Agricultural Economics Research Review
Vol. 18 (Conference No.) 2005 pp 19-34

Managing Risks of Drought in Indian Agriculture: Role of Credit Institutions

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Abstract

The pattern of growth in agriculture and rainfall has been studied along with droughts in the past and the role of the credit institutions in managing droughts. There has been no significant breakthrough in research on dryland farming. Two major negative features of agricultural growth presently affecting agriculture are: (i) instability in year-to-year production, and (ii) inter-regional and inter-crop disparities in production performance. It has been pointed that the decline in foodgrains production during the drought years (13.2% in 2002-03 over 2001-02) has incapacitated our contingency production programmes. The reduction in farm income as a result of drought forces the small and marginal farmers to borrow from other sources to meet their consumption requirements. The debt repayment capacity of the borrowers gets impaired heavily and they find it extremely difficult to repay their loan installments as per schedule. To mitigate the problems of the borrowers and credit institutions during the period of drought, NABARD sanctions conversion of short-term loans into medium-term loans (MTC loans) for 3 years and reschedulement of earlier converted loans for a period of 5-7 years in the event of natural calamities. A quick study on MTC loans in Andhra Pradesh has revealed that 23 per cent of the sample farmers have faced problems of one or other type as associated with MTC crop loans. Farmers have reported that temporary relief from repayment of bank loan, lower repayment installment are certain merits associated with MTC loans. About 71 per cent have reported temporary relief from repayment as the major advantage of MTC crop loan. Besides credit, drought has its implications for both food- and water-security. Appropriate strategies have to be evolved in terms of appropriate crop planning, thrust on irrigation, watershed development, thrust on rural non-farm sector for employment creation, etc. depending on the resource endowment of the arid and semi-arid regions.

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Introduction

Natural disasters that strike countries, both developed and developing, cause enormous destruction, human sufferings and produce negative impacts on national economies. Indian economy witnesses almost every year devastating natural disasters like droughts, floods, cyclones, earthquakes, landslides, etc. and among these, droughts are most frequent and often catastrophic. The shortfall in the rains causes droughts or drought-like situation in various parts of the country. This weather-induced instability and consequent risk in agriculture, is particularly dominant in the semi-arid and arid tropical regions. It has a direct bearing on the economic condition of the rural poor that leads to far reaching implications on the economy as a whole. The paper seeks to get an insight into the pattern of growth in agriculture and rainfall patterns and droughts in the past. It also presents, in brief, the role of the credit institutions and approaches to manage drought in future.

Indian Agriculture — Pace and Pattern of Growth

The agriculture constitutes the backbone of the Indian economy and shapes the life and culture of people in India. After independence, the growth process in agriculture was initiated with a planned endeavour. Various Five-Year Plans concentrated on growth in output for which several institutional changes like land reforms, restructuring credit institutions, remodelling Panchayat Raj institutions, etc. were undertaken vigorously. During the 1960s, HYV programme or Green Revolution was introduced. All these efforts bore fruit and production of foodgrains increased four-times since independence, from 50.8 million tonnes in 1950-51 to 208.9 million tonnes in 1999-2000. However, Indian agriculture has witnessed a slow and unsteady growth since independence, which is largely attributed to adverse conditions, specially droughts.

The compound growth rate of foodgrains output has been around 2.82 per cent during 1949-50 to 1964-65 (Table 1). The growth rate of foodgrains went up to 3.5 per cent during 1979-80 to 1989-90. This has been possible due to the seed-fertilizer-irrigation technology adopted during the Green Revolution period. During 1949-50 to 1964-65, the growth in area contributed to the growth in crop production. However, during the periods 1965-66 to 1979-80 and 1979-80 to 1989-90, the growth in area became less important and that in yield resulted in the increased output of foodgrains. However, the growth rate in foodgrains has come down to a mere 1.67 per cent during the past decade, which is a cause for concern. The modern or Green Revolution technology applied to agriculture depended largely on

