Dealing with Effects of Monsoon Failures

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The deficiency and uneven distribution of rainfall during the 2009 monsoon has brought several issues to the fore: rising water demand from various sectors, regional effects of a drought and the failure of the India Meteorological Department to provide credible forecasts at the disaggregate level. A multi-pronged strategy to permanently deal with monsoon deficiency requires exploring newer drought tolerant and climate-conducive crop varieties, enhancing employment opportunities to non-poor households, and developing a new model that improves the efficacy of the IMD forecast.

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1 Introduction

The south-west monsoon continues to be crucial in determining levels of agriculture output, farmers' income and price stability in the country. Serious deficiencies in the monsoon rainfall often result in drought, which has serious implications for the livelihood of the rural population, particularly for low income and poor households. These households are highly vulnerable to any shock in crop-related and other economic activities, water stress, and rise in prices of basic food items associated with drought. The reason for the strong effect of the south-west monsoon on agriculture and other economic aspects is that these rains account for 75% of natural precipitation in India, and they are the principal source of water supply for agriculture and non-agriculture uses. Since the onset of green revolution technology in the mid-1960s, droughts and monsoon failures have not caused as severe an impact in terms of food insecurity, as they used to in the earlier period. Year to year instability in food production has also witnessed a decline in the country over time, particularly after the late 1980s (Chand and Raju 2009). However, the impact of monsoon failure is now being felt more strongly than before because of several reasons. One, public sensitivity to the adverse impact caused by monsoon failure has increased. It is widely felt that in the 21st century the country should be better equipped to deal with such events. The public is no longer willing to accept that the consequences of monsoon failures are treated as purely the effects of nature. They expect quick and effective responses to mitigate the adverse effects of such events. This expectation is not out of place in the present age of information, communication, infrastructure and technology. Two, the impact of water shortage caused by monsoon failure is being felt more strongly now than before due to rising demand for water from agriculture and other sectors. Harvesting of water beyond renewable limits has made it more difficult to meet water deficiencies caused by insufficient rain. Third, increasing commercialisation of agriculture and water-intensive cultivation are subjecting farmers to higher income risks due to weather shocks.

Failure and uneven distribution of rainfall during the monsoon period of 2009 have further renewed interest in our strategy to cope with such events. Predictions about climate change and its effect on rainfall is reinforcing the need to look at our preparedness to face such eventualities. In the light of these factors, we examine options and strategies to deal with monsoon failure and to mitigate its adverse consequences on different sections of the society.

2 Frequency of Monsoon Failure

Monsoon failure is experienced in some parts of the country almost every year. The long-term trend shows that drought is experienced at least once in five years in all the states except in the north-east. The periodicity of drought is as high as once in three years in states like Rajasthan, Andhra Pradeh, Haryana, Tamil Nadu, Gujarat, Jammu and Kashmir and west Uttar Pradesh (Table 1). Further, besides amount of rainfall, its distribution is also an important determinant of the level of farm production. In some years crop

Table 1: Periodicity of Occurrence of Drought in Various Parts of the Country

Frequency of Deficient Rainfall	Meteorological Sub-Division
Once in 2.5 years	West Rajasthan, Rayalaseema, Telangana, Haryana, Chandigarh and Delhi.
Once in 3 years	East Rajasthan, Gujarat Region, Jammu and Kashmir, Tamil Nadu and Pondicherry, West Uttar Pradesh.
Once in 4 years	North Interior Karnataka, Uttarakhand, Vidarbha.
Once in 5 years	Bihar, Coastal Andhra Pradesh, East Uttar Pradesh, Gangetic West Bengal, Jharkhand, Kerala, Orissa, South Interior Karnataka, Madhya Maharashtra, West Madhya Pradesh.
Once in 15 years	Arunachal Pradesh, Assam and Meghalaya, Nagaland, Manipur, Mizoram and Tripura.

