as special invitees to attend the Board meeting or otherwise in carrying out the functions specified under this scheme.

(c) Subject to the foregoing provisions, the Board shall frame its own rules for the conduct of its business.

Officers and Servants of the Board

The Board may from time to time appoint or employ such and so many officers and servants as it thinks fit and remove or dismiss them, under the rules and regulations applicable to the appointment, removal and dismissal of the Central Government officers and servants. All such officers and servants shall as such be subject to the sole control of the Board. The scales of pay and other service conditions shall be as applicable to Central Government employees.

Administration and Field Organisation

All expenses of the Board (including salary and other expenses of the Chairman and independent Members) shall be borne by the State Governments of Kerala – 15%; Karnataka – 40%, Tamil Nadu – 40%; and Union Territory of Pondicherry – 5%. The expenses pertaining to Member representing a State shall be borne by the State concerned.

The cost of maintaining, operation and controlling of gauging and other hydrological systems for communicating the data shall be borne

by the State concerned. The cost of construction and maintenance of the storages, power installations, diversion works, head-works and canal networks shall be borne wholly by the State Government in whose territory the works are located.

Cauvery Water Regulation Committee

The Board shall constitute a committee known as Cauvery Water Regulation Committee with the following composition:-

(1)	Full-Time Member Irrigation of the Board	Chairman
(2)	One representative each of the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry not below the rank of a Sr. Superintending Engineer.	Member
(3)	One representative of IMD of the rank of Director	Member
(4)	One representative of Central Water Commission dealing with river gauging not below the rank of Superintending Engineer.	Member
(5)	One representative of the Central Ministry of Agriculture not below the rank of Superintending Engineer.	Member
(6)	Secretary to Cauvery Management Board	Member Secretary

Functions of the Regulation Committee:

The Regulation Committee shall ensure the implementation of the provisions contained in the final order of the Cauvery Water Disputes Tribunal in accordance with the directions of the Board namely:-

a) to collect daily water levels, inflows and storage position at each of the following reservoirs – Hemavathy, Harangi, Krishnarajasagara, Kabini, Mettur, Bhavani sagar, Amaravathy and Banasurasagar.

b) to ensure ten daily releases of water on monthly basis from the reservoirs as directed by the Board.

c) to collect data of water released from the aforesaid reservoirs on 12 hourly basis.

d) the Board's representatives at each of the reservoirs shall monitor proper implementation of the regulation instruction issued by the Regulation Committee; in the event of any variation the representative shall immediately inform the Secretary of the Committee for appropriate action.

e) to collect daily water flows passing through presently identified inter-State contact point i.e., Billigundulu gauge discharge site and keep the Board suitably informed.

f) to compile monthly water account for each reservoir.

g) to collect and compile weekly information about important rain gauge stations of the IMD in order to be able to broadly assess the position of monsoon and keep the Board informed about the status of the monsoon.

h) the State representative, in-charge of the major projects will keep the Regulation Committee regularly informed about the occurrence of the rainfall in the commands and whether any change in the releases is required.

(i) to prepare seasonal and annual report of the water account and submit the same to the Board as indicated below:-

- South-West monsoon season- Ist June to 15 October; (inclusive of fortnight of October)
- North East Monsoon season- 16th October to 31st January
- Hot weather season - Ist February to 31st May.

Meetings of the Regulation Committee

1) The Regulation Committee shall meet once in ten days during the months of June and October when the southwest and northeast monsoon set in; after the monsoon has set in, the meeting will be held at least once a fortnight but it shall have the powers to convene meetings as often as necessary.

In the case of any emergency situation, a minimum of 48 hours notice shall be given for holding a meeting.

2) In case, the State which is likely to be affected is not represented in the meeting, then the possibility of calling another meeting will be examined by the Committee.

Provided that if the situation is such that it is not possible to delay taking a decision then the Committee may decide the issue by majority vote even in the absence of representative from the affected State.

3) The quorum for meeting of Regulation Committee shall be six Members.

4) All the Members including the Chairman and Member Secretary of the Committee shall have voting right; the Chairman shall also have a casting vote.