Table 1. Compound annual growth rates of area, production and yield of foodgrains in India: 1949-50 to 2000-01

(in per cent)

Phases of agricultural growth	Growth in foodgrains			Growth in all commodities		
	A	P	Y	A	P	Y
1949-50 -1964-65	1.35	2.82	1.36	1.58	3.15	1.21
1967-68 -1979-80	0.40	2.02	1.16	0.53	2.15	1.19
1979-80 -1989-90	(-)0.11	3.54	3.33	0.21	3.72	2.99
1989-90 -2000-01	(-)0.15	1.67	1.41	0.36	2.40	1.37

Note: A: Area, P: Production and Y: Yield

irrigation and remained confined mainly to regions endowed with sufficient irrigation potential, like Punjab, Haryana and parts of Rajasthan. All these areas have reached their plateauing yield levels, leading to a deceleration in the production. The new technology was also restricted to well-irrigated areas leading to regional disparities. Research on HYVs showed success in the case of a few crops only, like rice, wheat, maize, etc. A deceleration in production and Total Factor Productivity (TFP) growth has been reported in some major irrigated areas. There has not been any significant breakthrough in research on dryland farming. Therefore, two major negative features of agricultural growth presently affecting the agriculture are: (i) instability in year-to-year production, and (ii) inter-regional and inter-crop disparities in production performance. The area with low and uncertain rainfall resulted in low irrigation development and comparatively lagged behind and is frequently exposed to the risk of droughts. During the past 5 decades, there were 11 major drought years with widespread failure of rainfall, leading to the emergence of scarcity conditions (Table 2). This table shows the percentage decline in the output of foodgrains based on the output in the immediately preceding year. It also reveals that Indian agriculture is still subjected to a considerable degree of instability in output.

The decline in foodgrains production in 1986-87 at 4.6 per cent over 1985-86 indicates some resistance in agriculture and the better capacity to implement contingency production programmes. This has also been so because area expansion had become a relatively declining component of growth after the mid-1960s and productivity as a source of growth and variability in agricultural production had increased in significance. However, the decline in foodgrains production by 13.2 per cent in 2002-03 over 2001-02 incapacitated our contingency production programmes.

Table 2. Decline in output of foodgrains in drought years compared to preceding years

(in million tonnes)

Sl No.	Drought years	Production of foodgrains	Decline in production, %
1	1950-51	50.8 (54.9)	7.4
2	1957-58	64.3 (69.9)	7.9
3	1965-66	72.3 (89.4)	19.0
4	1966-67	74.2 (72.3)	16.9*
5	1972-73	97.0 (105.2)	7.7
6	1974-75	99.8 (104.7)	4.6
7	1976-77	111.2 (121.0)	8.2
8	1979-80	109.7 (131.9)	16.8
9	1982-83	129.5 (133.3)	2.8
10	1984-85	145.5 (152.4)	4.5
11	1986-87	143.4 (150.4)	4.6
12	2002-03	184.1 (212.0)	13.2

Notes:1.* The figure indicates decline in output over 1964-65 since 1965-66 was the worst drought year; 2. The figures within the parentheses indicate the foodgrains production during the previous year.
Source: *Economic Survey*, Government of India, various issues

Pattern of Rainfall, Incidence of Droughts and Implications

The greater portion of Indian rainfall is under monsoon climate. The southwest monsoon (June-September) accounts for about 74 per cent of the country's total annual rainfall. It is the chief source of water supply for most of the peninsular India. The rainfall during the post monsoon months (October-December), winter (January-February) and pre-monsoon hot season (March-May) accounts for about 13 per cent, 3 per cent, 10 per cent, respectively of the total annual rainfall. The performance of southwest monsoon, that provides maximum rainfall, was somewhat satisfactory during the past decade. The actual rainfall as per cent of the normal rainfall ranged from the lowest of 91 per cent in 1991 to a high of 110 per cent in 1994 (Table 3), wherefrom, it can be claimed that 2000 and 2001 were the years of normal monsoon because the definition of normal rainfall permits variations of (±) 19 per cent of the long-term average. However, the temporal and spatial distributions of the southwest monsoon, which was highly uneven, had a devastating impact on the agricultural performance of several regions in the country.

