INDIA

HISTORICAL REVIEW

There was no State Policy for the development of resources during the early phase of British Rule in India. Some important steps taken during British rule were :

- Introduction of land tenure;
- Opening of road and rail communication;
- Promotion of export trade in certain agricultural commodities; and
- During the 1st decade of the last century, the Department of Agriculture at the national centre and in the provinces were organised.

MILESTONES

The Forest Research Institute was set up in 1890. On the recommendation of the First Irrigation Commission, attention was devoted to irrigation schemes, mainly of a protective nature in water scarce areas.

During the great economic depression of 1929-33, despite some expansion in the protected manufacturing sector of the economy, there was stagnation. During the decade preceding the depression, western economies had a spell of expansion of output, income and employment. A

new economic policy characterised by increased state intervention emerged in the western economies during the depression, while in India the traditional "Laissez faire" continued.

The separation of Burma in 1937 involved considerable economic recession, as close links existed between India and Burma.

With the outbreak of World War II there was dislocation of the normal flow of goods, particularly primary products from the foreign agricultural sector.

The Japanese occupation of Myanmar (Burma) and the consequential loss of imports of Burma rice completely upset the food strategy of the Government of India. Various steps were taken to develop a comprehensive and integrated policy for the development of agriculture in the basic food plan for distribution of food grains in the country under the situation of scarcity.

Irrigation in India dates to prehistoric times. Irrigation received due attention even before Independence in 1947, by the Hindu, Muslim and British rulers as it was an important input for successful crop growth in most parts of the country. The development of irrigation continued at a slow pace until partition. Irrigated in India at the time of partition was 2.26×10^7 ha.

Partition of India in 1947 brought about a far-reaching imbalances in the agriculture sector. The “Grow-more-food” campaign was therefore placed on a planned basis from 1947-48. The appointment of the Planning Commission in 1950 and implementation of Five Year Plans and agricultural development (including animal husbandry, forestry, and fisheries) became a major objective in the consistent plans of action. The concept of self-sufficiency in food-grains by the end of March, 1952 was modified to call for a relative self-sufficiency which implied that some imports of food-grains might be necessary to meet emergencies, to build reserve stocks and to compensate for loss due to diversion from food to cash crops.

PLANNED DEVELOPMENT OF WATER RESOURCES

In the initial period of developing water resources, the rapid harnessing of these resources was the prime objective. State Governments were encouraged to expeditiously formulate and develop water resource projects for specific purposes such as irrigation, flood control, hydro-power generation, drinking water supply, industrial and various miscellaneous other reasons. A large number of projects comprising dams, barrages, hydropower structures, and canal networks have been completed throughout India in successive Five Year Plans.

MILESTONES

Earlier legislation concerning Environmental Protection include the "Indian Penal Code" and the "Code of Criminal Procedure". Environmental protection laws have been enacted under the Environment Protection Act, 1986, the Air Prevention and Control Policy Act, 1981, the Water Prevention and Control of Pollution Act, 1974, the Hazardous Waste Management and Handing Rules, 1989, the Public Liability Insurance Act, 1991 and the National Environmental Tribunal Act, 1995.

Among the specific Natural Resources Protection Acts are the Wild Life (Protection) Act, 1972 and the Forests (Conservation) Act, 1980. Comprehensive Legislation is necessary and therefore a cross medium approach was adopted to remove a multiplicity of legislation besides removing the overlapping and ambiguous policies then in vogue.

NATIONAL WATER POLICY

India adopted a National Water Policy in September, 1987 which recognised water as one of the crucial elements in its planning and development . After the adoption of this Policy a number of

issues and challenges emerged in the development and management of water resources. Therefore this Policy should be updated by the National Water Resources Council.

WATER FOR FOOD AND RURAL DEVELOPMENT

River Systems: The river systems in India are classified into two groups namely perennial rivers of Himalayan origin and the rivers of peninsula India.

Precipitation: The rainfall in India is confined to 3-4 months in a year and varies from 100 mm in the western parts of Rajasthan to over 1000 mm in Cherrapunji in Meghalaya.

Principal Water Resources: The principal ones are :

- surface waters from rivers and streams, and
- ground water.

India has 24 river basins comprising 12 major and 12 medium and small basins. Figure-1 shows these basins in India. Out of a total precipitation of about $4x10^{11}m^3$ the water available is about $1.953\ x10^{11}m^3$. Details are given in Table 1.

USABLE WATER RESOURCES

The average yearly usable surface water is $6.9x10^{11}m^3$ and ground water*, $3.96x10^{11}m^3$ for a total of $1.086x10^{12}m^3$. The annual replenished ground water is estimated as $4.32x10^{11}m^3$.

Present Use

The capacity of live storage in dams and reservoirs in India is about $1.77x10^{11}m^3$. Dams to create additional live storage of $7.5x10^{10}m^3$ are under various stages of construction. Dams in planing stages will provide an additional live storage of $1.32x10^{11}m^3$. The present use of surface and ground water is about 70% and 30% respectively of the usable resources as shown in the following table:

Purpose	Present Utilisation (1997) (BCM)
Irrigation	501
Domestic	30
Industrial	20
Energy	20
Others	34
Total	605

Development of Irrigation Potential

At the end of 1995-96 there were $8.852\ x10^7m^3$ ha compared to $2.26\ x10^7m^3$ ha in 1947. Out of the present total irrigated area, that from ground water is $4.58\ x10^7m^3$ ha.