Annual Report of the Board

The Board shall prepare and transmit to each of the four parties as early as possible in any case before 30th September of each year, an Annual Report covering the activities of the Board for the

preceding year. The Board shall make available to each State on its request any information within its possession any time and always provide access to its records to the States and their authorized representatives.

Financial provisions

i) The Government of India shall initially contribute a sum of Rs. 2 crores (two crores only) for the functioning of the Board which would later on be reimbursed to the Centre by the Board after the contributions, as specified are received from the party States.

ii) All the capital and revenue expenditure required to be incurred by the Board shall be borne by the State Governments of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry in the ratio of 15:40:40:5 respectively.

iii) On the constitution of the Board, the Governments of the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry shall contribute Rupees two crores in the ratio indicated in (ii) above, towards the fund of the Board in the first instance; and later on make advance payments on a quarterly basis as demanded by the Board keeping in view the Annual Budget of the Board.

iv) The Board shall maintain detailed and accurate accounts of all receipts and disbursements and shall after the closing of each financial year, prepare an annual Statement of Accounts and send copies thereof to the Accountant General and concerned basin States.

v) The accounts maintained by the Board shall be audited by the Comptroller and Auditor General of India or his nominee, who shall certify subject to such observation as he may wish to make on the annual accounts of the Board. The Board shall forward to the Accountant General, the Central Government and the concerned basin States – the copies of the Report of the Comptroller and Auditor General of India and shall include the same in its Annual Report.

vi) To perform any other function which is supplemental, incidental or consequential to all or any of the function specified in sub-paragraphs (i) to (v) above.

Guidelines for the Cauvery Management Board

i) As it will not be possible for the Board to forecast about the nature of the monsoon, the Board at the beginning of the water year i.e. first June each year would determine the total residual storage in the specified reservoirs. Again, it is not possible to know the amount of season-wise river flows which will be available during a season; it will be assumed that the inflows will be according to 50% dependable year (yield 740 TMC). The share of each State will be determined on the basis of the flows so assumed together with the available carry over storage in the reservoirs. The withdrawals will be allowed during the first time interval of ten days of the season on the basis of the share worked out for each party State limited to the water requirements during the same period indicated by each State by placing an indent of water demand with Cauvery Water Regulation Committee.

ii) The Board will take stock of the actual yield in the basin at the end of the previous time interval as well as the utilization/releases and storage built up during the interval and assess the trend of inflows

and authorize withdrawals to the States for the subsequent time interval accordingly. For giving effect to the aforesaid provision, the Board may have to repeat this exercise for two or more time intervals.

iii) The Board shall ensure the implementation of the Order of the Tribunal including the carry -over storage during good year and the water releases for environmental purposes. The Board through the Regulation Committee and with the help of CWC, and other Central/State organizations as necessary will identify situations of distress in the basin. Distress caused by diminution of water flows during the period will be shared by the party States after the distress conditions and their extent is determined by the Board keeping in view water shares allotted to parties.

iv) The following important reservoirs in the basin namely: Banasurasagar in Kerala, Hemavathy, Harangi, Kabini and Krishnarajasagara in Karnataka and Lower Bhavani, Amaravathy and Mettur in Tamil Nadu shall be operated in an integrated manner by the concerned State under the overall guidance of the Cauvery Management Board for each ten day period throughout the year to meet the seasonal water requirements of the various States for irrigation, hydro-power generation, domestic and industrial uses etc and the remaining quantities of the surplus water conserved as far as possible and spillage of water reduced to the minimum.

v) The Board is to set up a well designed communication network in the Cauvery basin for transmission of data and a computer based control room for data processing to determine the hydrological conditions including distress, if any. For this purpose, it may utilize the latest technology. For operational purposes, this work may be entrusted by the Board to CWC or any other Central/State Government organization.

vi) At the start of irrigation season i.e. 1st June of every year, all the party States through their representatives in the Board shall submit an indent for the supplies required by them at each reservoir site (capacity 3 TMC and above) for the month of June broken in 10 daily intervals. The Board will examine reasonableness of the indents keeping in view the cropping pattern and extent of area to be irrigated and order releases keeping in view the overall ceiling prescribed by the Tribunal for the month after determining the available carry-over storage and taking into consideration the likely inflows during the month. The Regulation Committee shall release water on ten daily basis as ordered by the Board.

