11 HEALTH AND NUTRITION CARE

The national policy for children adopted by the country in 1974 enjoins, among other things, that children shall be given priority for protection and relief in times of distress or national calamity. This policy is being followed in all situations of calamity like flood or drought where children are often serious victims. To combat the situation created by drought of 1987, health and nutrition care measures including those focussed on children were taken. Since the drought was unprecedented in severity and most parts of the country were in its grip, it became imperative to take special care of the nutritional and health requirements of children and pregnant and nursing mothers. While provision of supplementary nutrition is an essential component in the *anganwadis* in the blocks covered by the Integrated Child Development Services (ICDS) programme, special measures were initiated to operationalise drought nutrition programme in the areas affected by drought but not covered by the ICDS programme.

1.2 The immediate impact of unprecedented and widespread drought resulted in a reduced availability of food and dwindling purchasing power in the affected area. The impact was particularly disastrous on the families below or near the poverty line. Since exact figures of population in the States affected by drought were not available, projections were made on the basis of coverage by the ICDS projects, for the population of the affected children in 0-6 year age group and pregnant and nursing mothers. Nearly 65 per cent of the entire population was estimated to be affected by drought. A population of 100 million children and pregnant and nursing mothers was projected as affected by drought. With the government having already covered one-third of the country through the ICDS programme, which has supplementary nutrition as one of its components, it was estimated that nearly 33 million children and pregnant and nursing mothers were outside the ICDS area to be targeted for supplementary nutrition.

1.3 The problems of the drought affected population are compounded by the prevalance of acute poverty, illiteracy and backwardness in these areas. Deficiency of nutrition decreases the resistance of the body to infections and prevalent diseases in the community like tuberculosis. Infections and malnutrition form a vicious circle, often difficult to break in the drought context. Some of nutritional

Table 43: States and Districts covered under Nutritional Survey, 1987.

S.No.	State	District	Number of Villages Covered
1.	Andhra Pradesh	1. Mahboob Nagar	13
2.	Gujarat	1. Banaskanta 2. Kutch	34
3.	Karnataka	1. Mysore 2. Hasan 3. Tumkur 4. Kolar 5. Dharwad	32
4.	Madhya Pradesh	1. Khargaon 2. Dhar 3. Rewa 4. Rajanandgaon	16
5.	Orissa	1. Kalahandi 2. Phoolbani 3. Ganjam 4. Koraput	67
6.	Rajasthan	1. Jodhpur 2. Jaisalmer 3. Barmer 4. Jalore 5. Nagaur 6. Sikar	62
7.	Tamil Nadu	1. Dharmapuri 2. Ramanad 3. North Arcot 4. Thanjavur	16
	Total	26	240

deficiency diseases seen in this situation are: (a) night blindness, (b) xerophalmia, (c) nrutitis, (d) *kwashiorkor*, (e) marasmus, (f) anaemia, (g) mental apathy, (h) scurvy, (i) glossitis, and (f) cirrhosis of the liver.

1.4 Water scarcity results in health problems and leads to waterborne diseases compounding the problems further during drought. Some common water-borne diseases encountered in this situation are: (i) dehydration, (ii) dysentary, (iii) ascariasis and other kinds of worm infestations, (iv) typhoid, and (v) other unspecified diarroheal diseases.

1.5 The Indian Council of Medical Research (ICMR) was requested by the Ministry of Health and Family Welfare (MHFW) to undertake a nutritional survey in the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu during October-December, 1987. The States and the districts covered are shown in Table 43.

1.6 A total of 25,617 persons were examined from 240 villages. Of these 9,666 were pre-school children and 15,951 were adults. During the survey, investigations were carried out on the following: (1) general health condition, (2) food and nutrient consumption, (3) nutritional deficiency signs, (4) growth status, and (5) relief measures. The salient features of the results of this survey were: (1) the drought was extensive and most severe in Gujarat and Rajasthan, (2) there was reduction in food intake particularly of protective foods, vitamins and minerals, (3) reduction in cereals in energy intake was severe in most of the States. The effectiveness of drought relief measures was evident from the energy intake below 500 calories (starvation level) which was only 0.2 per cent as compared to 36 per cent observed during the drought survey in 1967 in Bihar and Andhra Pradesh, and (4) though the supply of goods like cereals was maintained, the intake level of protective foods like vitamins and minerals was lower than in the normal times.

1.7 The observations of the survey were in accordance with the reports received from the State Governments which were tabulated by the Emergency Medical Relief Section of Directorate General of Health Services in MHFW. The details of the survey reports may be seen in Annexure—XXV. It may also be mentioned that the incidence of water-borne diseases was found to be much lower than even in the normal times due to effective preventive measures taken by the State Governments. However, there was a serious rise in cases of respiratory infections due to persistent dry weather resulting in remultiplication of viruses and other organisms.

Policy Initiatives

2.1 Senior officials of the Department of Women and Child Development (DWCD) were included in the central teams visiting States and such officers were briefed about the manner in which the State Governments were to be advised to identify and work out their supplementary nutrition needs and get them included in the recommendations of the central teams to the HLCR. Even when proposals for supplementary nutrition had not been included by State Governments in their original memoranda, the officers of the DWCD worked out the requirements and got them included in the central team's recommendations to the HLCR.

2.2 Pending the receipts of sanction by the State Governments, as an advance measure, instructions were issued to the Secretaries of Women and Child Development Departments in the States alerting them to the need to gear up the state relief machinery to utilise the amounts likely to be sanctioned. For the affected area, not covered by the ICDS, it was specifically mentioned that the implementation of the drought nutrition efforts should be on the same lines as the ongoing Wheat-Based Nutrition (WBN) Programme. In order that full value for the money sanctioned could be derived by the beneficiaries, the States were instructed to obtain the wheat required for the programme from the States quota of the PDS at the issue price of the Food Corporation of India (FCI).

2.3 Consultations with the Central Food Technological Research Institute (CFTRI), Mysore were held to identify cereal based recipes to be used in the States, in addition to those indicated in the ongoing WBN programme. A meeting was held in the DWCD with the Chairman, Food Sciences Division, CFTRI, Mysore and the Technical Adviser (Nutrition), Department of Food. Guidelines were evolved on the basis of 27 CFTRI formulations on nutrition that could be used in the States and these were communicated to the State Secretaries in charge of Women and Child Development for adoption.

2.4 Since special nutrition efforts of this magnitude had been mounted for the first time in the context of drought and these efforts were to be mounted outside the ICDS area where no ready delivery infrastructure existed, instructions were also issued to the State Governments to utilise such existing infrastructure as the creches and *balwadis* in these areas, mostly through non-Government Organisations.

2.5 With a view to involve the voluntary agencies in this mammoth effort, instructions were issued to the Central Social Welfare Board and the national level voluntary organisations like the Indian Council for Child Welfare to enlist the assistance of voluntary organisations in programmes for the children and mothers in their respective project areas. With concerted efforts of this kind, central assistance to the extent of Rs.55.51 crore was got approved by the HLCR and released to the affected States for the drought nutrition programme. About 77.23 lakh children and nursing and expectant mothers benefited under the drought nutrition programme in the affected states.

2.6 A Committee of Secretaries including the Secretary, Women and Child Development, visited most severely drought affected States of Gujarat and Rajasthan. Based on their recommendations, certain SDAAs were identified in these two states where 40 ICDS projects were established at the rate of 20 projects in each State, envisaging 3,388 *anganwadi* centres in Gujarat and 2,872 *anganwadi* centres in Rajasthan. Appropriate instructions were issued to these two States to start the nutrition part of the programme immediately so that sustenance would be provided to the children and pregnant and nursing mothers backed by health support. This endeavour was to base the drought nutrition programme on wheat. In order that the full value of the money could be derived, 47,500 metric tonne of wheat was allocated to the States by the Department of Food so that the States did not have to buy wheat from the open market at higher rates.

2.7 With a view to evolve suitable linkages between the nutrition programme and relief works, instructions were issued to the Relief Commissioners of the States affected by drought to make arrangements for providing temporary creches at the relief work sites wherever a sizeable number of women were employed to take care of their children in the 0-6 year age group. Such steps were immediately taken, for example, by the States of Gujarat, Orissa and Madhya Pradesh. The Government of Gujarat opened 148 such centres at various relief work sites covering nearly 18,000 beneficiaries.

2.8 The surveys conducted in Rajasthan by the Desert Medical Research Centre, Jodhpur of the Indian Council of Medical Research (ICMR) were carefully analysed and, realising that the calories

gap in several parts of the State was of the order of 600 calories and more and postulating a similar situation in Gujarat, a scheme for providing a second supplementary meal to the children below 6 years and expectant and nursing mothers in these two States, in addition to the supplementary nutrition programme already introduced in these areas, was launched on 1st June, 1988 with funds provided from the Prime Minister's Relief Fund. Under the scheme, additional daily feeding (over and above the normal feeding under the ICDS and drought nutrition feeding) during the months of June and July 1988, to 7 lakh beneficiaries in Rajasthan and 4.7 lakh in Gujarat in the SDAAs in 6 districts of Rajasthan (Jaisalmer, Barmer, Jodhpur, Churu, Jalore and Nagaur) and 5 districts of Gujarat (Jamnagar, Banaskantha, Kutch, Mehsana and Surendranagar) was provided.