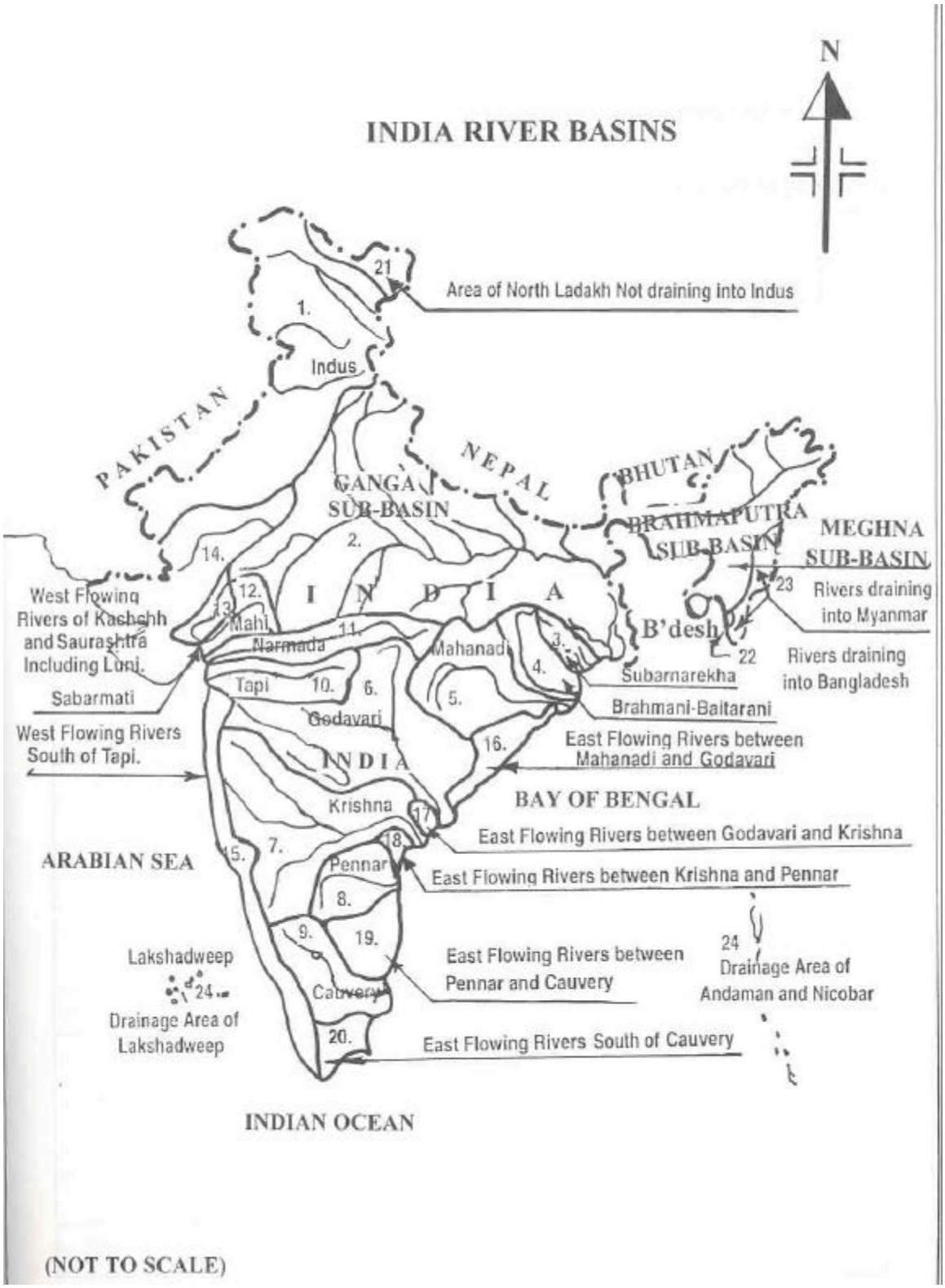
INDIA RIVER BASINS
N
21
Area of North Ladakh Not draining into Indus
1.
Indus
PAKISTAN
NEPAL
BHUTAN
GANGA SUB-BASIN
2.
BRAHMAPUTRA SUB-BASIN
MEGHNA SUB-BASIN
23
Rivers draining into Myanmar
14.
12.
13.
Mahi
11.
Narmada
West Flowing Rivers of Kachchh and Saurashtra Including Luni.
Sabarmati
I N D I A
B'desh
22
Rivers draining into Bangladesh
3.
Mahanadi
4.
Subarnarekha
Brahmani-Baitarani
5.
Tapi
10.
6.
Godavari
West Flowing Rivers South of Tapi.
INDIA
16.
East Flowing Rivers between Mahanadi and Godavari
BAY OF BENGAL
Krishna
17
East Flowing Rivers between Godavari and Krishna
ARABIAN SEA
15.
7.
18
Pennar
East Flowing Rivers between Krishna and Pennar
8.
9.
19.
East Flowing Rivers between Pennar and Cauvery
24
Drainage Area of Andaman and Nicobar
Lakshadweep
24
Drainage Area of Lakshadweep
Cauvery
20.
East Flowing Rivers South of Cauvery
INDIAN OCEAN
(NOT TO SCALE)

Table 1. Water Resources Potential and Status of Live Storage in The River Basins of India

(Unit b.cu.m.)