Incidence and Extent of Droughts

A drought has been defined by Indian Meteorological Department (IMD) as a situation occurring in an area in a year when the annual rainfall is

Table 3. Trends in the rainfall under southwest monsoon (1 June-30 September)

Years	Sub-divisions receiving		Percentage of districts receiving excess/ normal rainfall	Percentage of GCA receiving excess/ normal rainfall	Actual rainfall as percentage of normal rainfall
	Excess/ normal rainfall	Deficient/ scanty rainfall			
1987	14	21	43	35	81
1991	27	8	68	82	91
1992	32	3	65	87	93
1993	31	4	78	94	100
1994	25	10	77	81	110
1995	33	2	79	93	100
1996	32	3	82	91	103
1997	32	3	81	91	102
1998	33	2	81	90	106
1999	28	7	67	80	96
2000	28	7	66	71	92
2001	30	5	68	90	93
2002	15	21	39	37	81
2003	31	5	76	92	105
2004	23	13	57	62	87

Source: Monthly Review of Indian Economy, CMIE, September, October and several other issues.

deficient by 20 per cent or more of the normal rainfall of that area. If the deficiency is in the range of 20 to 39 per cent, the drought is considered mild. If the deficiency is in the range of 40 to 59 per cent, it represents a major drought. When the rainfall deficiency exceeds 60 per cent, it is termed as a severe drought. However, an agricultural drought is said to occur when the soil, moisture and rainfall are inadequate during the crop season to support the growth of a healthy crop to maturity and costs extreme crop stress and wilt (National Commission on Agriculture, 1976).

About one-third of the country and also one-third of the crop area are prone to recurrent droughts (Irrigation Commission, 1972). Out of the total rain-fed area of about 104 million hectares, about 68 per cent falls in low (up to 750 mm) and medium (750 to 1125 mm) rainfall zones. The remaining 32 per cent is in the high rainfall zone (more than 1125 mm rainfall). The low rainfall areas have a larger concentration of drought-prone areas on account of low and highly variable rainfall and low protective cover of irrigation. These low rainfall areas are mainly in the states of Rajasthan, Punjab, Haryana, Karnataka, Gujarat and Maharashtra. However, all these

states are not equally affected by the adverse impact of droughts, as protective irrigation has been developed to a significant extent in some of the states. A total of four Meteorological Sub-Divisions (MSDs), i.e. (i) East UP, (ii) West UP, (iii) Haryana, Chandigarh, Delhi; and (iv) Punjab fall under the well-irrigated areas, where about 75 per cent of the GCA are under irrigation. Even though these Sub-Divisions are under low rainfall zones (normal rainfall of 672 mm), they are protected by high incidence of irrigation.

The variability in rainfall largely determines the productive efficiency of agriculture. The arid and semi-arid tropical regions account for 43 per cent of the total geographical area. Dryland or rain-fed agriculture, practised on about 68 per cent of the net sown area, contributes only about 42 per cent of the total foodgrains production. Despite climatic constraints, 91 per cent of the coarse cereals, 90 per cent of pulses, 81 per cent of oilseeds, 65 per cent of cotton, 55 per cent of rice, and 25 per cent of wheat are grown in the rain-fed areas. Nearly two-thirds of the 450 million heads of cattle in India too thrive in the rain-fed regions.