2.9 It was emphasised by DWCD that supply of spot-cooked food, regular medical checkups, distribution of vitamin A, iron and folic acid tablets, strict supervision by the block level officers and maintenance of separate accounts for the normal feeding and the additional feeding should be ensured under the programme. Additional feedings were organised in the evenings while the normal feeding under the ICDS and drought relief programmes were organised in the morning. The centrally sponsored wheat-based nutrition programme, launched in January 1986, was further strengthened by funds, commodity coverage and supervision points of view and this enlarged the scope to ameliorate the lot of the weaker sections of the society. Additional beneficiaries were targetted primarily in tribal area and backward rural area both in ICDS and non-ICDS blocks where nutritional deficiency was most prevalent amongst pre-school children and expectant and nursing mothers. Under this programme, an amount of Rs.22.04 crore was provided to State Governments including the States affected by natural calamities during 1987-88 for covering 31 lakh beneficiaries. In addition, 65,511 tonne of wheat was also allocated free of cost under the centrally funded and 32,724 tonne of wheat at subsidised rates under State funded components of the WBN programme. As a measure of health support to the victims of drought, a contingency plan was prepared by the MHFW and finalised in a meeting with Health Secretaries and Directors of Health Services of the States.

2.10 For the first time 6 medical colleges, 3 each in Rajasthan and Gujarat, were involved in providing health care facilities at the NREP worksites and also at the primary health centre level. These medical colleges were: (1) Dr. S.N. Medical College, Jodhpur, (2) R.N.T. Medical College, Udaipur, (3) S.P. Medical College, Bikaner, (4) B.J. Medical College, Ahmedabad, (5) Government Medical College, Baroda, and (6) M.P. Shah Medical College, Jamnagar. Involvement of medical colleges in addition to public health infrastructure helped to provide expert medical care facilities directly to the rural population of the drought affected area.

2.11 An amount of Rs.10 lakh was provided to the Government of Gujarat from the Prime Minister's National Relief Fund for a special *Sukhadi* programme alongwith distribution of Vitamin A to control night blindness. The special efforts were felt necessary as the number of cases of night blindness had registered a considerable increase in this area. 21,900 bottles of Vitamin A were distributed additionally in Rajasthan and Gujarat under maternity and child health programme.

2.12 As part of drought relief measures, a new central scheme called 'Operation Health Care Scheme' was started on an experimental basis for the States of Rajasthan and Gujarat. The aims of the Scheme were: (1) doctors and students from the department of preventive and social medicine of the medical colleges would be mobilised to provide preventive and curative medical facilities at primary health centres and sub-centres, and at the worksites; (2) these personnel would provide Vitamin A tablets to prevent night blindness, health education in *anganwadis* and *balwadis*, special care to children, expectant mothers and other people and also conduct health and nutrition surveys; (3) health education at the worksite will be organised once a week; (4) a first-aid box and clean drinking water would be made available at the work site; (5) to explore the feasibility of creche services for children of the workers at the work site; and (6) the GOI would supply free vaccines for coverage of the entire population at the work site. The above scheme covered 16 primary health centres in Rajasthan and 15 primary health centres in Gujarat.

2.13 During the implementation of the supplementary feeding programme, the problems faced were; (i) non-availability of kitchen utensils for the preparation of food at feeding centres, (ii) deployment of inadequate staff for conducting the feeding programme, (iii) lack of coordination between the Health Department and Welfare (Nutrition) Department at District and State level, (iv) lack of supervision where the programme was mounted, (v) non-observance of sanitary and hygienic

conditions recommended by medical experts, (vi) delayed mounting of programmes, and (vii) very slow flow of data regarding number of beneficiaries to be covered and actually covered. These constraints resulted in the late start of the feeding programme in many States and, to some extent in diminishing the impact of the feeding programme. However, in a series of meetings taken with the concerned State officials in Delhi as well as in the State headquarters by the officials of the DWCD who were assigned to supervise the drought relief work in States, these bottlenecks were sought to be eliminated.

2.14 Despite these efforts, information received at Central level was not in accordance with the prescribed formats, due to which difficulties were faced in analysing the information received. For example, information on preventive measures taken by the State of Orissa was mentioned in detail but there was no information about prevalence of diseases including nutritional diseases. Whatever information was received from the States of Gujarat, Maharashtra and Rajasthan was one to one-and a half month late. This delayed information prevented appreciation of the problems in time. For example, the supply of Vitamin A to prevent blindness could have been made much in advance to the States of Rajasthan and Gujarat.

2.15 No programme can be successful unless it is backed up by proper monitoring and reporting systems. Considerable efforts were made in this direction. Weekly progress reports were prescribed for submission to the DWCD. The proforma evolved provided for not only progress of expenditure but also the number of beneficiaries covered. As a measure of abundant precaution, an additional proforma was also evolved calling for information on the total number of beneficiaries to be covered, the specific field agency that would operate the programme and the administrative arrangements for the implementation of the programme. Also included in this proforma was a column for the States to report on the recipes that would be used in the feeding centres run under the drought nutrition programme.

2.16 Senior officers of the DWCD were made responsible for undertaking monitoring and co-ordination of nutrition programmes in the severely drought affected States of Orissa, Rajasthan and Gujarat. These visits brought home the kind of problems and the severity of the incidence of malnutrition noticed in these areas. The MHFW made following monitoring and reporting arrangements: (1) A meeting of all Directors of Health Services of major drought-affected States was held on 31st March 1987 to take stock of drought situation and to discuss details of arrangements made by them including arrangement to get feedback information; (2) 14 major drought affected States were visited by senior officials of the GOI for on the spot assessment of the situation. The States and Union Territories visited were Andhra Pradesh, Gujarat, Haryana, Punjab, Chandigarh, Jammu and Kashmir, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Uttar Pradesh, Rajasthan and Tamil Nadu; (3) Regional Directors of Health and Family Welfare posted at State headquarters remained in touch with State Governments; (4) State Governments were requested to send fortnightly reports on action taken; (5) Separate letters were issued to Health Secretary, Government of Kerala to take adequate measures in view of large number of diarrhoeal diseases; and (6) Review of drought measures was under taken twice by the GOI with the Health Secretaries of State Governments on 3rd November, 1987 and 10th June, 1988. A proforma for monitoring the drought nutrition programme was prepared and circulated to all the States for compilation of weekly reports.

Lessons Learnt

3.1 The foremost requirement is to have a cell both at the Central and State levels. These cells need to be equipped with basic data, monitoring network, implementation machinery and co-ordinating functions. As soon as a disaster is suspected to occur on the basis of the monsoon behaviour,the cell should be activated even before action is needed. It is necessary that problems of children and women both in regard to nutritional and health aspects, should not be dealt with in a routine manner but programmes should be evolved on an assessment of a particular situation and answering to that situation.

3.2 Other important lessons that were learnt for future are:-

(i) The need for the preparation of an advance action plan by the State Governments to meet contingencies of drought and updating the same from time to time;

(ii) The programmes of health and nutrition should be implemented together and in time and there should be no time lag in the initiation of the programmes. There should be no phasing in the implementation of the programmes.

(iii) Nutrition programmes and programmes of health should go together so that one reinforces the other. Particularly important are the programmes of immunisation against preventable diseases, prophylaxis against Vitamin A and B deficiencies and de-worming of children;

(iv) Spot feeding should be invariably insisted upon and the food should be such that it can readily be taken by very young children. Ready to eat food for children under one year of age should also be thought of;

(v) The need for the location of an adequate monitoring outfit in each State down to the district headquarters and ensuring that necessary strengthening of these outfits takes place as and when needed;

(vi) Programme of orientation of State and Central personnel should be undertaken on the points of proper implementation of programme for the contingencies of drought, particularly in regard to those that benefit women and children. Monitoring programmes and report collection systems should also be strengthened.

(vii) Training programme for personnel involved in drought relief work should be undertaken and training should have an important component of nutrition and health focussed on women and children;

(viii) A working manual should be kept ready in all States to deal with contingencies for drought and these should be updated from time to time; and

(ix) A focal point should be designated in each State for work on drought relief with specific reference to the health and nutrition aspects. Adequate budget provision should be available to these focal points.