Sr. No.	Name of the River Basin	Average annual potential in the river	Estimated utilisable flow excluding ground water	Live Storage		
				Live completed projects storage	Ongoing projects	Proposed projects
1	Indus (upto border)	73.31	46.00	13.85	2.45	0.27
2	a Ganga b Brahmaputra, b Barak & Others	525.02 629.05 48.36	250.00 24.00	36.84 1.10	17.12 2.40	29.56 63.35
3	Subernarekha	12.37	6.81	0.65	1.65	1.59
4	Brahamani and Baitarni	28.48	18.30	4.76	0.24	8.72
5	Mahanadi	66.88	49.99	8.49	5.39	10.96
6	Godavari	110.54	76.30	12.51	10.65	8.28
7	Krishna	69.81	58.00	34.48	7.78	0.13
8	Pennar	6.32	6.86	0.38	2.13	
9	Cauvery	21.36	19.00	7.43	0.39	0.34
10	Tapi	14.88	14.50	8.53	1.00	1.99
11	Narmada	45.64	34.50	6.60	16.72	0.46
12	Mahi	11.02	3.10	4.75	0.36	0.02
13	Sabarmati	3.81	1.93	1.35	0.12	0.09
14	West flowing Rivers of Kutch, Saurashtra including Luni	15.10	14.98	4.31	0.58	3.14
15	West flowing Rivers South of Tapi	200.94	36.21	17.35	4.97	2.54
16	East Flowing & Rivers from Mahanadi to Godavari	17.08		1.63	1.45	0.86
17.	East flowing Rivers between Godavari and Krishna	1.81	13.11			
18	East flowing Rivers between Krishan and Pennar	3.63		-		
19	East flowing Rivers between Pennar and Cauvery	9.98	16.73	1.42	0.02	0
20	East flowing Rivers South of Cauvery	6.48				
21	Area of North Ladakh not Draining into Indus	NA	NA	NA	NA	NA
22	Rivers Draining in to Bangladesh	8.57	NA	NA	NA	NA
23	Rivers Draining in to Myanmmar	22.43	NA	0.31	NA	NA
24	Drainage areas of Andman, Nicobar and Lakshadwee Island	NA	NA	NA	NA	NA
	Total Say	1952.87 1953.00	690.32 690.00	173.71 174.00	75.43 76.00	132.32 132.00

Source : Report of the National Commission Integrated Water Resources Development in (1999)

Electricity plays an important role in the agricultural sector. Agriculture remained in second place following industry among the consumers of electricity. Electrical consumption in agriculture increased from1892 Giga watt hours (GWH) in 1965-66 to 85736 GWH in 1995-96 which registered an annual growth rate of 13.6% against a growth rate for total consumption of 8.1%. The total power generated in 1994-95 was 350,490.4 GWH of which hydro-power generated was 82,712.0 GWH. This is less than the electricity consumed by agriculture in 1995-96 i.e. 85,736.0 GWH. In other words the entire hydro-power generated is insufficient to meet the demand of agriculture. The percentage of consumption has increased from 7% in 1965-66 to 31% in 1995-96. During 1995-96 the state of Maharashtra with a consumption of 13621 GWH for agriculture was the greatest of all states followed by Andhra Pradesh, Gujarat, Uttar Pradesh and Madhya Pradesh having a consumption of 11775, 10152, 9888 and 8235 GWH respectively. Agriculture consumed 30, 50, 39, 37 and 36% respectively of electricity for the above five states. Andhra Pradesh remained at the top using half of the electricity. There were 10.7×10^6 electrical irrigation pumps on 31st March 1995. The total installed capacity in 1995-96 was 83,288 MW of which 20,976 MW (25.1%) was hydro-power.

The Central Electricity Authority (CEA) carried out a re-assessment of the hydro-electric potential in India during 1987 and assessed it at 84,044 MW or 60% of the load excluding contributions from small schemes. This hydro-potential when fully developed will probably result in an installed capacity of 150,000 MW on the basis of an average load. The demand for electricity in India has been growing at an average annual compound growth rate of 8 to 9 %. The installed capacity is in the order of 210,000 MW which will meet the demand by the end of the XI Plan and 350,000 MW by the year 2020. The total demand for hydro-electricity by agriculture will be 140,000 MW assuming it needs 40% of the total power.

Irrigation Potential

A broad assessment in 1960 of the area that can be brought under irrigation indicated that the irrigation potential of the country is about 1.13×10^8 ha. An analysis of the irrigation potential is that major systems will be 5.8×10^7 ha, medium systems 1.5×10^7 ha by minor surface water schemes i.e. the total of 7.3×10^7 ha by surface water and 4×10^7 ha by minor ground water schemes. Present indications are, however, that the ultimate irrigation potential from major and medium surface water projects is 5.848×10^7 ha, 1.738×10^7 ha. by minor surface water and 6.405×10^7 ha by minor ground water schemes. Thus the total irrigation potential by the present estimate is 1.399×10^8 ha. The gross irrigated area is projected as 9.5×10^7 ha by 2025.