Implications

Wide fluctuations in production that occur in drought-prone areas year-after-year adversely affect the total production and the agricultural economy. These year-to-year fluctuations result in instability in the agricultural output, as observed from Table 2, and disturb the mutual balance among many independent processes in the economy. They enhance the degree of uncertainty about the future for the policymakers, wide array of producers and consumers in the economy. The drought aggravates not only the degree of instability in agricultural production but also its various factors like, deficiency of rainfall, shortage of adequate water storage devices, etc. resulting in reduction of farm output and farm income. A study by a NABARD Chair Unit has indicated that a 10 per cent deficiency from the normal rainfall would result in a 4.45 per cent shortfall in foodgrain production at the all-India level. The prices of agricultural commodities go up due to shortfalls in production, as a result of which the poor are hit hard. As the small and marginal farmers do not have sizeable marketable surpluses, they do not get any advantage out of the increase in commodity prices.

The reduction in farm income as a result of droughts forces the small and marginal farmers to borrow from other sources to meet the consumption requirements. The debt-repayment capacity of the borrowers gets impaired heavily and they find it extremely difficult to repay their loan installments as per schedule. Some studies have pointed out that the incidence of poverty

exhibits a pattern of fluctuation closely linked to deficiency of rainfall (falling in periods of good agricultural performance and rising in periods of drought). Therefore, drought and water instability in agriculture give rise to higher incidence of poverty.

The droughts also result in a substantial reduction in the agricultural activity that renders a large number of farmers unemployed. Rural landless labourers and also agricultural workers are highly vulnerable to this crisis. This results in the migration of labourers to nearby cities and areas with assured irrigation along with their family members in search of employment. Excessive migration results in congestion, health and sanitation problems, juvenile delinquency, etc. in the nearby cities.

The repeated occurrence of droughts also leads to the process of desertification. Droughts also cause in an imbalance between human and animal population and also between plants, land and water resources. With increased population of both man and animal, crop lands get converted into grazing grounds and fallow lands. As the wastelands grow, people tend to keep more goats than cattle that result in a more risky environment in the degraded lands exposed to frequent droughts. However, goats put further pressure on the environment, thereby creating a vicious circle.

Managing Drought Risks through Medium-Term Conversion (MTC) of Credit

The instability arising as a consequence of droughts affects the credit institutions and borrowers in the drought-prone areas. These institutions face the twin problems of raising resources through mobilization of deposits and of mounting defaults in the repayment of loans by the farmers. This situation calls for the credit institutions to look into both the adequacy of credit flow and its sustainability in the face of high instability arising from the natural factors.

To mitigate the problems of the borrowers and credit institutions like Primary Agricultural Cooperative Societies (PACS), District Central Cooperative Banks (DCCBs) and Regional Rural Banks (RRBs), during the period of droughts, NABARD sanctions conversion of short-term loans into medium-term loans for 3 years and reschedulement of earlier converted loans for a period of 5-7 years in the event of natural calamities. The benefit of the conversion is passed on to the borrowers who become eligible to borrow fresh loans to meet the production credit needs. This facility is extended to meet the situations arising on account of widespread failure of crops due to natural calamities (droughts, floods, pests, etc.) and when the crop yields do not exceed 50 per cent of the normal yield, i.e. when annewari

Table 4. Medium-term (conversion/rephasement) loans granted to State Cooperative Banks

(in million Rs)

SCB Name	1982-83	1987-88	1999-2000	2000-01
Andhra Pradesh	129.5	219.8	157.5	246.7
Gujarat	35.6	468.0	—	—
Haryana	12.3	98.4	—	—
J & K	—	6.3	—	—
Karnataka	64.6	—	57.1	—
Kerala	—	17.4	—	—
Madhya Pradesh	82.2	312.7	—	—
Maharashtra	50.0	343.4	—	—
Orissa	169.2	108.9	—	274.2
Punjab	—	139.4	146.6	—
Rajasthan	392.9	772.6	126.9	579.9
Tamil Nadu	178.7	—	—	—
Uttar Pradesh	302.9	833.1	30.5	—
Total	1739.9	3322.4	518.6	1100.8

*pertains to the period July-March.
Source: *NABARD Annual Report*, various issues

of 6 annas or less is declared by the State Government and the remission of government dues is granted by the State authorities in the affected villages. This facility is available only in respect of loans, which are outstanding but are not overdue for demand. The data on such conversions for a few years, including two major drought years, viz. 1982-83 and 1987-88, have been presented in Table 4. It shows that during the periods of drought, there had been a steep rise in the amount of medium-term (conversion) loans, as is evident from the higher conversion loans issued during 1982-83 and 1986-87 as compared to those in 1999-2000 and 2000-01.