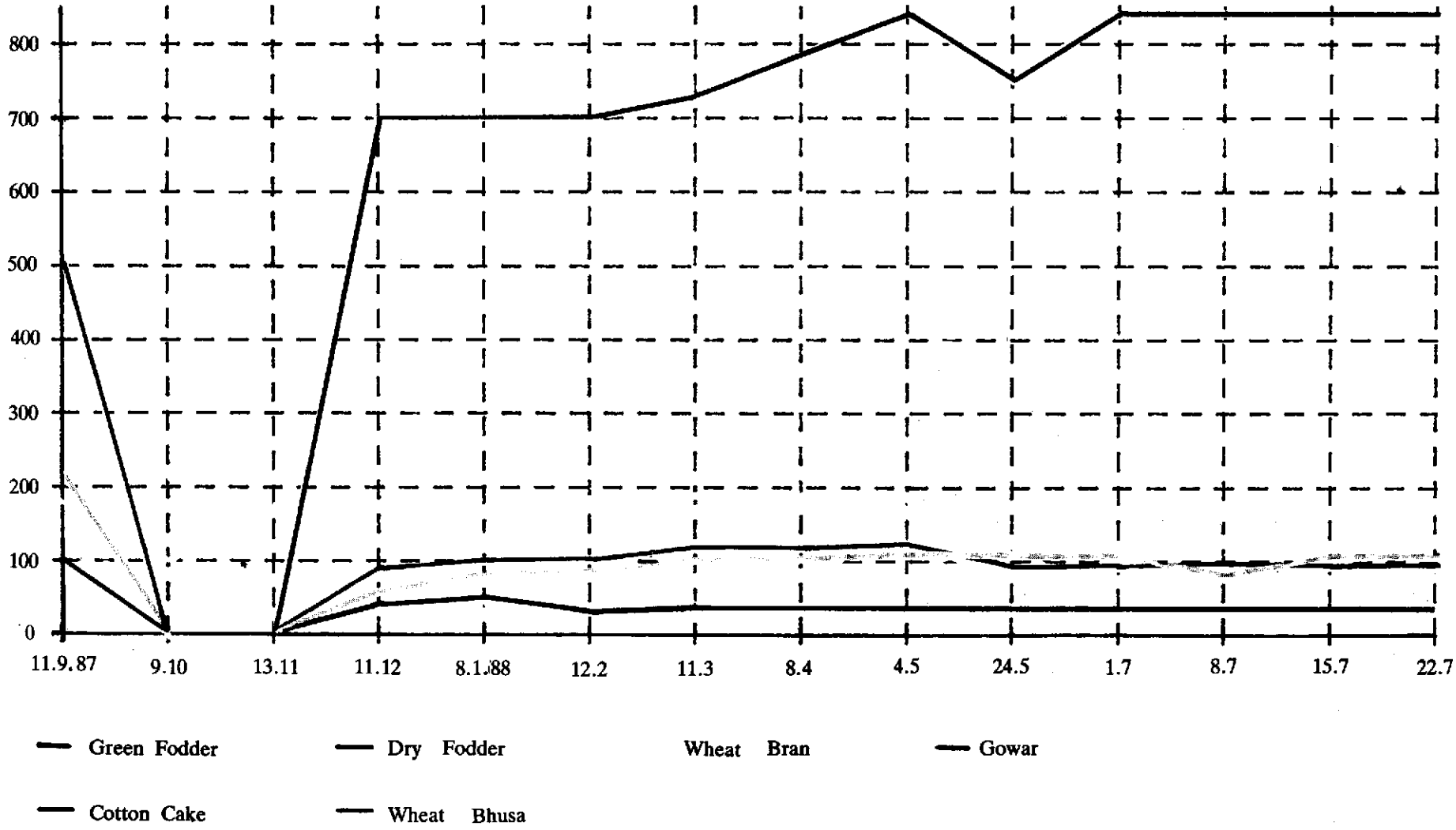

Figure 20: **Weekly Rate of Feed and Fodder Varities in Rajasthan from 11 September 1987 to 22 July 1988.**

12 CATTLE CARE

The bovine population occupies an important place in the economy of the people. The cattle care therefore assumes particular importance in times of drought. This task was rendered singularly arduous during drought of 1987 in the arid western parts of the country which had been subjected to droughts in preceeding years. The measures undertaken by the GOI and the State Governments proved very effective in protecting cattle wealth. Out of a bovine population of 214 million in 17 drought affected States and Union Territories, as many as 120 million were affected by drought to varying degree. The details of cattle population affected in 15 States and 2 Union Territories affected by drought may be seen in Table 44. The impact of drought on cattle population was severe in northern/north-western Rajasthan (Barmer, Jaisalmer, Jhunjhunu, Jodhpur, Jalore, Churu, Nagore, Sikar and Pali districts) and in northern Gujarat (Banaskantha, Surendranagar, Kutch and Saurashtra).

1.2 Owing to shortage of feed and fodder, milk production was adversely affected in all the drought affected States and more acutely in Rajasthan and Gujarat. There was a decrease of 1.5 to 9.5 per cent in the average daily milk procurement in 14 drought affected States under Operation Flood programme during May to October, 1987 as compared to the corresponding period of the previous year as shown in Annexure XXVI. The buffalo population usually calves during the monsoon and it does not reach peak milk production during the drought owing to inadequate nutritional support. The mineral deficiency also leads to shortfalls in breeding cover which in the long run could show adverse impact on milk production.

1.3 In the wake of drought conditions, a significant part of bullock and other draft animal population located in some acute fodder scarcity and water scarcity area migrated to other area. The inadequate nutritional support did tell upon the draft capabilities of these animals. Thus, a decline in the animal power in qualitative and quantitative terms, was felt in the drought affected area.

1.4 No report of death of cattle due to starvation was received. A close watch was maintained by DAC on the development in this regard through a weekly monitoring exercise throughout the drought period. However, animal deaths due to old age, malnutrition diseases and other causes were reported

Table 44 : Bovine Population Affected by Drought, 1987

(lakh)

S.No.	State/Union Territory	Total Bovine Population	Bovine Poulation Affected
1.	Andhra Pradesh	219.0	143.0
2.	Gujarat	114.0	102.0
3.	Haryana	57.0	50.0
4.	Himachal Pradesh	58.0	27.9
5.	Jammmu and Kashmir	29.0	2.3
6.	Karnataka	149.0	55.0*
7.	Kerala	35.0	5.0
8.	Madhya Pradesh	336.0	100.0
9.	Maharashtra	201.0	35.0*
10.	Nagaland	1.6	0.5
11.	Orissa	143.0	55.0*
12.	Punjab	78.0	24.0
13.	Rajasthan	195.0	129.0
14.	Tamil Nadu	136.0	90.0
15.	Uttar Pradesh	419.0	393.0
16.	Chandigarh	0.3	0.2
17.	Delhi	2.3	2.0
	Total	2143.2	1203.7

Note : *Estimated

from drought affected area. The mortality rate in normal times is around 10 to 15 per cent of the population and there was no appreciable increase in this percentage on account of drought conditions. At times there were reports of large scale deaths, which on investigation were found to be not based on facts.

Central Initiatives

2.1 : Guidelines were issued to States as early as 24th July, 1987 for preparing contingency plans for relief to livestock, including establishment of fodder banks, cattle camps, feeding non-conventional fodder and agro-industrial wastes, enrichment of fodder with urea and molasses. Availability of fodder seeds at Central and other fodder farms for both *kharif* and *rabi* seasons was intimated to States alongwith guidelines for special fodder cultivation to be adopted in the wake of drought. Discussions were arranged on television regarding various measures required to be adopted for providing relief to livestock during the drought.

2.2 The Action Plan for Drought Relief (Table 7), envisaged specific measures for the preservation of cattle in the drought affected area of the country. These measures related to augmentation of fodder available in the affected area, distribution of fodder at reasonable prices for the cattle of weaker farmers, monitoring of prices of fodder in the country and provision of feed supplementation for the affected cattle.

2.3 The State Forest Departments were energised to harness forest grass and despatch it to fodder deficit area. Consequently, substantial quantities of forest grass were mobilised for use in the drought affected area as shown in Table 45.

2.4 When the significant fodder shortage was expected in July-August, 1987, the GOI launched a scheme for crash cultivation of fodder in the drought affected area in the States of Gujarat, Haryana, Madhya Pradesh, Orissa, Punjab, Rajasthan and Tamil Nadu and the flood affected State of Bihar.

Table 45: Availability of Forest Grasses as Fodder, 1987-88

(tonne)

S.No.	State	Quantity of Forest Grasses cut	Quantity of Forest Grasses Ready for Delivery	Quantity of Forest Grasses Delivered
1.	Madhya Pradesh	15986.91	7182.14	852.96
2.	Andhra Pradesh	4500.00	4500.00	
3.	Karnataka	10000.00	10000.00	
4.	Punjab	900.00	900.00	
5.	Uttar Pradesh	37277.60	37277.60	37277.60
	Total			38,130.56

Table 46 : Contingency Action Plan for Fodder Production, 1987-88

S.No	State	Amount (Rs in lakh)	Area Targetted (hectare)	Number of Beneficiaries	Fodder Minikits Distributed	Amount Utilised (Rs in lakh)	Area Covered (hectare)
1.	Gujarat	200 00	57,000	1,27,676	1,27,676	200 00	63,838
2.	Haryana	87 50	25,000	1,02,941	1,02,941	87 48	20,588
3.	Madhya Pradesh	87 50	25,000	93,836	4,953 Qtls of seed supplied	57 57	10,869
4.	Orissa	19 50	6,000	39,155	31,155	19 50	NA
5.	Punjab	87.50	25,000	1,45,283	NA	87 48(+)	25,398
6.	Rajasthan	233.00	67,000	N A.	1,90,217	305.72@	55,817
7	Tamil Nadu	87.50	25,000	19,978	N A.	51 55	NA

Note : @Including State Government scheme (involving Rs 194 lakh)
+ Rs 256.88 lakh as cash relief to 2,12,768 beneficiaries for Purchase of fodder
NA · Not Available

An amount of Rs. 8.93 crore for this purpose was sanctioned and released to the States. The targets and achievements in the States under this scheme are as shown in Table 46.

2.5 Towards the end of the South-west monsoon, the country experienced some welcome showers. This give rise to expectation of improvement in fodder availability in the subsequent months beyond October, 1987. Earlier, during the crucial period, August-October, some innovative measures for improving the fodder availability in parts of Gujarat and Rajasthan were undertaken. In Gujarat, the sugarcane in the area controlled by the cooperative sugar factories in south Gujarat was bought, transported and distributed at subsidised rates to sustain the cattle in Saurashtra. A similar measure was also taken in Rajasthan in transporting sugarcane from the eastern parts of the State and neighbouring parts of Madhya Pradesh to western parts of Rajasthan.