In case of deficiency in the water availability during any month as reported by the Regulation Committee, the Board will consider reduction in the indent of the parties in proportion to the quantities allocated to each State by the Tribunal for the designated crops.

vii) The Regulation Committee shall keep a watch on the actual performance of the monsoon during each ten daily interval and report position to the Board indicating therein the extent of variation from the normal. The Board on receipt of such information will consider any change in the release ordered by them earlier. Similar exercise will continue as the monsoon progresses during the succeeding months till the end of the water year i.e. 31st May of every year.

viii) The Board has to ensure that the State Governments should construct proper Hydraulic structures at all important anicut sites in the basin with provision of appropriate regulation mechanism, besides

regular monitoring of the withdrawals at such diversion structures on the part of the State would be necessary.

ix) The Board may direct party States to furnish data in respect of carry-over storage in reservoirs, including inflows and outflows, rainfall data, the area irrigated and water utilized.

x) The Board shall arrange collection of data for important rain gauge stations maintained by IMD/CWC/States in the Cauvery basin; as also inflow data measured at important nodal points on the Cauvery river system through the Cauvery Regulation Committee which will suitably compile the rainfall data for different monsoon seasons along with the inflows measured at different sites.

x) The Board or any Member or any representative thereof shall have power to enter upon any land or property upon which any hydraulic structure or any work of gauging or measuring device has been or is being constructed, operated or maintained by any agency in the Cauvery basin for the purpose of implementing the decision of the Tribunal.

xi) To hold and dispose of property, enter into contracts, sue and be sued and do all such acts as may be necessary for the proper exercise and discharge of its jurisdiction, powers and functions.

xii) To construct or make direction to construct additional gauging stations to the States concerned with the assistance of Central Government and Central Water Commission for implementing the decision of the Tribunal.

xiii) If the Board finds that either Government of the party States namely Tamil Nadu, Kerala, Karnataka and Union Territory of Pondicherry do not co-operate in implementing the decision/direction of the Tribunal, it can seek the help of the Central Government.

xiv) If any delay/shortfall is caused in release of water on account of default of any party State, the Board shall take appropriate action to

make good the deficiency by subsequently deducting indented releases of that party State.

Chapter 9

Final Order and Decision of the Cauvery Water Disputes Tribunal

The Tribunal hereby passes, in conclusion the following order:-

Clause-I

This order shall come into operation on the date of the publication of the decision of this Tribunal in the official gazette under Section 6 of the Inter-State Water Disputes Act, 1956 as amended from time to time.

Clause-II

Agreements of the years 1892 and 1924:

The Agreements of the years 1892 and 1924 which were executed between the then Governments of Mysore and Madras cannot be held to be invalid, specially after a lapse of about more than 110 and 80 years respectively. Before the execution of the two agreements, there was full consultation between the then Governments of Madras and Mysore. However, the agreement of 1924 provides for review of some of the clauses after 1974. Accordingly, we have reviewed and re-examined various provisions of the agreement on the principles of just and equitable apportionment.

Clause-III

This order shall supersede –

i) The agreement of 1892 between the then Government of Madras and the Government of Mysore so far as it related to the Cauvery river system.

ii) The agreement of 1924 between the then Government of Madras and the Government of Mysore so far as it related to the Cauvery river system.

Clause-IV

The Tribunal hereby determines that the utilisable quantum of waters of the Cauvery at Lower Coleroon Anicut site on the basis of 50% dependability to be 740 thousand million cubic feet-TMC (20,954 M.cu.m.).