The facility of conversion of short-term loans into medium-term loans was extended for the first time to the RRBs during 1986-87. In 1986-87 and 1987-88, the two major drought years, NABARD had granted medium-term (conversion) loans amounting to Rs15.8 crore to 35 RRBs. During the period July 2000 to March 2001, NABARD sanctioned Rs 3.7 crore to RRBs for such conversion purposes. Furthermore, the scheme of cyclical credit is being reintroduced by NABARD to ensure that farmers in the rain-fed areas are not denied access to institutional credit due to non-wilful defaults arising out of frequent failure of rains.

Farmers' Perceptions on MTC Loans and Crop Insurance

(i) Perceptions on MTC Loans

A simple study was conducted in the districts of Anantapur and Mahabubnagar in Andhra Pradesh to assess the conversion credit. A total 61 sample farmers from both the districts were taken for the study which revealed that about 31 per cent of the farmers did not know that they were granted conversion of their crop loan (Table 5). Agency-wise, larger number of farmers availing loan from cooperatives (54.5%) did not have any knowledge of conversion of their crop loan compared to farmers availing laon from RRBs (3.6%). Category-wise, the same was higher for SMFs (47.2%) than other farmers (8%). Those who had the knowledge that their crop loan was converted, about 76 per cent got the same information from bankers and the rest (24%) acquired the information from the fellow farmers. Only 39 per cent of farmers had been provided with fresh finance. The percentage of farmers availing fresh loans was higher for RRBs (57 %) than cooperatives (24%). Category-wise, there was not much variation in availing of fresh loan between SMFs and other farmers. Those farmers who were provided with fresh crop loans, about 63 per cent were given the same on the year following the conversion year. For about 38 per cent farmers, there was delay in granting fresh crop loans.

Out of the total sample farmers (61), about 59 per cent MTC accounts were closed by the time the study was undertaken. Agency-wise, 64 per

Table 5. Performance indicators of MTC crop loans

(in per cent)

Performance indicators of MTC crop loans	Coops	RRBs	SMFs	OFs	Overall
No. of sample farmers	33	28	36	25	61
Farmers knew they were granted MTC	45.5	96.4	52.8	92.0	68.9
If Yes, source of information					
Fellow farmer	66.7	0.0	42.1	8.7	23.8
Banker	33.3	100.0	57.9	91.3	76.2
Farmers given follow-up finance	24.2	57.1	38.9	40.0	39.3
Follow-up finance received in time	37.5	75.0	71.4	50.0	62.5
Follow-up finance delayed	62.5	25.0	28.6	50.0	37.5
Present status of MTC loans					
Closed	54.5	64.3	61.1	56.0	59.0
Outstanding	45.5	35.7	38.9	44.0	41.0
Farmers acquired loans from money lenders/relatives	39.4	25.0	41.7	20.0	32.8

cent of farmers availing MTC from RRBs had closed their accounts compared to 54 per cent by cooperatives. Thus, accounts outstanding was higher for cooperatives (46%) than RRBs (36%). Category-wise, accounts outstanding for SMFs and OFs were 39 per cent and 44 per cent, respectively. About 33 per cent farmers had availed loans from informal sources for one or the other purpose. A larger number of farmers availing MTC from cooperatives (39%) had acquired loan from informal sources, compared to the farmers from RRBs (25%). This was so, as RRB in Anantapur was giving at least up to 50 per cent of their MTC outstanding as fresh finance to the MTC farmers. RRB from Mahabubnagar and DCCB, Mahabubnagar had not provided fresh finance even to a single farmer. However, certain PACS under Anantapur DCCB had provided fresh crop loans.