2.6 Further, the paddy straw available in Punjab and Haryana at the end of the *kharif* season was also identified. The utilisation of paddy straw available in Punjab and Haryana and modality of its utilisation by Gujarat and Rajasthan were discussed in a meeting held on 12th October, 1987 by the Animal Husbandry Commissioner which was attended by representatives of the State Governments of Gujarat, Rajasthan, Haryana and Punjab as also of dairy cooperatives.

2.7 The problem of transportation was sought to be removed by special arrangement for pressing and baling at the site of procurement. Special teams of officials for procurement of paddy straw were sent by the State Governments to Punjab. NDDB also collected 22,000 tonne of paddy straw from Punjab for distribution in Gujarat. Paddy straw was also mobilised from *terai* region of Uttar Pradesh for distribution to Rajasthan. The Rajasthan Government engaged voluntary agencies and *panchayats* to procure and transport paddy from Punjab. The DAC asked the Compound Livestock Feed Manufacturers' Association (CLFMA) to arrange supply of cattle feed to drought affected States on priority. The facilities provided by railways in the transport of paddy and grass deserves a special mention.

2.8 Similarly at the end of *rabi* season, transportation of wheat *bhusa* to Rajasthan and Gujarat was also undertaken. The Animal Husbandry Commissioner kept a close watch on the availabiltiy of fodder on a continuous basis. The coordination of different agencies engaged in the inter-State movement of fodder was brought about by DAC's intervention on appropriate occasions.

2.9 The Central Government enlarged the scope of Central assistance for subsidising the cost of transportation of fodder to affected area; this subsidy was 75 per cent of the cost of transportation for inter-State movement and 50 per cent for intra-State movement.

2.10 The feed supplementation of livestock in the affected area was an important area in which considerable efforts were made by different GOI agencies. All the sugar mills in the country were advised to save *bagasse* and release it for feeding livestock. About 10 per cent of the molasses production was reserved for manufacture of cattle feed. Molasses used for the manufacture of cattle

Table 47: Allocation of molasses for Cattle Feed and Fodder, 1987

(tonne)

S.No	State	States From Where Allocated				
		Uttar Pradesh	Maharashtra	Haryana	Pondicherry	Total
1.	Gujarat	8000	10000			18000
2	Himachal Pradesh			500		500
3	Jammu and Kashmir			50		50
4.	Karnataka		6000		2000	8000
5	Kerala		6000		2000	8000
6	Madhya Pradesh	15000				15000
7	Punjab			6000		6000
8	Rajasthan	9000		3000		12000
	Total	32000	22000	9550	4000	67550

Note Allocation made by the Department of Chemicals and Petro-Chemicals, Ministry of Industry, New Delhi, vide circular letter No 15021(28)87-Ch II dated 7th September, 1987

feed in the public sector undertakings were exempted from excise duty. Further, 67,550 tonne of molasses was allocated to eight States as shown in Table. 47.

2.11 The cattle feed availability was further sought to be improved by the diversion of damaged foodgrains if found suitable for feed manufacturing. About 99,000 tonne of such foodgrains (including wheat) was identified by FCI for this purpose. The GOI also supplied damaged wheat at a concessional price of Rs. 65 per quintal.

2.12 In view of the critical situation of fodder availability in drought affected area, the States, particularly, Gujarat and Rajasthan, were required to prepare Contingency Fodder Plans for the drought period indicating the requirement, availability and logistics for augmentation in the drought affected area. The States, in turn, estimated this requirement for the entire livestock affected, on the basis of 3 to 5 kg. of fodder per day per animal. This requirement was estimated at 25 million tonne for the entire State and 11.2 million tonne for the crisis area in Rajasthan and 14.8 million tonne for the entire State and 6.6 million tonne for the crisis area in Gujarat. The details may be seen in Annexure XXVII.

2.13 It was subsequently realised that the requirement should be based on the number of cattle camps proposed to be established and the expected off-take of fodder from fodder depots. The quantity supplied by Rajasthan (most of it by transportation from outside and limited quantities from within the State) was 1.1 million tonne during August, 1987 to March, 1988. In case of Gujarat 91,100 tonne of fodder was supplied by the State agencies mainly to card holders and cattle camps. Due to the uncertainties of the fodder situation, the detailed plans of the States were subject to weekly review at the DAC.

2.14 The organisation of cattle camps was a major element of the strategy for preservation of the cattle wealth of the drought affected area, particularly in the arid parts of Gujarat and Rajasthan. Successive droughts in these area had made cattle maintenance difficult. Migration of cattle to more favourably endowed area is resorted to by cattle breeders in such a crisis. In view of the severity of drought, the population of cattle and hardship involved in migration, the GOI gave thrust to the establishment of cattle camps in the affected area. The association of voluntary agencies with this gigantic task was given a lot of emphasis. The GOI extended financial assistance at the rate of Rs. 3 for adult cattle and Rs. 1.5 for calf for the maintenance of cattle in the cattle camps. These norms enhanced to Rs. 4 and Rs. 2 in respect of SDAAs. The number of cattle camps and the cattle in these camps registered a steady increase in the months of October to December 1987, and rose to 2,236 camps and 1.7 million cattle in May 1988. For nearly 5 months, not less than 1600 camps with 1.2 million cattle were maintained. The enormity of the scale of operations can be discerned from Table 48.

2.15 Livestock health situation covering incidence of diseases, prophylactic vaccinations, treatment of cases, drenching against worm/fluke infestation, supply of mineral supplements, etc. was also

Table 48: Cattle in Cattle Camps in Gujarat and Rajasthan 1987-88

S.No.	Week Ending	GUJARAT		RAJASTHAN	
		Number of Cattle Camps	Number of Cattle (lakh)	Number of Cattle Camps	Number of Cattle (lakh)
1.	2.10.1987	240	2.68	105	0.55
2.	9.10.1987	295	3.21	105	0.55
3.	16.10.1987	330	3.94	105	3.00
4.	23.10.1987	363	4.16	175	6.00
5.	30.10.1987	363	4.16	175	6.00
6.	6.11.1987	363	4.16	233	3.06
7.	13.11.1987	492	5.31	233	3.06
8.	20.11.1987	564	5.82	233	3.06
9.	27.11.1987	564	5.82	233	3.06
10.	4.12.1987	726	6.37	378	4.61
11.	11.12.1987	775	6.59	419	5.03
12.	18.12.1987	845	7.03	419	5.03
13.	24.12.1987	845	7.03	419	5.03
14.	1.1.1988	974	7.54	419	5.03
15.	8.1.1988	1015	7.81	603	5.03
16.	15.1.1988	1056	8.05	603	5.03
17.	22.1.1988	1101	8.32	603	5.03
18.	29.1.1988	1136	8.62	603	5.03
19.	5.2.1988	1161	8.68	603	5.03
20.	12.2.1988	1201	9.08	603	5.03
21.	19.2.1988	1245	9.99	603	5.03
22.	26.2.1988	1284	10.21	603	5.03
23.	4.3.1988	1312	10.38	603	5.03
24.	11.3.1988	1334	10.46	603	5.03
25.	18.3.1988	1348	10.51	603	5.03
26.	25.3.1988	1394	10.74	603	5.03
27.	30.3.1988	1431	10.95	603	5.03
28.	8.4.1988	1471	11.22	603	5.03
29.	15.4.1988	1506	11.45	603	5.03
30.	22.4.1988	1506	11.45	603	5.03
31.	25.4.1988	1560	11.81	603	5.03
32.	6.5.1988	1582	11.93	603	5.03
33.	13.5.1988	1577	11.79	603	5.03
34.	20.5.1988	1577	11.79	603	5.03
35.	27.5.1988	1603	12.01	603	5.03
36.	3.6.1988	1655	12.55	603	5.03
37.	10.6.1988	1653	12.54	603	5.03
38.	17.6.1988	1646	12.18	603	5.03
39.	24.6.1988	1559	11.29	603	5.03
40.	1.7.1988	1411	9.97	603	5.03

minitored on weekly basis. The States had set up veterinary aid camps in the vicinity of cattle camps and put mobile veterinary services into operation in the drought affected area. Special care was taken for mineral and vitamin deficiencies and reproductive disorders resulting from such deficiencies. Infertility and sterility camps were also set up. Animals were vaccinated and treated for various clinical and surgical ailments. Disinfectants were sprayed in drinking water reservoirs.

2.16 The DAC was regularly monitoring fodder situation and supply position in the drought affected States covering aspects like (i) establishment of cattle camps and number of animals being taken care of in them; (ii) feed and fodder supply through fodder depots and feeding centres; (iii) animals being given succour through *gaushalas* and *pinjrapoles;* (iv) mobilisation of wheat *bhusa,* paddy straw. etc. from surplus to drought-affected area; (v) augmentation and availability of forest grass and its supply to needy area; (vi) transport arrangements; and (vii) special State efforts for fodder cultivation.

2.17 The progress in implementation of the contingency plan on fodder production was being monitored on a weekly basis. A close watch on feed and fodder prices was also kept at 53 centres spread across the country, from where current prices were monitored alongwith prices prevalent a week ago, a month ago and an year ago. This monitoring was done on a weekly basis. A graphical representation of movement of fodder prices may be seen in Figures 20 and 21.