Clause-V

The Tribunal hereby orders that the waters of the river Cauvery be allocated in three States of Kerala, Karnataka and Tamil Nadu and U.T. of Pondicherry for their beneficial uses as mentioned hereunder:-

i)	The State of Kerala	-	30 TMC
ii)	The State of Karnataka	-	270 TMC
iii)	The State of Tamil Nadu	-	419 TMC
iv)	U.T. of Pondicherry	-	7 TMC
			726 TMC

In addition, we reserve some quantity of water for (i) environmental protection and (ii) inevitable escapages into the sea as under:-

i)	Quantity reserved for environmental protection.	-	10 TMC
ii)	Quantity determined for inevitable escapages into the sea.	-	4 TMC
			14 TMC
		Total (726 + 14)	740 TMC

Clause-VI

The State of Kerala has been allocated a total share of 30 TMC, the distribution of which in different tributary basins is as under:

(i) Kabini sub-basin	-	21 TMC
(ii) Bhavani sub-basin	-	6 TMC
(iii) Pambar sub-basin	-	3 TMC

Clause-VII

In case the yield of Cauvery basin is less in a distress year, the allocated shares shall be proportionately reduced among the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry.

Clause-VIII

The following inter-State contact points are identified for monitoring the water deliveries:

(i) Between Kerala and Karnataka : Kabini reservoir site

(ii) Between Kerala and Tamil Nadu

a) For Bhavani sub-basin : Chavadiyoor G.D.site

It is reported that Chavadiyoor G.D. Site was being earlier operated by the State of Kerala which could be revived for inter-State observations.

b) For Pambar sub-basin : Amaravathy reservoir site

(iii) Between Karnataka and Tamil Nadu : Billigundulu G.D.site/ any other site on common border

(iv) Between Tamil Nadu and Pondicherry : Seven contact points as already in operation

Clause-IX

Since the major shareholders in the Cauvery waters are the States of Karnataka and Tamil Nadu, we order the tentative monthly deliveries during a normal year to be made available by the State of Karnataka at the inter-State contact point presently identified as Billigundulu gauge and discharge station located on the common border as under:-

Month	TMC	Month	TMC
June	10	December	8
July	34	January	3
August	50	February	2.5
September	40	March	2.5
October	22	April	2.5
November	15	May	2.5
			192 TMC

The above quantum of 192 TMC of water comprises of 182 TMC from the allocated share of Tamil Nadu and 10 TMC of water allocated for environmental purposes.

The above monthly releases shall be broken in 10 daily intervals by the Regulatory Authority.

The Authority shall properly monitor the working of monthly schedule with the help of the concerned States and Central Water Commission for a period of five years and if any modification/adjustment is needed in the schedule thereafter, it may

be worked out in consultation with the party States and help of Central Water Commission for future adoption without changing the annual allocation amongst the parties.

Clause -X

The available utilisable waters during a water year will include the waters carried over from the previous water year as assessed on the 1st of June on the basis of stored waters available on that date in all the reservoirs with effective storage capacity of 3 TMC and above.

Clause-XI

Any upper riparian State shall not take any action so as to affect the scheduled deliveries of water to the lower riparian States. However, the States concerned can by mutual agreement and in consultation with the Regulatory Authority make any amendment in the pattern of water deliveries.

Clause-XII

The use of underground waters by any riparian State and U.T. of Pondicherry shall not be reckoned as use of the water of the river Cauvery.

The above declaration shall not in any way alter the rights, if any, under the law for the time being in force, of any private individuals, bodies or authorities.

Clause-XIII

The States of Karnataka and Tamil Nadu brought to our notice that a few hydro-power projects in the common reach boundary are

being negotiated with the National Hydro-Power Corporation (NHPC). In this connection, we have only to observe that whenever any such hydro-power project is constructed and Cauvery waters are stored in the reservoir, the pattern of downstream releases should be consistent with our order so that the irrigation requirements are not jeopardized.

Clause-XIV

Use of water shall be measured by the extent of its depletion of the waters of the river Cauvery including its tributaries in any manner whatsoever; the depletion would also include the evaporation losses from the reservoirs. The storage in any reservoir across any stream of the Cauvery river system except the annual evaporation losses shall form part of the available water. The water diverted from any reservoir by a State for its own use during any water year shall be reckoned as use by that State in that water year. The measurement for domestic and municipal water supply, as also the industrial use shall be made in the manner indicated below:-

Use	Measurement
Domestic and municipal Water supply	By 20 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.
Industrial use	By 2.5 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.