Various benefits and problems as reported by the farmers availing MTC crop loans, have been analysed in Table 6. Only 23 per cent of the sample farmers reported problems of one or the other type as associated with MTC crop loans. Farmers reported that temporary relief from repayment of bank loan, and lower repayment installment were certain merits associated with MTC loans. About 71 per cent reported temporary relief from repayment as the major advantage of MTC crop loan. Agency-wise, both for RRBs and cooperatives and category-wise both for SMFs and OFs, a majority of MTC farmers reported the same as one of the merits of MTC crop loans. About 77 per cent farmers conveyed their agony towards MTC crop loans. The problems associated with MTC loans, as reported by sample farmers, included increased debt burden, non-availability of fresh finance, loser from crop insurance angle, etc. About 53 per cent farmers reported increased debt burden as the major problem of MTC crop loan. Agency-wise, both for RRBs and Cooperatives and category-wise, both for SMFs and OFs, a majority of MTC farmers reported the same as one of the major disadvantages of MTC crop loans. Non-availability of fresh finance and loser from crop insurance angle were two other disadvantages of MTC crop loans, as reported by about 32 per cent and 15 per cent farmers, respectively.

(ii) Perceptions about Crop Insurance

Various indicators to judge the perception about crop insurance have been presented in Table 7. At least 77 per cent of farmers had insured their crops for insurance. Out of this, about 57.5 per cent were small and marginal farmers. About 81 per cent farmers knew that their crops were insured. This knowledge was relatively higher for RRBs farmers (60%) compared to the farmers associated with PACS (40%). The information on crop insurance was received by farmers mostly from bankers (67%). Hardly 33

Table 6. Benefits and problems of MTC crops loans as reported by MTC farmers

(in per cent)

Major categories	No. of MTC farmers	Farmers benefited out of MTC	Nature of benefits		Farmers face problems due to MTC	Nature of problems		
			i	ii		I	II	III
Coops	33	15.2	60.0	40.0	84.8	64.3	25.0	10.7
RRBs	28	32.1	55.6	44.4	67.9	36.8	0.0	63.2
Total	61	23.0	57.1	42.9	77.0	53.2	14.9	31.9
SMFs	36	27.8	80.0	20.0	72.2	61.5	11.5	26.9
OFs	25	16.0	50.0	50.0	84.0	42.9	19.0	38.1
Total	61	23.0	71.4	28.6	77.0	53.2	14.9	31.9

i: Temporary relief from repayment, ii: Lower repayment instalment,
I: Debt burden goes up, II: Banks don't give fresh finance, III: No insurance claims

per cent farmers knew at least some intricacies of crop insurance. These people knew why some mandals/ crops were getting insurance claims and some others were not getting the same. Others put forth claim that while annewari was declared for all mandals, insurance claim was not being paid in all the blocks. Very few knew that annewari decleration had nothing to do with crop insurance. They also knew that annewari was more political and hypothetical and insurance was some what scientific/real and factual. About 64 per cent farmers, whose crops were insured, received claims at least once in the past. However, about 70 per cent farmers reported prolonged delay in receiving claims. The delay was more in the case of cooperatives than RRBs.

All farmers (70%) who received claims were adjusted their loan amounts. However, the percentage of accounts adjusted was significantly lower for RRBs (46 %) than Cooperatives (72%). Only 18 per cent of sample farmers reported in favour of the conversion. While 59 per cent farmers demanded a comprehensive and fullproof insurance sheme, about 23 per cent reported that conversion and insurance should go side-by-side.

Approach to Drought Management

Besides credit, drought has its implications for both food- and water-security. Appropriate strategies have to be evolved depending on the resource endowment of the arid and semi-arid regions.