2.18 The joint teams of animal husbandry and forest officials of the GOI visited various drought affected States for mobilising forest fodder/grass for feeding cattle. The Animal Husbandry Commissioner also visited Gujarat, Rajasthan and other drought affected States for working out monthwise requirements, availability, shortfall and measures for mobilising fodder. Apart from this, one Area Officer each for Gujarat and Rajasthan, was identified in the DAC to make monthly visits to these two States to study the fodder situation regularly. Availability of fodder was also reviewed in

Table 49: Central Assistance Approved for Cattle Conservation under Drought Relief, 1987-88

(Rs in crore)

S No	State/Union Territory	Central Assistance Approved		
		Upto March 1988	April to June/ July 1988	Total
1	Andhra Pradesh	0 64	—	0 64
2	Gujarat	40 07	21 00	61 07
3	Haryana	8 00	—	8 00
4	Himachal Pradesh	1 21	—	1 21
5	Jammu and Kashmir.	1 71	—	1 71
6.	Karnataka	0 20	—	0 20
7	Kerala	2 10	—	2 10
8	Maharashtra	0 30	0 66	0 96
9	Madhya Pradesh	0 25	0 25	0 50
10	Nagaland	0 10	—	0 10
11	Orissa	—	—	—
12	Punjab	6 00	—	6 00
13	Rajasthan	56 01	35 00	91 01
14	Tamil Nadu	—	—	—
15	Uttar Pradesh	2 43	—	2 43
16.	Andaman and Nicobar Islands	0 02	—	0 02
17.	Chandigarh	0 05	—	0 05
18	Delhi	0.10	—	0 10
19.	Pondicherry	0 10	—	0 10
20.	Dadra and Nagar Haveli	—	—	—
21.	Daman and Diu	—	—	—
	Total	119 29	56 91	176 20

the Conference of Relief Commissioners held on 6th January, 1988 in New Delhi. Another meeting was convened on 9th February, 1988 in New Delhi to discuss fodder management in the drought affected area, particularly during, the critical period of March-June, 1988. Relief Commissioners, Chief Conservators of Forests and Directors of Animal Husbandry of the drought affected States attended this meeting, apart from officers of the GOI, the NDDB the ICAR etc. Stress was laid on suitable tie-up between the States of Gujarat and Rajasthan, on the one hand, and the neighbouring States, on the other, with a view to secure maximum amount of fodder and forest grasses. A workshop sponsored by the DAC on Crisis Management of Livestock under drought conditions was organised at Anand, Gujarat on 8-12 February, 1988 in which specialists from the NDDB, SAUs and the State Agriculture and Animal Husbandry Departments participated.

2.19 Substantial Central assistance flowed to the States for measures relating to animal health cover and maintenance of cattle. Central assistance in this regard accounted for nearly 11 per cent of the total Central assistance. The details of Central assistance approved for various States may be seen in Table 49.

State Efforts

3.1 In view of the successive droughts, faced by major parts of Gujarat and Rajasthan and the semi arid conditions in these parts, these two states had to adopt a dynamic management strategy in relation to preservation of cattle wealth.

3.2 In Rajasthan out of population of 494.86 lakh live-stock, 358.77 lakh were affected by drought and 179.41 lakh of these belonged to small and marginal farmers. As regards cattle and buffaloes 141.38 lakh out of a population of 195.01 lakh were affected by drought and 70.69 lakh of affected cattle and buffaloes were owned by small and marrinal farmers and agricultural labourers. The relief operations were mounted for cattle and buffaloes only, as sheep, goats and camels could sustain themselves on crop residues in soil or on *khejri* fodder trees or through migration.

3.3 Cattle camps were organised by voluntary agencies. A total of 5.03 lakh cattle were provided succour in 633 cattle camps. The strength of animals in such camps varied from 100 to 1000. As against GOI's norms of assistance of Rs.4 per adult cattle and Rs.2 per calf in SDAAs and Rs. 3 and Rs.1.5 in other areas, the Government of Rajasthan provided a flat rate of Rs. 4 per cattle irrespective of age group or area. The strength of calves below one year was around 1 per cent of the

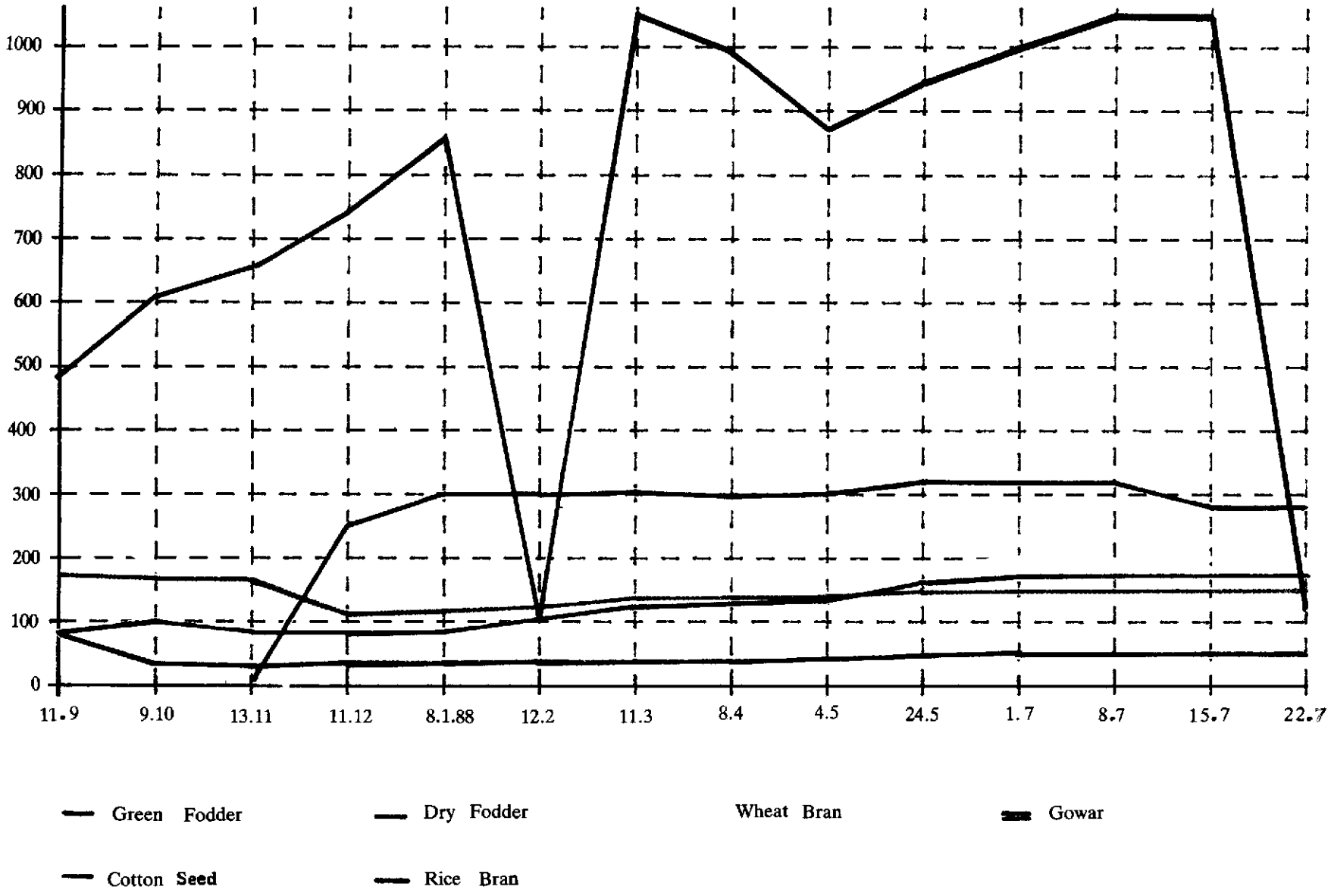

Figure 21: **Weekly Rate of Feed and Fodder Varities in Gujarat from 11 September 1987 to 22 July 1988.**

strength of cattle camps. Heifers were deemed as adult. The ration commodities given at cattle camps included per cattle dry fodder 4-5 kg., cattel feed 1 kg. and greens, if available, 1 kg. Urea molasses blocks were also provided in some camps as licks. The cost of feeding a cattle in cattle camps was Rs.5-6 as against Rs. 4 given by the GOI as subsidy. The mortality in cattle camps was around 8-10 per cent which was very much within the normal mortality levels. The mortality was due to old age, malnutrition and other disorders.

3.4 Whereas the cattle camps were organised by voluntary agencies, the veterinary aid facilities in such camps were provided by the animal husbandry department through redeployment of staff drawn from its regular strength. One stock assistant was attached to each camp and the veterinary assistant surgeon paid frequent visits. Animals were treated for various ailments and vaccinated against rinderpest, foot and mouth disease and *haemorrhegic septiceamia.* Mineral mixture, Vitamin A supplement and anthelmaintics were provided and insecticides sprayed for preventing external pests. There was no epidemic in the camps. Cases were treated for sterility and breeding coverage provided through artificial insemination.

3.5 However some lacunae were noticed in running of the cattle camps run by voluntary agencies. It was frequently noticed that animals in these camps were weak. However, such weak animals were kept in segregation and provided extra feed. There was no independent supervision of the functioning of cattle camps run by the voluntary agencies due to the large scale of operations. It was therefore quite possible that the quantities of feed made available to animals might have been below what were required.

3.6 Fodder depots were run by *Panchayat Samities,* cooperative societies and voluntary agencies for which the State Government advanced interest-free loan varying from Rs. 20,000 to Rs. one lakh to each agency as working capital for maintaining fodder stocks. The State Government provided Rs. 8.34 crore to voluntary agencies and Rs. 3.07 to *Panchayat Samities* for this purpose. A total of 3,422 fodder depots were established. Wheat *bhusa, jowar kutti,* gram *bhusa* and chaffed *ber* fodder, brought from neighbouring States of Madhya Pradesh, Uttar Pradesh and Maharashtra, were also distributed by these depots on 'no-profit-no-loss' basis. Most of the beneficiaries of fodder distribution by these depots were small and marginal farmers and agricultural labourers.