PRESENT STATUS OF FOOD

Land Resources

The total geographical area of India is 3.2873×10^8 ha. Of this only 3.0485×10^8 ha constituting about 93% of the total accounted for in the latest available Land Use Statistics. There has been no appreciable increase in the net sown area during 1970-71. The details of the Land Use Classification Statistics (from 1950-51 to 1994-95) are given in the table.

According to Water and Related Statistics published by the Central Water Commission, 8.5×10^6 ha of land are water logged in the country and nearly 2.46×10^6 ha are estimated to have inadequate drainage systems within irrigation commands. Similarly out of 5.5×10^6 ha of land are affected by salinity, and a further 3.06×10^6 ha are affected by irrigation related problems. The total land affected by water logging and salinity is 1.4×10^7 ha of which 5.52×10^6 ha are caused by irrigation related problems and inadequate drainage. The net sown area has been stabilised from 1.41 to 1.425×10^8 ha which is about 77% of the cultivable area in India.

Table 2. Land use clasification

Headings	1950-51	60-61	70-71	80-81	89-90	90-91	91-92 (P)	92-93 (P)	93-94 (P)	94-95	% of reporting area
1I. Geographical Area											
II. Reporting area for land utilisation statistics (1 to 5)	284.32	289.46	303.76	304.15	304.88	304.88	304.90	304.84	304.88	304.88	100.00
1. Forests	40.48	54.05	63.91	67.47	67.41	67.80	67.87	87.98	68.28	68.39	22.4
2. Not available for cultivation (a+b)	47.52	50.75	44.64	39.62	40.96	40.48	40.74	40.91	40.90	41.28	13.6
(a) Area under non agricultural uses	9.36	14.84	16.48	19.66	21.26	21.09	21.47	21.87	22.21	22.51	7.4
(b) Baren and un-culturable land	38.16	35.91	28.16	19.96	19.70	19.39	19.27	19.04	18.69	18.77	6.2
3. Other uncultivated land excluding fallow land (a+b+c+)	49.45	37.64	36.06	32.31	30.20	30.22	30.05	29.40	29.07	29.08	9.6
(a) Permanent features and other crazing lands	6.68	13.97	13.26	11.97	11.30	11.40	11.30	11.07	10.97	11.24	3.7
(b) Land under miscellaneous tree crops and groves not included in the net area sown	19.83	4.46	4.30	3.60	3.80	3.82	3.76	3.76	3.69	3.63	1.2
(c) Culturable waste	22.94	19.21	17.50	16.74	15.10	15.00	14.99	14.57	14.41	14.21	4.7
4. Fallow lands (a+b)											
(a) Fallow land other than current fallows	17.44	11.18	8.76	9.92	10.27	9.68	9.94	9.68	9.63	9.77	3.2
(b) Current fallows	10.68	11.64	11.12	14.83	13.70	13.70	14.67	14.15	14.38	13.53	4.4
5. Net area sown (6-7)	118.75	133.20	140.27	140.00	142.34	143.00	141.63	142.72	142.42	142.82	46.8
6. Total cropped area (Gross cropped area)	131.89	152.77	165.79	172.63	182.27	185.74	182.24	185.70	186.60	188.15	-
7. Area sown more than once	13.14	19.57	25.52	32.63	39.93	42.74	40.61	42.98	44.18	45.33	-
8. Cropping intensity*	111.07	114.69	118.19	123.31	128.05	129.89	128.67	130.10	134.00	131.70	
-											
III. Net irrigated area	20.85	24.66	31.10	38.72	46.70	47.78	49.87	50.30	51.34	53.00	-
IV. Gross irrigated area	22.56	27.98	38.19	49.73	61.85	62.47	65.68	66.76	68.25	70.64	-

** Source : Agricultural statistics at a glance (March 1998), Ministry of Agriculture, Government of India*

Food Production

All India Food Grain Production from 1950-51 to 1997-98 is given in the graph. During the period 1950-51 to 1960-61, food-grain production showed a rising trend at a rate of 3.3% per annum. During the second period 1960-61 to 1973-74, production only rose at a rate of 2.6% per annum. Compared to the first period, food grain production during the second period is more stable. The high rate of growth achieved in food-grain production is the result of a planned development. It was not accompanied by stability. However, the high rate of growth achieved during 1973-74 to 1996-97 is more stable.

Food Security

In the past, food and nutritional security have been largely interpreted to mean an adequate availability of basic food grains in the country as a whole. The concept of food security now needs to be broadened to include people's access to basic nutritional requirements both physically and economically. It is necessary to develop strategies by which inadequacies can be overcome by integrating the full production and distribution systems with the employment and poverty alleviation programmes. Considering the 180 kg per person per year which is normally taken as the minimum food requirement to be too inadequate to define food scarcity for Vision purposes, there is a general feeling that food security should be defined at a higher level than this minimum norm as an increasing standard of living over the next few decades is likely to change the norms of food consumption. Considering this fact, food security should be defined in concrete terms rather than in terms of simple quantity. Among the factors that are likely to influence the future food security status are population increases and food production.

Food security implies a situation where everyone has access, at all times, to the food needed for an active and healthy life. Thus the essential elements of food security are :

a. adequate availability of food,
b. efficient distribution through trade and/or public distribution systems, and
c. availability of adequate purchasing power in the hands of the people.