Clause-XV

If any riparian State or U.T. of Pondicherry is not able to make use of any portion of its allocated share during any month in a particular water year and requests for its storage in the designated reservoirs, it shall be at liberty to make use of its unutilized share in any other subsequent month during the same water year provided this arrangement is approved by the Implementing Authority.

Clause-XVI

Inability of any State to make use of some portion of the water allocated to it during any water year shall not constitute forfeiture or abandonment of its share of water in any subsequent water year nor shall it increase the share of other State in the subsequent year if such State has used that water.

Clause-XVII

In addition, note shall be taken of all such orders, directions, recommendations, suggestions etc, which have been detailed earlier in different chapters/volumes of the report with decision for appropriate action.

Clause XVIII

Nothing in the order of this Tribunal shall impair the right or power or authority of any State to regulate within its boundaries the use of water, or to enjoy the benefit of waters within that State in a manner not inconsistent with the order of this Tribunal.

Clause-XIX

In this order,

(a) "Normal year" shall mean a year in which the total yield of the Cauvery basin is 740 TMC.

(b) Use of the water of the river Cauvery by any person or entity of any nature whatsoever, within the territories of a State shall be reckoned as use by that State.

(c) The expression "water year" shall mean the year commencing on 1st June and ending on 31st May.

(d) The "irrigation season" shall mean the season commencing on 1st June and ending on 31st January of the next year.

(e) The expression "Cauvery river" includes the main stream of the Cauvery river, all its tributaries and all other streams contributing water directly or indirectly to the Cauvery river.

(f) The expression "TMC" means thousand million cubic feet of water.

Clause-XX

Nothing contained herein shall prevent the alteration, amendment or modification of all or any of the foregoing clauses by agreement between the parties.

Clause-XXI

The State Governments of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry shall bear the expenses of the Tribunal in the ratio of 15:40:40:5. However, these parties shall bear their own costs before this Tribunal.

Sd/-	Sd/-	Sd/-
Sudhir Narain J.	N. S. Rao J.	N. P.Singh J.
MEMBER	MEMBER	CHAIRMAN

New Delhi
5th February 2007

Statement showing cropwise area and utilisation under existing, ongoing and proposed projects claimed by Karnataka as in statement of case and Common Format