3.7 The State Government in the past fixed rates of transport subsidy in terms of amount per quintal per kilometre. But subsequently flat rates of transportation had been fixed which varied from district to district. For example, in Sikar the rates had been fixed at Rs.40 per quintal for fodder from Maharashtra, Madhya Pradesh and Uttar Pradesh and Rs.35 per quintal from Haryana and Punjab. In Nagaur Rs.40 per quintal was admissible on transportation of fodder from Madhya Pradesh and in Churu Rs.40 per quintal was allowed for transportation from Haryana. In addition to transportation charges, 5 per cent administration charges were given by the Government to the organisers. The State Government enforced a system of concurrent audit for expenditure incurred on transport subsidy, cattle camps, feeding centres, *gaushalas,* etc.

3.8 The sale price of fodder was computed based on the price at destination minus the transport and administration charges. For example, at the time of visit of the central team, the destination price of wheat *bhusa* stock at fodder depot at Nagaur for fodder transported from Ashok Nagar, Guna, Madhya Pradesh was Rs.135 per quintal and the sale price was fixed at Rs.90 after deducting transport charges of Rs.40 per quintal and administration charges of Rs.5 per quintal. The destination price varied from Rs.122 to 136 and the sale price ranged from Rs.67 to 91 per quintal. The sale price was fixed by the district authorities. Sale price upto Rs.90 were fixed by the Tehsildar and price exceeding Rs. 90 by Sub-Divisional Magistrate. The respective sale price at fodder depot Chappar (Churu) for jowar *kutti,* wheat *bhusa* and gram *bhusa* were Rs.100, 70 and 50 per quintal.

3.9 Although purchase prices of fodder were not available, the central team made a comparison of the sale price of wheat *bhusa* at fodder depots in Rajasthan and the rates compiled by the DAC from supply States of Madhya Pradesh and Haryana. A perusal of these rates showed that both the rates were comparable. It was, therefore, concluded that the fodder depots were supplying fodder at 'no profit no-loss' basis.

3 10 The State Government organised 3,016 feeding centres providing succour to 5.48 lakh milch cattle. These were run by Rajasthan Co-operative Dairy Federation (RCDF) Centres and other Government and private agencies. Each animal was provided 2 kg. of feed (costing Rs.4) on 50 per cent subsidy (Rs.2). At some places the subsidised cattle feed was also available to animals kept in

the cattle camps @ 1 kilo feed per animal (Rs.1). At such places the total amount of subsidy worked out to Rs.5. It was felt that the animals in the cattle camps could not thrive on dry fodder only and some quantity of cattle feed was necessary. About 22,000 animals in *gaushalas* were being provided subsidy @ Rs.3 per adult and Rs.1.50 for young cattle. The State Government provided subsidy @ Rs.7 per bull for 6,142 breeding bulls. These bulls were mostly community bulls kept by *panchayats* and they depended in normal times either on grazing or on feeding by the community. Under the drought conditions since neither grazing was available nor was there any chance of feeding by the community, the Government was obliged to maintain these bulls. Veterinary care was arranged through veterinary camps and special facilities were provided by the Animal Husbandry Department in cattle camps. The Government spent Rs.1.46 crore on veterinary care.

3.11 The State Agriculture Department was allotted an amount of Rs.1.25 crore for fodder cultivation and fertilisers were distributed to farmers at a cost of Rs.1.94 crore. Additionally the State utilised Rs.2.33 crore Central aid given as contingency grant for fodder cultivation for covering 67,000 hectare. The central team observed that there was favourable response from small farmers, marginal farmers and agricultural labourers to green fodder cultivation programme. The green fodder produced through Central contingency plan was not for procurement by voluntary agencies for fodder depots or cattle camps but it was meant for consumption by the weaker sections of the society for their own cattle.

3.12 For augmenting drinking water for cattle, the State Government energised wells, constructed lakes and tubewells and wells. The central team visited one cattle drinking water lake at Loha (Churu) which had been constructed primarily to cater to the future needs of cattle fair organised in that village. The State Government arranged migration of several thousands of animal of *Rathi* and other good breeds to Rajasthan canal area for safeguarding their health and production potential. The State Government spent an amount of Rs.54.68 crore during August, 1987 - March 1988 for relief to livestock. The districtwise details are shown in Annexure XXVIII.

4.1 In Gujarat, it was estimated that out of a cattle and buffalo population of 1.14 crore, 1.02 crore was affected by drought. The State established 1,655 cattle camps in which 12.55 lakh animals were tended. Additionally 1.79 lakh animal were also provided relief through 364 *pinjrapoles* and *gaushalas*.

4.2 The State Government set districtwise targets for cultivation of fodder on 4 lakh hectare of land, which was expected to yield 80 lakh tonne of green fodder. Water from tube wells of the State Water Resources Development Corporation as also district *panchayats* was supplied free of cost for growing fodder on 35,000 hectare of land. The State Government also provided water free of cost from reservoirs of the State Irrigation Department whenever possible. A support price of Rs.500 per tonne was fixed for fodder where the cost of cultivation was entirely borne by the cultivator and Rs.250 per tonne where grass was produced by availing of free water. The State exempted cattle feed manufacturing units from power cuts. The State Government also arranged for procurement of sugarcane at a cost of Rs.450 per tonne, one-third of this cost being provided as subsidy. About 23,000 tonne of sugarcane procured from the southern districts of Surat and Valsad, was distributed to fodder deficit area like Kutch. A subsidy to voluntary agencies was given for maintaining cattle in the cattle camps.

4.3 About 33,000 tonne of dry grass and 19,000 tonne of paddy straw were available from within the State (Valsad district) and about 5,600 tonne of grass from the State Forest Department. The NDDB collected 25,000 tonne of dry grass from Punjab for supply to Gujarat. Further availability of fodder from outside the State was estimated at 60,000 tonne from Maharashtra, 2,000 tonne from Madhya Pradesh, 7,000 tonne from Punjab and 5,000 tonne from Dadra and Nagar Haveli. About 38,400 tonne of grass and paddy straw and 8,500 tonne of dry fodder were procured from within the State and from outside respectively. Allotment of grasses made from the forest area of selected districts was of the order of 1,806 tonne, out of the expected availability of 5,600 tonne.

4.4 Under the veterinary care programme, 38.38 lakh animals were vaccinated and 14.91 lakh treated. The GOI scheme for assisting small and marginal farmers for fodder production was implemented through the District Rural Development Agencies (DRDAs), for which 1,07,250

Table 50 Cattle Feed and Fodder Prices in Gujarat, 1988.

S.No.	Fodder	Existing Price (March-April, 1988) (Rs. per quintal)	Per cent Variation from Price an Year Ago
1.	Dry Fodder	130	100
2.	Green Fodder	35-42	59-68
3.	Rice Bran	100-130	57-116
4.	Wheat Bran	178	11
5.	*Gowar*	1100	174

Note: Data are based on prices collected from Patan, Surat, Broach and Anand in Gujarat State.

minikits were distributed. Each minikit was expected to cover approximately an area of 0.5 hectare. In the forest area of the State, 128 hectare were covered under fodder cultivation and another 52 hectare treated with fodder augmentation measures. Although about one crore cattle were affected by drought the State's requirement covered supply mainly for fodder card holders and cattle camps. The number of such card holders was 6 lakh and cattle camps 1,899 with 12.86 lakh animals in them. A large number of animals migrated to Gir forest areas. The prices of feed and fodder obtained in March-April, 1988 in the State with per cent variation from earlier year are shown in Table 50.

5. In Madhya Pradesh, the fodder situation was not of great concern owing to rainfall during September-October, 1987. The State forest authorities cut 15,987 tonne of forest grass, of which 7,182 tonne was baled. From this quantity, 853 tonne was delivered, including 369 tonne lifted by Rajasthan, to whom an allotment of 5,000 tonne was made by Madhya Pradesh. Similar allotment made to Gujarat amounted to 2,000 tonne. Regarding the Central Government's contigency plan for fodder production in drought hit area, the State could utilise only Rs. 57.57 lakh out of the sanctioned amount of Rs. 87.5 lakh. This covered an area of 10,869 hectare, output being 45,685 tonne of green fodder.

6. In Uttar Pradesh 27,587 hectare was covered by fodder cultivation. The State sanctioned Rs. 30 lakh for purchase of fodder and Rs. 3.35 lakh for its transportation. 1,800 hectare was covered under the fodder augmentation programme in forests. 37,278 tonne of forest fodder was cut, baled and consumed within the State. Drinking water shortage for cattle was felt in the Bundelkhand region of the State during April-June, 1988.

7. In Haryana, no fodder shortage was anticipated. The State made plans to save as much wheat *bhusa* as possible at the time of future harvests by preferring to use human labour instead of machine labour for harvesting, and thus had expected to mop up additionally about 17,500 tonne of wheat *bhusa*. It was also proposed to collect one lakh tonne of gram *bhusa*. The State fully utilised the Central assistance of Rs. 87.5 lakh provided for fodder production under the contingency plan, and distributed 1,02,941 fodder minikits to an equal number of beneficiaries for cultivating 20,588 hectare. This provided 5.15 lakh tonne of green fodder.