An approach to national food security which relies largely on domestic production of food needed for consumption as well as for building buffer stocks, is a strategy of self-sufficiency. However a strategy for food security should not preclude external trade in food. Trade may take place on the margin and according to need : exports in surplus situations and imports in deficit periods. The strategy for food security based largely on self-sufficiency in food production has the advantage of promoting both productivity and purchasing power among small peasants and agricultural labourers. Ensuring food security for India has been a major pre-occupation of the government since Independence.

Apart from policies to promote domestic food grain output with a minimum support price, the current food security system consists of procurement of storages, public distribution, maintenance of buffer stocks, and open market sales. Trade in food grains, which is highly regulated even now, was never a strategic instrument for a food security system in India. The success, in terms of self-sufficiency in production and relative price stability, has not, however, been without significant cost to the economy. The system of food security, as it evolved over time, has tended to consume substantial financial resources because of high subsides.

Self-sufficiency in production of food grains is often advocated as a first step towards attaining food security for a county of India's size for a number of reasons. The first, the world's food grain market is narrow compared to India's domestic produce and consumption. For example, the size of the international rice market is about 1.2 to1.3×10^7 tonnes. India produces 8×10^7 tonnes of rice. Although the world wheat market is comparatively large at $1.1\text{-}1.2 \times 10^8$ tonnes, it is cartelised. India produces about 6.5×10^7 tonnes of wheat. Under such a situation, large scale imports of say 10% of its requirement can make India vulnerable to sharp rises in the world price of food grains.

Secondly, the strategy of self-sufficiency in food serves the goal of national security. Dependence on food aid or large scale imports may entail unacceptable comprises on national security policies. Third, the county is heavily populated and food production is a predominant means of livelihood for a large section of peasant cultivators and agricultural labourers, who cannot easily move to other occupations, at least for quite sometime. Last, but not least, most of the time the country continues to produce cheaper food grains, particularly cereals, compared to the CIF cost of imports. Significant strides have been made in the domestic production of food grains and other cereals. India's position in world agriculture in 1996 is given in the Table 3.

Adequate availability of food at the national level does not necessarily lead to adequate availability in all the regions, especially in deficit and inaccessible regions of a county. Market imperfections and Government restrictions hamper the free movement of food grains across international borders. A common market is the best guarantee for establishing an efficient distribution network. Apart from strengthening and expanding the market, there is a need to disperse food grain production to deficit regions in order to ensure physical access to food for all at affordable prices. The strategy of dispersal of production has several other spin-off benefits. First, hitherto deficit regions will increasingly contribute to an incremental production since the yield rates in traditional surplus regions have plateaued. Second, large transaction costs involved in the import of food grains from a few surplus pockets to all corners of the country can be avoided. Third, widely dispersed employment and income effects, implicit in such a strategy, will serve the objective of poverty alleviation.

Fluctuating food grains production is a world-wide phenomenon and therefore, shortage and surpluses are the recurring themes for individual countries. In order to avoid paying more than necessary for import and receiving less than due on export, it is essential to build up sufficient capacity to hold back from purchases or sales for short periods. This capacity is essentially a derivative of a strong buffer stock management. As a matter of fact, India should take advantage of the International "Futures" in the food grains, primarily rice and wheat markets, as a medium of buffer stock management at relatively low volumes. The "Futures" can ensure a stable equilibrium in the price of food grains even in a situation of low domestic stocks. However, to be effective the Government of India, though its agencies, must have a sustained presence in the International "Futures" market.

There is a strong case to liberalize the trade, not only in food grains but also in all other agricultural commodities. On the export side, opportunities of export of food grains and other rainfed agricultural products such as cotton and fruits will open up. On the import side, opening up India's agriculture to more competition would result in more efficient gains for all crops and improve incentives to producers of food grains and cotton. India should aim to be more than a marginal exporter of basic agricultural commodities. This will strengthen the food security system.

POPULATION

The total population of India in 1991 was 8.463×10^8 after examining the latest trends and views expressed by different demographers, the higher and lower limits of India's population in 2025 are 1.333×10^9 (Visaria and Visaria (Standard)) and $1.2863 \times 1 \times 10^9$ (United Nations, the low variant).

The projected future population and the decennial growth of the population since 1901 to 1991 (actual figures) are given in the graph. The rural population, which is about 74.3% of the total population in1991 is expected to go down to 50% by 2050 as per the low urban population projections. The percentage distribution of Main Workers into cultivators, agricultural labourers, household industry workers and other workers according to the 1981-91 census are given as follows :

- there was a decline in cultivators and a small increase in agricultural labourers during the 1981-91 decade;