Table 7. Farmers' perceptions on crop insurance

(in per cent)

Category/Particulars	SFs/MFs		OFs		Overall
	Coops	RRBs	Coops	RRBs	
No. of sample farmers	21	15	6	19	61
Farmers whose crops were insured	71.4	80.0	66.7	84.2	77.0
Farmers knew their crops were insured	66.7	80.0	66.7	87.5	80.9
If Yes, source of information					
Fellow farmer	60.0	8.3	16.7	28.6	33.3
Banker	40.0	91.7	83.3	77.4	66.7
Farmers knew modalities of crop insurance	19.0	33.3	16.7	52.6	32.8
Farmers receive premium subsidy	87.5	83.3	0.0	0.0	51.1
Farmers received insurance claims at least once	80.0	41.7	50.0	56.3	63.8
Claims received with prolonged delay	80.0	60.0	25.0	55.6	70.0
Claims adjusted to the loan amount	83.3	50.0	50.0	33.3	70.0
If given choice, preference to					
Conversion	9.5	26.7	0.0	26.3	18.1
Crop insurance	71.4	46.6	66.7	52.6	59.0
Conversion and insurance both to continue	19.1	26.7	33.3	21.1	22.9

(i) Credit Arrangements/Dispensation

As the farmers are worst affected due to droughts, dependence on credit institutions grows heavily in the wake of repetition of such calamities. The arrangements like conversion of ST and MT loans and reschedulement/ repahasement of MT loans are not adequate when occurrences of drought are high and extensive. In such cases, adoption of crop insurance arrangements to farmers for all crops provides protection against decline in production and indirectly minimizes the risk of credit institutions. Further, repeated occurrences of drought impair the production capacity of the assets financed out of credit like wells and tanks going dry, livestock becoming less productive, etc. High instability and risk of failure in crop and other enterprises in areas vulnerable to drought requires a different approach to credit dispensation as well. Credit should be provided with a lot of flexibilities to the borrowers to diversify their activities. Credit should also be sanctioned with flexible repayment periods with inbuilt rephasement/ rehabilitation at the time of original sanction. Key issues requiring immediate attention of credit institutions are:

- Organising delivery system for disbursing large number of small loans needed frequently and quickly during and after a drought.

- Devising viable policy for developing different repayment schedules in different ecological regions and for different classes of farmers for the same enterprise.
- Developing different viability norms for RRB and its branches in the dry regions and devising control policies for subsidising cost of RRB and other cooperative credit institutions in the dry regions.

The problem of overdues has to be dealt with care. Scarcity-induced genuine-overdues deserved to be dealt with differently from the other more deliberate type of overdues. During and after drought, as the demand for credit goes up, money lenders become active and start exploiting the already impoverished farmers, charging higher interest rates. No specific policy bias for credit in the dry regions has till now been created in the country. At the same time, policies for making the loan costlier for bigger and irrigated farmers also need to be vigorously pursued and explored.

(ii) Crop Planning

To mitigate the effect of drought, crop production activities are required to be reoriented suitably with a better understanding of the pattern of rainfall in a particular area. To facilitate suitable crop planning, the rainfall pattern in terms of quantum, spread and period of dependable rainfall for promoting crop growth needs to be studied for each segment of a particular area. In the arid and semi-arid areas, the productivity potential of the land is low; soils are immature, structureless, and coarse in texture and poor in nutrient status with low water-holding capacity. Proper selection of trees is of prime significance in this region for the development of agro-forestry. The trees should have the characteristics of drought-tolerance mechanism like deep root system, leaf shading in summer to conserve moisture, water-binding mechanism, etc. Crops should have tolerance to salinity and saline water and alkalinity, which are common features in these areas.