8. In Punjab, no fodder shortage was anticipated. The State Forest Department cut and baled 900 tonne of fodder grass, which was made available for supply to outside area. The use of urea molasses bricks as also enriched fodder was being popularised in the State. Under the Central contingency plan, the State, like Haryana, utilised the entire amount of Rs. 87.5 lakh and 25,398 hectare had been thus cultivated additionally for fodder through 1,45,283 identified beneficiaries.

9. In Orissa, under the Central contingency plan for fodder production, an amount of Rs.19.5 lakh was released for raising fodder crops on 6,000 hectare.

10. In Maharashtra 61,400 tonne fodder was earmarked for drought-affected area and 2,500 fodder minikits were distributed. Farmers were advised to feed chaffed fodder to their cattle.

11. No fodder shortage was anticipated in the other drought affected States. In Andhra Pradesh, 4,500 tonne of baled forest fodder was kept at the disposal of State Animal Husbandry Department, and in Karnataka 10,000 tonne of forest fodder was kept ready for delivery.

12. The drought of 1987 affected vast area of the country. However, the severely affected States were Rajasthan and Gujarat which experienced drought during the preceding three years as well. Therefore, massive efforts were mounted in these two States to meet the drought situation, especially for tending to the livestock. The timely measures taken by the DAC and executed by the concerned States averted a catastrophe and helped in maintaining the health status and production potential of the livestock. The mortality was contained within normal limits. The drought was managed by Rajasthan and Gujarat mainly through organising cattle camps and fodder depots. The strategy for mopping in the two States differed. Whereas Gujarat mounted massive efforts for cultivation of fodder and harvesting the unripe sugarcane, Rajasthan laid stress on mobilisation of wheat *bhusa* and other fodder from neighbouring States. Caravans of trucks loaded with fodder were common sight in Rajasthan during the difficult period. The official effort alone would not have sufficed. The role played by voluntary agencies in arranging cattle camps and supplying fodder was laudable. The participation of these agencies, however, require streamlining by the official agencies by way of better monitoring of their activities and modalities for procuring and supplying fodder.

The climate of the earth is determined by the rates at which land and ocean surfaces of the earth and its atmosphere absorb, re-distribute and dispose off solar radiation. Climatic changes are induced by a number of natural phenomena over which man has no control. However, man's intervention is beginning to play a significant role in inducing the climatic changes. According to one theory, an increase in land's reflectivity of solar radiation such as occurs when land is denuded of vegetation leads to a decrease in net incoming radiation and an increase in the radiative cooling of the air. The resultant suppression of the cumulus convection and the decrease in its associated rainfall further reduces plant cover, raises *albedo* and amplifies the effect. Verification of this effect is extremely difficult and so is the availability of irrefutable evidence for climatic changes on account of the 'green house effect'. However, the increasing carbon dioxide content and other gases produced by industry and deforestation are causing concern to a section of the scientific community, who foresee general warming up of the climate and increasing severity of future droughts on this account though societal and governmental action is still waiting for some more locations/specific and unimpeachable evidence of the global warming.

1.2 Any change in the rainfall or in the temperature caused by any factor has serious implications especially in the context of hydrological balance, leading to serious consequences like soil erosion, lowering of water table, resultant shortage of drinking water and food production, which are concomitants of any drought situation. Normally, nature governs its moisture content by the cover of soil and vegetation, which stores up ground water. This sponge effect is present in area covered with grass and is most prominent in dense forests with abundant ground vegetation such as tropical land forests. The self-propitiating interaction between vegetation, soil and water described as evapotranspiration, affects humidity, temperature and cloud formation in a region. The soil, water and vegetation have proved to be superior to any other method of preventing floods as well as droughts. The direct effect of soil erosion caused by deforestation is the inability of the land to retain ground water which accentuates the vulnerability of the region to drought. Indirect effect of soil erosion such as reduction in the crop output is also costly and extremely difficult to rectify. Besides reducing long term

Table 51: Water Requirement and Productivity of Irrigated Crops

S.No	Crop	Water (mm)	Productivity (kg/ha/mm)
1	Rice	• 950	1.72
2	Wheat	400	—
3	*Ragi*	250	4 65
4	*Jowar*	250	4 67
5	Maize	200	—
6	Sugarcane	1250	—

productivity, land erosion also leads to silting of reservoirs and increased turbidity and sediment deposition and pollution in down stream rivers. These can have detrimental effect on irrigation and electricity generation.

Soil Water Drought

2.1 Soil water drought is casued on account of undue interference in disturbing moisture conserving capacity of the soil. Soil can lose its effective moisture conserving capacity through a complex and diverse process and the consequent land aridisation can be described as soil water drought. Availability of water in the soil is essential pre-condition for plant growth. What could be a drought condition for paddy could as well be a condition for excess moisture for dry crops like *bajra* or *jowar*. Hence, the choice of crops in India had evolved according to the variation of climatological and soil conditions. Table 51 shows the water requirement of some common crops and their productivity with respect to water input. It is notewothy that when water use is to be optimised, the indigenous dry crops prove very high yielding. Under extreme conditions of soil water drought, however, no plant will be able to survive and the condition could be described as desertification.

2.2 All soils do not have the same resistance to drying and will have different needs for water inputs. Organic matter inputs increase the water holding capacity and hence soils rich in organic content do not dry up quickly. A 2 to 5 times increase in the water retention in the soil and a 15 to 20 per cent reduction in evaporation has been observed with the addition of manure and organic fertilizer. In India black soils occuring south of Vindhya mountains and the Malwa plateau and many areas of Maharashtra, Karnataka, etc. have highwater holding capacity and are resistant to drought. Cotton has been grown in these soils alongwith *jowar, bajra* and *wheat.*

2.3 The high moisture retention in the black soils allows cultivation of crops like chillies and onions without irrigation while they are normally irrigated in the lighter soils. In the heavier black soil, water depletion is extremely slow and drought occurs slowly and much later than in lighter soils. Thus, there is no clear cut meteorological description of crop failure from drought. It depends on the nature of soil, the nature of organic inputs as well as the nature of crops. As a response to this diverse requirements of soil-crop combination, land and water use has evolved indigenously in India. The decreased organic matter production destroys the only effective means of drought control and insurance in drought prone regions where organic matter addition to the soil is a significant measure for water conservation. Large doses of organic matter have traditionally been added to the soil in the Deccan which, increase retention of moisture and reduce run off. The success of sustainable agriculture depends on the management of the soil moisture reservoir for optimising crop production.

Ground Water Drought

3.1 Owing to the peculiar temporal distribution of rainfall, coupled with depletion of forest cover, the run off of water is very high, and ground water recharge is limited. With the introduction of new technology, private exploitation of ground water has increased. There are also powerful adverse external effects, especially when over-exploitation by farmers who can afford modern water extraction equipments leads to unequal sharing of a scarce resource among potential users. Since ground water satisfies a variety of needs apart from crop production, the cost of a decline in water table to the society may include the increased time and expense of finding water for drinking, washing, etc. Sustained withdrawal of groundwater at a rate substantially greater than the natural recharge rate can produce a number of undesirable side effects on environment such as drying up of neighbouring lakes

Table 52: Land Use Pattern in India.

S No.	Land Use	Area (million hectare)	Percentage of Total Area
1	Agriculture (Cultivable land)	154 70	47 0
2	Forests	75 18	22 8
3	Permanent Pastures and other Grazing Lands	12 15	3.7
4	Land under Cultivable Tree Crops and Groves	3 91	1.3
5	Cultivable Wasteland	16 64	5 1
6.	Land under other Non-Agricultural Uses	17.53	5 3
7.	Barren and Wasteland	24 60	7 5
8.	Area for which no returns exist	24 09	7 3
	Total	328 80	100 0

and ponds, underground streams, etc. Since underground water is a common property resource, its unrestricted exploitation is likely to result in inefficient use and inequitable distribution.

Land Use Pattern

4.1 Land, comprising soil, water and associated plants and animals involving total ecosystem, is the most important resource available in the country. Figures worked out by the Forest Survey of India reveal the land-use pattern as shown in Table 52. The forests of the country are rich in variety with 16 major forest types comprising 221 minor types. The vegetation varies from tropical rain forests in Andaman and Nicobar Islands in the south to dry alpine forests high up in the Himalayas in the north. Between these two extremes lie the forest types like semi-evergreens, the deciduous forests, littoral and swamp forests, subtropical pine forests and montane temperate forests. Over 45,000 species of plants occur in the country. The vascular flora, which forms the conspicuous vegetal cover, itself comprises about 15,000 species.

4.2 In 1986-87 the officially recorded forest area in the country was 75.18 million hectare which works out to 22.8 per cent of the total geographical area of the country. The Forest Survey of India estimates forest cover over 62.4 million hectare area, which works out to 19.7 per cent of the total geographical area of the country. This estimation is based on visual interpretation of *Landsat* (land satelittle) imageries for the period 1981-83. Of the actual forest cover only 35.77 million hectare area has more than 40 per cent crown density which implies that only 10.88 per cent of the country's total geographical area has adequate forest cover.

National Forest Policy

5.1 Impact of forests on climate and site conditions has been much debated without arriving at consensus. There are different theories/models which try to explain the role played by forest canopy in interception of precipitation and subsequent losses through evaporation and transpiration. These models also tend to infer that forest canopy helps in reducing the runoff and recharging the atmospheric moisture. On the other hand there are other micro-level studies which indicate definite positive effect, some of which can be summarised as follows: (1) infiltration of water into the soil is increased; (2) runoff is reduced as well as regulated; (3) soil-moisture is conserved by vegetation and litter; (4) percolation of water through soil in 'open' is rapid without being used while under plantation this rate of percolation is very much checked by interception of forest canopy and absorption of water by roots, etc.; (5) air and soil temperature are moderated by raising the morning temperatures and lowering up the afternoon temperatures; and (6) bare ground is heated more rapidly than the ground under forest cover.