Table 3. India's position in World Agriculture – 1996

Item	India	World	Share %	India's Rank	Next to
Area (Million ha.)**					
Total Area	329	13383	2.5	Seventh	Canada, USA, China, Brazil, Australia, Russian
Land Area	297	13048	2.3	Seventh	Fed. USA, China, Canada
Arable Land	166F	1362	12.2	Second	Brazil, Australia, Russian
Irrigation	50F	255	19.6	Frist	Fed. USA, USA
Population (Million)					
Total	945	5768	16.4	Second	China
Agriculture	541	2592	20.9	Second	China
ECONOMICALLY ACTIVE					
Population (Million)					
Total	410	2568	14.8	Second	China
Agriculture	541	2592	20.9	Second	China
CROP PRODUCTION (Million Tonnes)					
Cereals	214*	2050	10.4	Third	China, USA
Wheat	63*	585	10.8	Second	China
Rice	120*	562	21.4	Second	China
Coarse Grain	31*	902	3.4	Fifth	USA, China, Brazil Russian Fed.
Potatoes	18F	295	6.1	Sixth	China, Russian Fed. Poland, USA, Ukraine
Total Pulses	15F	57	26.3	First	–
Groundnut	8*	29	27.6	Second	China
Tobacco Leaves	0.51*	6.51	7.8	Third	China, USA
Rapeseed	6*	30	20.0	Second	China
Coffee (green)	0.18*	5.93	3.0	Ninth	Brazil, Clombia, Indonesia Mexico, Ethiopia, Uganda Vietnam, Guatemala
Sugarcane	255*	1193	21.4	Second	Brazil
Tea	0.72F	2.62	27.5	First	
Jute & Allied Fibres	1.72F	3.02	57.0	First	
Cotton (lint)	2.55*	18.82	13.5	Third	USA, China
LIVESTOCK NUMBERS (Million head)					
Cattle	196*	1320	14.8	First	
Buffaloes	80*	152	52.6	First	
Camels	1.52F	19.29	7.9	Third	Somalia, Sudan
Sheep	45*	1048	4.3	Fifth	Australia, China, New Zealand, Iran
Goats	120*	674	17.8	Second	China
Chicken	610	12952	4.7	Fifth	China, USA, Brazil, Indonesia
IMPLEMENTS (Thousands Numbers)**					
Tractors-in-use	1355	26197	5.2	Fourth	USA Japan Italy

* Unofficial Figure ** Figures relate to 1995

Source : Agricultural Statistics At a Glance, March, 1998, Ministry of Agriculture, Government of India.

- the most striking feature was the marked decline in the proportion of male cultivators and an increase in the proportion of female agricultural labourers,
- overall, however, there has been an increase in he number of agricultural labourers.

The percentage distribution of main workers as compared to cultivators, agricultural labourers, household industry workers and other workers, according to the 1981-91 Census is given in Table 4.

Table 4. Percentage Distribution of Main Workers As Cultivator, Agricultural Labourers, Household Industry Workers and other Workers 1981-91

Sl. No.	India/State or Union Territory	Total Rural Urban	Persons Males Females	Cultivators		Agricultural Labourers		Household Industry Workers		Other Workers	
				1981	1991	1981	1991	1981	1991	1981	1991
1.	India*	Total	Persons	41.58	38.75	24.94	26.15	3.47	3.63	30.01	31.47
			Males	43.70	40.01	19.56	20.09	3.18	3.33	33.56	35.76
			Females	33.20	34.55	46.18	43.56	4.59	4.63	16.03	17.26
		Rural	Persons	51.10	48.47	29.88	31.77	3.08	3.08	15.94	16.68
			Males	55.16	51.79	24.00	26.11	2.87	2.84	17.97	19.26
			Females	37.07	38.98	50.20	47.94	3.79	3.76	8.94	9.32
		Urban	Persons	5.13	4.99	6.05	6.66	4.94	5.57	83.88	82.78
			Males	5.20	4.90	4.66	5.35	4.21	4.82	85.93	84.93
			Females	4.66	5.54	16.57	14.89	10.48	10.30	68.29	69.27
	India (Excluding Assam and Jammu & Kashmir)	Total	Persons	41.45	38.43	25.12	26.49	3.45	3.66	29.98	31.42
			Males	43.58	39.72	19.71	21.11	3.17	3.37	33.54	35.80
			Females	33.09	34.15	46.34	44.29	4.57	4.62	16.00	16.94
		Rural									
			Persons	50.95	48.22	30.09	32.29	3.07	3.10	15.89	16.39
			Males	55.03	51.61	24.19	26.48	2.86	2.87	17.92	19.04
			Females	36.94	38.58	50.36	48.83	3.77	3.75	8.93	8.84
		Urban	Persons	5.11	5.00	6.08	6.79	4.91	5.59	83.90	82.70
			Males	5.17	4.92	4.68	5.40	4.18	4.83	85.97	84.85
			Females	4.63	5.54	16.65	15.00	10.44	10.30	68.28	69.16

* The proportions for the 1981 census excludes assam where the 1981 census could not be held and the proportion for the 1991 census excludes jammu & kashmir where the 1991 census has not been held.

RURAL DEVELOPMENT

Agriculture provides the livelihood for the largest number of people. Robust growth in this sector guarantees the achievement of broad-based growth of income levels and employment especially in rural areas. The strategy of agricultural development is centred around achieving the objectives of sustainability of employment generation, food and nutrition security, and equity and poverty alleviation. Efforts have to be made to achieve a growth rate of 4.5% per annum in agricultural output in order to a make a significant impact on overall growth and poverty.

Agriculture has not benefited as much as it should have from the policies of economic liberalization because agriculture continues to suffer from too many restrictions and impediments which prevent framers from marketing their produce at attractive prices. The opening of an export market for agricultural products will help to shift the problems of trade in favour of agriculture and this should help to raise rural incomes. But broad-based agricultural development also requires substantial investment in economic infrastructure especially in irrigation, rural roads and the creation of markets.