S No.	Name of the. Project	Rabi Semi-d Area OOO'Ac	Require-ment TMC	Delta in inches	Rabi Summer Semi-d v Area OOO'A	Require -ment TMC	Delta in inches	Perennial Area OOO'Ac	Require -ment TMC	Delta In inches	Cropped Area OOO'Ac (Col.5+8+11 +14+17+20)	Total requirement at canal head TMC (CoI.6+9+12+ 15+18+21)	Evopo -tion losses	Total require mentTMC (CoI.24+25)
1	2	14	15	16	17	18	19	20	21	22	23	24	25	26
I.	**EXISTING PROJECTS**													
1.	Anicut Channels	-	-	45.920	47.370	7.895		4.942	1.977	110.219	237.890	57.700	-	57.700
2.	KR Saqar	-	-		-	-		60.000	24.000	110.208	196.000	55.200	6.000	61.200
3.	Kanva	-	-		4.670	NA		1.695	NA		11.035	1.000	0.200	1.200
4.	Byramangala	-	-		-	-		1.600	NA		4.000	1.000	0.100	1.100
5.	Markonahalla	-	-		-	-		-	-		15.000	3.980	0.040	4.000
6.	Hebbahalla	-	-		-	-		-	-		3.050	0.380	0.040	Q.400
7.	Nugu	-	-		-	-		-	-		18.110	7.680	0.040	7.700
8.	Chilkkahole	-	-		-	-		0.600	0.170	78.064	4.077	0.720	0.040	0.760
9.	Mangala	2.100	0.274	35.949	-	-		-	-		6.140	0.736	0.090	0.826
10.	Suvarnavathi+	-	-		-	-		-	-		16.694	3.37S	0.225	3.600
11.	Gundal+	-	-		-	-		2.000	0.227	31.272	15.100	1.595	0.115	1.710
12.	Nallur Amanikere	-	-		-	-		-	-		3.200	0.270	0.074	0.344
	Total I	**2.100**	**0.274**		**52.040**			**70.837**	**26.374**		**530.296**	**133.576**	**6.964**	**140.540**
II	**ON GOING PROJECTS**													
13.	Kamasamudra Lift Irrigation	9.670	0.720	20.514	-	-		-	-		19.340	1.089	-	1.089
14.	Hutchanakiooalu	5.505	0.418	20.92-1	-	-		-	-		13.805	0.936	-	0.936
15.	Hemavathv	261.500	24.880	26.214	-	-		-	-		700.756	51.170	3.500	54.670
16.	Votehole	13.000	1.300	27.552	-	-		-	-		18.500	2.175	0.221	2.396
17.	Yaqachi	21.470	2.250	28.874	-	-'		-	-		53.070	5.074	0.670	5.744
18.	Kabini	149.200	19.552**		42.000	NA		15.000	6.846	125.747	447.400	59.862	5.351	65.213
19.	Harangi	35.129	4.254	33.365	-	-		-	-		170.024	16.541	1.459	18.000
20.	Chicklihole	-	-	32.144	1.200	0.140		-	-		5.400	0.820	0.042	0.862
21.	Manchanabele	2.500	0.270	29.756	-	-		-	-		9.500	0.738	0.210	0.948
22.	Taraka	15.000	1.876	34.458	-	-		-	-		32.400	3.157	0.250	3.407
23.	Arkavathv	7.500	NA		-	-		7.900	NA		22.900	2.587	0.394	2.981
24.	Iggalur	-	-	28.156	3.650	0.373		6.350	0.710	30.806	13.650	1.786	0.108	1.894
25.	D.Devaraia Urs (Varuna)	59.500	5.613	25.991	-	-		-	-		139.500	10.503	-	10.503
26.	Uduthorehalla	-	-		-	-		6.000	0.544	24.980	16.300	1.177	0.054	1.231
27.	Modernisation of KRS	-	-		-	-		-	-		S.OOO	-	-	-
	Total II	**579.97**	**41.581**		**46.850**	**0.513**		**35.250**	**8.100**		**1667.545**	**157.615**	**12.259**	**169.874**
III	**MINOR IRRIGATION**													
28.	Existing & on-going	-	-		-	-		-	-		330.000	71.300	-	71.300
	Total III										**330.000**	**71.300**	-	**71.300**
	GRAND TOTAL **1+11+111**	**582.07**	**41.855**		**98.890**	**0.513**		**106.087**	**34.474**		**2527.841**	**362.491**	**19.223**	**381.714**
IV	**PROPOSED PROJECTS**													
29.	Lakshmana-thirtha	6.500	NA		-	-		-	-		13.500	1.239	0.261	1.500
30.	KRS Extension	6.000	NA		-	-		-	-		94.430	8.217	-	8.217
31.	Chenqavadi	6.500	NA		-	-		-	-		15.500	1.108	0.156	1.264
32.	Lokapavani	6.200	NA		-	-		-	-		12.400	1.910	-	1.910
33.	Pooriqali L.I.S	-	-		-	-		-	-		18.000	1.357	-	1.367
34.	Minor irriqation	-	-		-	-		-	-		47.000	13.900	-	13.900
	Total IV	**25.200**									**200.830**	**27.741**	**0.417**	**28.158**

Note:

1. Coiumn no. 14,15,17,18,20,21,23,24,25 & 26 are culled out from the information in the Common Format for the respective projects(E-52 to E-82) and the project report except in the case of anicut channels.
2. Theremaining columns 16,19 and 22 giving delta in Ft. are computed: Delta in inches= 22.96 multipiied by 12 divided by duty in acres per Mcft.