(iii) Thrust on Irrigation

Development of irrigation reduces instability in agricultural output arising from drought. Availability of adequate, timely and assured irrigation is the critical determinant of agricultural productivity. Irrigation, however, cannot be a major factor in reducing the impact of drought, since its available potential is limited. Therefore, improving utilization of the existing irrigation potential, promoting water-conservation and efficient water management and expansion of irrigation facilities are to be given priority for raising foodgrains output. There is extensive scope for expansion of various micro irrigation systems in the form of sprinkler and drip irrigation networks in the irrigated areas of the low rainfall zone.

(iv) Watershed Development

Thrust on development of mini watersheds in the rain-fed areas is of prime importance. Mini watersheds in conjunction with several technology options like crop or seed centred technology options, agronomic/ management practices and resource-centred technology options will go a long way in minimizing production instability. But the above approaches would have to go side-by-side with adequate co-ordinated extension/ technical back up, emphasis on soil and water conservation, etc. The local community needs to be mobilized to take care of its common property resources like land, water, forest and grazing land. NABARD's experience in this field in Maharashtra, where 83 projects had been taken up with intense involvement of the local community, indicates that to be successful, watershed development technology needs to be (i) specific to the natural endowments of the area, (ii) built on local practices and indigenous knowledge, (iii) based on people's participation, (iv) based on the principles of equity in sharing of costs and benefits, and (v) rooted in village-based institutions.

(v) Conserving Soil and Water

Soil conservation is essential for sustainable production. Thus, larger investments are required for preparation and adoption of a scientific cropping plan (land-use plan detailed by every survey number) based on land capability, to minimize soil erosion and loss of moisture, adoption of full package of agronomic practices and alternate land-use in tune with the new technology. Over the years, there has been a rise in the incremental costs of land and water development schemes. Conserving rainwater where it falls, or capturing the run-off in one's own village or town, capturing run-off from rooftops; capturing run-off from local catchments; capturing seasonal flood water from local streams; and conserving water through watershed management will benefit the locals during water-scarcity periods.

(vi) Thrust on Rural Non-Farm Sector

Many drought-prone areas are dominant in various types of non-farm enterprises. Raw hides and skins., minerals, gums, etc. are processed in the rain-fed regions. Silt of tanks and other low lying areas is used as a raw material after grading for the ceramics industry — an industry of future. Some drought-prone regions have very rich repertoire of designs, crafts and other non-farm enterprises based on local as well as external materials. A cluster approach and addressing a whole lot of issues along with credit

will go a long way in the economic development of these drought-prone areas. Simultaneously, the government should look into the resources, skills and local knowledge systems in which the people inhabit these regions.

(vii) Social Issues

Most drought-prone regions have certain social issues that have to be addressed together if any major dent has to be made in alleviating drought-induced distress and deprivation. In these areas, the literacy levels are extremely low, particularly among the women, with the result most of the workers fall in the lowest income group in the rural and urban labour markets. The male migration is very high and thus number of households headed or managed by women is very large. The fluctuations in environment make people suffer both when production is too little and when it is too high (through price decline for want of efficient procurement system). The market forces as also the public infrastructure are very weak. With population density being very low, the transaction costs of providing basic services are substantial. The systematic development of these regions in matters of literacy, health and other infrastructure will lead to over all upliftment of these areas.

(viii) Information Technology and Weather Forecasting

Use of IT and other forcasting devices like, Geological Imagery Sensing (GIS) and Remote Sensing (RS) will help in planning out strategies to organize relief work. Satellite data may be used to target potential groundwater sites for taking up well-digging programmes. Satellite data provide valuable tools for evaluating areas subject to desertification. Film transparencies, photographs and digital data can be used for the purpose of locating, assessing and monitoring deterioration of natural conditions in a given area.

To conclude, a holistic approach with a suitable mix of policy options on the lines of technology and institutional changes, community-based approaches in conserving scarce resources, like water, soil, etc. innovative and appropriate credit dispensation mechanisms are needed to achieve a long-run immunity from drought.

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