Agriculture growth is a pre-requisite for the economy and social development of the country. Agriculture contributes 28% of GNP, about 60% of employment and is primarily a source of livelihood in rural areas which account for 75% of India's population and 80% of its poor. Irrigated agriculture contributes nearly 56% of agriculture output. Between 1970-71 to 1993-94, the net sown area virtually remained uncharged (from 1.4027 to1.421×10^8ha). Hence the increased production is attributable to an increase in yields through an increase in cropping intensity and utilization of better inputs. Irrigation is a vital input to increase agricultural output to keep pace with the food requirements of an ever increasing population. India had the largest irrigated area at the end of 1996 among the countries of the world. This greatly increased food grain production. Employment in agricultural productivity from irrigated agriculture is one of the main objectives of the command area development programme. An analysis of the data of productivity in respect of some selected projects under the command area development programme indicates that staple crops like paddy and wheat have registered an increase of productivity of 50% and 85% respectively.

Provided the required investments are made and adequate availability ensured, the country's agro-climatic situations and the present state of agricultural development will provide opportunities for a substantial increase in the production of food grains even without expanding the net sown area in food grains.

Poverty eradication is one of the major objectives of the planned development. Thirty six percent of the Indian population was below the poverty line in 1993-94, the last year in which data are available. The absolute number of poor was 3.29×10^8 out of which 2.44×10^8 (37% of the rural population) live in rural areas. The incidence of poverty declined from 54.9% in 1973-74 to 36% in 1993-94. But the absolute number of poor did not decline much over this period of 20 years. The same may be the scenario in 2025 when the incidence of poverty may decline to 24% but the absolute numbers will remain at 3.2×10^8 out of a total population of 1.33×10^9.

Poverty can effectively be eradicated only when the poor start contributing to the growth by their active involvement in the growth of India. This is possible if process of social mobilisation encourages participatory approaches, institution and empowerment of the people. There are many rural poverty alleviation programmes like the Integrated Rural Development Programme (IPRD) which aims at providing self-employment to the rural poor through the acquisition of production assets or appropriate skills which will generate additional income on a sustained basis to enable them to cross the poverty line.

The scheme of TRYSEM (Training of Rural Youth for Self-Employment) facilitating components of IRDP aims at providing basic technical and entrepreneurial skills to the rural people to enable them to take up income generating activities. There is another scheme, namely SITRA (Supply of Employment Cheap Tools) for rural artisans, launched in1992 which provides kits of hand tools for a variety of crafts (except weavers, tailors, and bidi workers). There are also a number of other schemes like DWCRA (Development of Children and Women in Rural Areas), (JRY) Jawahar Rozgar Yojna, EAS (Employment Assurance Scheme), MWS (Million
Well Scheme) and NASP, (National Social Assistance Programme).

RURAL WATER SUPPLY AND SANITATION

Recent published data indicates that rural water supply programmes have covered 3.4 lakh villages/habitats during the 8th Plan. In terms of population, according to the 1991 census, about 86.74% of the rural population is expected to have been provided with access to safe drinking water. By the end of 2002, 100% coverage of habitats will have sufficient water, and provide quality monitoring and surveillance systems throughout the country, rearranging the structure and functioning of rural water supply planning and implementing agencies. It will take all these measures to ensure the sustainability of drinking water sources.

Recent data show that the population covered by sanitary latrines has increased from 11% to about 16%. This is inclusive of efforts by IAY, JRY, UNICEF, CAPART and centrally and state sponsored rural sanitation programmes. The existing policy, subsiding under the rural sanitation programme, is provided to people below the poverty line for construction of individual household latrines and conversion of dry into sanitary latrines. It can be presumed that rural sanitation could be increased to 50% from the present 16% by 2025.

FUTURE DEMAND for FOOD

The demand for food averages about 3.45×10^8 tonnes. This has to be met from both rainfed and irrigated areas. Apart from these, there are non-food grain demands in regard to other food related items and also demands for fibres and industrial oil seeds, which have to be met from the land. The amount of land used for agriculture depends on its productivity. Assuming a national average yield of 1.25 t/ha for un-irrigated crops and 2.75 t/ha for irrigated crops, the likely land use plan in 2025 will be as follows :

Net Sown Area	=	1.42×10^8 ha
Gross sown Area	=	2.00×10^8 ha
Gross Irrigated Area	=	9.5×10^7 ha
Gross Cropped Area (Rainfed)	=	1.08×10^6 ha
Gross Irrigated Area (Food grains)	=	6.5×10^7 ha
Gross Crop Area (Rainfed) Food grains	=	7.2×10^7 ha
Food Production from Irrigated Areas	=	2.25×10^6 tonnes
Food Production from Rainfed Areas	=	9.0×10^8 tonnes
Total Food Production	=	3.15×10^8 Tonnes

FUTURE DEMAND FOR WATER FOR AGRICULTURE

The gross irrigated area of 9.5×10^7 ha can be achieved through the following plan :

S.No.	Source of Irrigation	Area (in Million Hectare)	Gross Delta (in Meters)	Gross Use (in BCM)
1.	Surface Irrigation	47	0.73	340
2.	Irrigation from Ground Water	48	0.51	240
	Total	95		580

DEMAND FOR DOMESTIC WATER

Water for consumption, health and hygiene necessarily has to receive priority in both vision and planning. Up until today we have had a reasonable water supply for most of our urban and the majority of our rural areas. However, there is a large variability in the quantity supplied to urban areas. It varies from 10 to 500 LPCD and in rural areas from 5 to 70 LPCD. There is a need to

have much more water provided to the rural areas and a more equitable distribution in the urban areas. A norm of 220 LPCD for urban areas and 150 LPCD for rural areas has been suggested by the National Commission of Integrated Water Development. These goals can be achieved by 2050 AD. The norms proposed by 2025 are 220 LPCD for urban areas and 70 LPCD for rural areas. The total water required for drinking by 2025 is $6x10^{10}m^3$. It is expected that 80% of the domestic water will be recycled and the consumptive demand will be 20%.