5.2 Presence of humus, leaf litter and roots in forest floor improves soil-sturcture making it more conducive to infiltration. According to one calculation, the soils of India's forest area—if they had good forest on them—have the capacity to store more than all the rainwater that falls in an average year on a temporary basis and more than half of it on a prolonged basis. Clear cutting a forest can increase peak run off from higher intensity storms by 10 to 20 per cent by reducing interception and soil moisture storage. Investigation carried out in India and elsewhere indicates that deforestation of catchments could lead to floods.

5.3 Apart from moisture conservation, forests help in controlling soil erosion. Trees work as wind brakes and reduce shifting of sand and dust. Transportation of silt and other fine soil-particles poses

problems by way of silting of water—bodies, reservoirs, etc. It is estimated that of the total soil eroded every year about 29 per cent goes to the seas, 10 per cent gets deposited in dams reducing their storage capacity by 1 to 2 per cent every year and about 61 per cent gets transported from one place to another resulting in silting of river beds.

5.4 Importance of forests for sustenance of various life-support systems, for example, the perennial river systems and productive agricultural lands, was recognised in the National Forest Policy of 1952. It considered the following as paramount needs of the country: (i) checking the denudation in mountainous regions, on which depends the perennial water supply of river system whose basis constitute the fertile core of the country; (ii) checking the erosion progressing space along the treeless banks of the great rivers leading to ravine formations and on vast stretches of undulating waste-lands depriving the adjoining fields of their fertility; (iii) checking the invasion of sea-sands on coastal tracts, and the shifting of sand dunes, more particularly in the Rajputana desert; and (iv) establishment of tree-lands, wherever possible for the amelioration of physical and climatic conditions promoting the general well-being of the people.

5.5 Keeping the above aspects in view, the Forest Policy of 1952 suggested following measures:

1. *Protection forests.*—'Protection forests' denote forests found, or required, on hill slopes, river banks, sea-shores, or other erodable localities. In such sites the need for forest cover is dictated by purely protective physical considerations, such as prevention of erosion, conservation of moisture, and control of rushing torrents and floods. The role of such forests in saving the soil from being washed away, and when maintained in catchment area, in the prevention of floods and maintenance of stream-flow, cannot be over-emphasised. On flat country with loose sandy soil, especially under dry conditions, forests, whether natural or artificial, perform an essential function in minimising wind erosion, fixing the soil and preventing the formation of sand-dunes, and mitigating the dessication of agricultural crops leeward of the tree cover. The National Forest Policy requires, therefore, an immediate and speedy programme for the reconditioning of mountainous regions, river valleys, and coastal lands by establishing protective forest over larger area, and preserving the existing ones. The primary object of management of such forests should be to utilise in full their protective influence on the soil the water regime, and the physical and climatic factors of the locality; and the interest to be thus protected should far outweigh those which it may be necessary to restrict. The scientific management of such protection forests, wherever possible should include the production of exploitation of timber within the limits of safety.
2. *Reconditioning of hills and dales.*—The denudation of hill sides with serious repercussions on the fertility of the land, and the growing erosion along the banks of rivers of which the Yamuna, the Chambal, the Mahi, the Narmada, the Kosi, and the Damodar are examples, constitute the major considerations demanding immediate attention.

3 The immobilization of the desert of Rajputana.—Attention also needs to be drawn here to the Rajputana desert more particularly to the fixation of the shifting sand dunes. Strong winds that develop in this region during the summer, transport vast quantities of sand and salt from the sea and Rann of Kutch, whipping the desert into terrific dust-storms, the fury of which is felt throughout the north-western India. The desert has spread through the ages causing the 'westering' of the Indus and the 'northering' of the Sutlej, meeting an obstruction of sort only along its eastern confines in the Aravallies. The immobilization of the desert and protection of the remaining fertile belts inside it constitutes one of the planks of the National Forest Policy.

5.6 The National Forest Policy 1988 considers environmental stability and maintenance of ecological balance as the principal aim of forest policy. The following have been defined as the four most important objectives:—

1. Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country;

Table 53 : Planwise Details of Afforestation

S.No.	Five-Year Plan Period	Physical		Financial	
		Area Afforested (lakh hectare)	Cumulative Afforestation (lakh hectare)	Expenditure on Afforestation (Rs. in crore)	Cumulative Expenditure on Afforestation (Rs. in crore)
1.	First (1951-56)	0.52	0.52	1.28	1 28
2.	Second (1956-61)	3.11	3.63	6.86	8 14
3.	Third (1961-66)	5.83	9.46	21 13	29.27
4.	Annual Plans (1966-69)	4.53	13.99	23.02	52.29
5.	Fourth (1969-74)	7.14	21.13	44.34	96.63
6.	Fifth (1974-79)	12.21	33.34	107.28	203.91
7.	Annual Plan (1979-80)	2.22	35.56	37.10	241.01
8.	Sixth (1980-85)	46.50	82.06	926.01	1167.02
9.	Seventh (1985-90) (upto 1987-88)	50.40	132.46	1319.65	2486.67

2. Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country;
3. Checking soil erosion and denudation in the catchment area of rivers, lakes, reservoirs in the interest of soil and water conservation, for mitigating floods and droughts and for the retardation of siltation of reservoirs; and
4. Checking the extension of sand dunes in the desert areas of Rajasthan and along the coastal tract.

5.7 A minimum of one-third of the total land area of the country under forest or tree-cover has been set as the national goal. In the hills and in mountainous regions, such cover is expected to be two-third of the area for preventing erosion, land-degradation and ensuring the stability of the fragile eco-systems. Functionally, 10 million hectare of forest cover are managed as "protection forest" for ecological stability, 16 million hectare for production of timber for industries, commerce, defence and railways; 25 million hectare as social forests to meet the demand of firewood and fodder and 13 million hectare of the forest cover for national parks and wildlife sanctuaries.

5.8 Most of the forest areas are worked according to an approved working plan, which is a written document containing set of detailed prescriptions for every unit of land, called compartment. Such plans are drawn after detailed inventory of the growing stock and regeneration and keeping in view the site conditions. Working plans are revised after 10 to 15 years based on review of past practices. The working plan aim at ensuring continuity in forestry practices, limiting annual harvest to the accruing increment and securing adequate natural regeneration. About 78 per cent of the officially recorded forest area in the country is covered by working plans. Conservation of biological diversity and protective roles of forests are considered of paramount importance while prescribing treatments in the working plans. Often forestry practices are rather extensive and silvicultural prescriptions are based on single stem systems.

Afforestation and Forest Development

6.1 Plantation forestry was introduced in India in 1842 when teak plantations were raised in Malabar. However, these continued to be taken up in isolated pockets and at a modest scale. Even under the Five Year Plans rate of afforestation was not very significant till 1980 though every successive Plan saw steadily improved targets and achievements. The total area afforested from 1950 to 1980 was 3.5 million hectare giving an average of 0.11 million hectare per year. Planwise details are shown in Table 53.

6.2 In 1980 the GOI incorporated 'afforestation-tree planting' as one of the items of the revised 20-Point Programme. Outlay in forestry sector was increased during the Sixth Five Year Plan with

finances of forest department being supplemented by agriculture department, rural development department, and externally aided social forestry projects in 15 states. This helped in increasing the rate of afforestation. There was substantial improvement in achievement during Sixth Plan with afforestation over 4.65 million hectare. During this period an average of 0.93 million hectare per year of afforestation as compared to 0.11 million hectare per year during 1951-1980 was achieved.

6.3 Tree-planting and afforestation efforts were further intensified during the Seventh Five Year Plan with the setting up of the National Wastelands Development Board (NWDB) in 1985. The details of afforestation and tree plantation undertaken during the Seventh Five Year Plan (1985-90) so far may be seen in· Annexure-XXIX. . The principal aim of NWDB is to reclaim wastelands in the country through a massive programme of afforestation and tree-planting. The resolve has been further strengthened by the new forestry policy which stipulates a massive needbased and time-bound programme of afforestation and tree-planting, with particular emphasis on fuelwood and fodder development, on all degraded and denuded lands in the country, whether it is forest or non-forest land.

Ecology and Droughts

7.1 Naturally evolving vegetation, intensively adopted cropping practices and water management techniques have all evolved over the centuries to cope with the rainfall variations and maximise conservation of water so that adequate water is available on the surface, in the sub-soil and as ground water, to maintain plant, animal and human life on a sustainable basis in drought prone area. If adequate steps are not taken to maintain this delicate balance, the temporary phenomenon of meteorological drought may turn into the permanent phenomenon of desertification undermining the biological productivity of soil.

7.2 The overall development of the country over the years has contributed to reducing the vulnerability of the population to droughts. However, development inconsistent with sound ecological principles may increase the vulnerability. Regulated development based on sound ecological principles would immensely help in reducing the vulnerability of the people on a sustainable basis.

8. The successive recent droughts in the country have increased the awareness of people towards role of ecology in general and forestry in particular, in environmental conservation. The drought of 1987 brought home the fact that environmental degradation aggravated by successive droughts may lead to irreversible process of desertification. The efforts towards progressive drought proofing and support to ecology made during the drought of 1987 were harbinger of societal awareness in this direction.