INDUSTRIAL AND OTHER DEMANDS

Industrial requirements are estimated to be around $1.2x10^{14}m^3$ gross, of which the net requirement may be $6/5x10^7$. Apart from this the requirement for maintaining the ecology of the rivers and for maintaining navigability in the lower reaches would be around $2x10^7$. Water requirements for the energy/power sector has been estimated as $3.5\ x10^{10}m^3$. The water requirement for hydro power generation is mostly non consumptive. However, the evaporation losses from reservoirs in 2025 have been estimated to be $5\ x10^{10}m^3$. The requirement for navigation in water channels are mostly met by seasonal flows in various river systems or canals. However, the actual release downstream of the Farakka Barrage for the year 2025 has been projected at $1\ x10^{10}m^3$ by the National Commission.

Thus the total water requirement for 2025 can be abstracted as follows :

Sl. No.	Item	Gross Requirement (in BCM)	Net Requirement (in BCM)
1.	Agricultural	580	350
2.	Domestic Water Demands	60	12
3.	Energy & Hydro-Power	85	61
4.	Industry	120	65
5.	Navigation & Ecology	10	0
	Total	800	488

CONCLUSIONS AND VISION

(i) Water Requirements

It is clearly seen that water planning for the year 2025 calls for the irrigation of $9.5\text{-}20x10^7$ ha which is less than the irrigation potential of $1.39x10^8$ ha achievable through conventional means. This clearly indicates that conventional means of in-basin surface and ground water development will suffice.

Gross water demand is large at $8x10^{11}m^3$. As per the current thinking the utilisable water resource is limited to only $1.086x10^{12}m^3$ made up of $6.9x10^{11}m^3$ through surface sources and $3.96x10^{11}m^3$ through ground sources. With increased water withdrawls, a large scale recycling of water would become inevitable and ground water will be augmented by return flows from agriculture and domestic uses. Similarly recycled water will be added to surface water. In view of this, net water requirement will be $4.88x10^{11}m^3$. This again indicates that if utilisation by conventional means alone is considered, there will be marginal water shortages. These shortages naturally would be far more serious in the water short basins like the Cauvery, Pennar, Sabarmati, Mahi, and Krishna basins.

Thus the Water Vision for 2025 has to stress on initiating measures for unconventional means such as inter-basin water transfers and artificial recharge as essential ingredients for meeting the day-time demands, keeping in view the possibility of occurrences of drought.

The net water requirements are much smaller at $6.85 \times 10^{11} m^3$. These are smaller than the available water resources of around $1.87 \times 10^{12} m^3$. Thus no import of water from other areas is necessary. However, the net use of such large quantities as $6.85 \times 10^{11} m^3$ will require a large scale storage development. Considering that the total live storage which is possible to develop within India is $3.84 \times 10^{11} m^3$ then some storages in other countries may have to support the development.

The large difference between gross and net utilisation of about $5.85 \times 10^{11} m^3$ indicates that in 2025 re-circulation through return flows would be in the order of $5.6 \times 10^{11} m^3$ which is about 30% of the $1.87 \times 10^{12} m^3$ water available. Thus the pollution hazards in both surface and ground water, particularly in regard to ground water, will be a cause for serious concern and have to be addressed in the Vision.

(ii) Development of Eastern Region

In view of the fact that there is a relatively smaller opportunity of increasing food production in the agriculturally advanced regions like Punjab and Haryana with present technology, the eastern region holds the most promise for future food security. The agricultural production potential of the plains of the eastern regions is sufficiently high and is comparable to the agriculturally advanced regions of the country. The management of water is a critical factor in the realisation of this production potential.

(iii) Reclamation of Land

According to the Water and Related Statistics published by the Central Water Commission, 8.5×10^6 ha of land are water logged in the country and nearly 2.46×10^6 ha is estimated to be caused by inadequate drainage systems in irrigation commands. Similarly out of 5.5×10^6 ha of land are affected by salinity and as much as 3.06×10^6 ha comprise the area affected by irrigation related problems.

The waterlogged areas can be reclaimed by surface and sub-surface drainage and also by conjunctive use. ICID and CWC have already published guidelines for the Conjunctive Use of Surface and Groundwater. Reclamation of saline and alkaline land will be a more complex job, involving leaching, soil additions, sub-surface drainage and trunk drains.

(iv) Water Conservation Methods

Even though the supply of water is to be increased before the year 2025, water conservation measures such as water management, reducing evaporation and evapo- transpiration, better irrigation practices and adoption of sprinkler and drip irrigation methods, maintenance of irrigation systems, conjunctive use and the recycling and reuse of water must be introduced. All of these measures will greatly assist in saving water.