Source: Crisis Mangement Plan, Drought Management Division, Ministry of Agriculture, GoI.

output turned out to be higher than normal even under rainfall deficit, and vice-versa (Table 3).

According to official sources, monsoon rains are erratic 40% of the time (GOI 2009). This implies that monsoon rains follow a pattern in which the behaviour of monsoon is close to the long-term average of the pattern in 60% of the cases, while in 40% of the cases it deviates from the long-term average of the pattern. The probability of erratic monsoons being as high as 40% requires a strategy to adjust to such pattern; otherwise we would be losing out on precious production in four out of 10 years.

3 Country and Region Level Effect

Agriculture sector is defined to include crops and livestock. Monsoon failure and drought affect output of these two activities in entirely different ways. This can be seen from the change in crop output and livestock output during the last four drought years in the country.

During 1972-73, monsoon rains were deficient to the extent of 24% of the long period average and output of crop sector in that year declined by 6.25% over the previous year. Similarly, crop output during 1979-80, 1987-88 and 2002-03 show decline in the range of 3.12% to 12.8% corresponding to about 19% deficiency in the south-west monsoon rainfall (Table 2).

Table 2: Change in Value of Crop Output and Value of Livestock Output during Previous Drought Years

Drought Year	Change in Output in Drought Year Over the Previous Year (%)			
	Value of Crop Output	Value of Livestock Output	Value of Milk	Milk Quantity
1972-73	- 6.25	3.66	4.63	
1979-80	-12.80	4.30	4.00	
1987-88	- 3.12	2.27	2.09	1.30
2002-03	-10.50	2.74	2.21	2.13

Source of basic data: CSO.

In contrast to the decline in crop output, livestock output did not show a decline in any of the drought years, though its growth in some of the drought years turned out to be lower than the long-term growth rate of 4.67% experienced during the period 1970-71 to 2005-06. Within the livestock sector, quantity as well as value of milk output at constant prices show growth rates similar to growth in total output of livestock (Table 2). The reason for positive growth in livestock output during the drought years seems to be that some households affected by severe drought sell their livestock to butchers to meet their cash needs, and slaughter of more livestock adds to output of livestock. Second, some of the crops which do not reach maturity due to deficiency of moisture are harvested prematurely and used as green fodder. In such cases, fodder availability improves at the cost of basic food items, like grains. Thus, the adverse effect of monsoon failure is better captured from output of the crop sector and not the livestock sector.

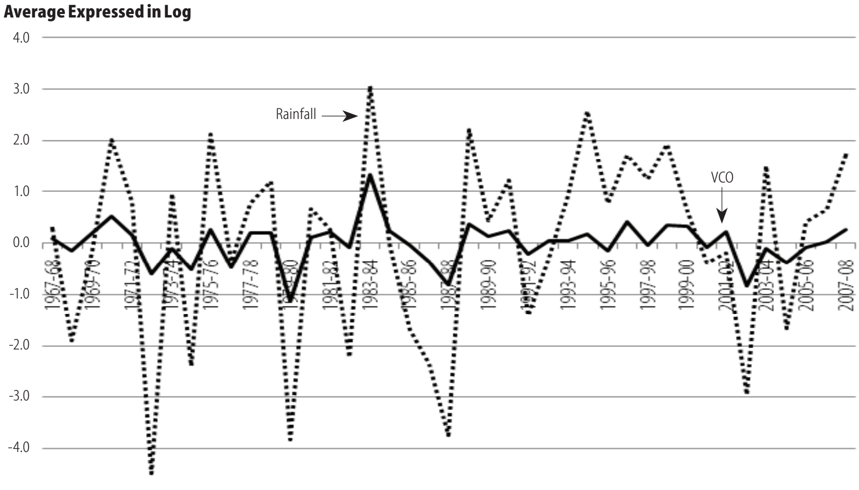
The impact of a poor monsoon is generally examined by looking at the changes in output between the years of monsoon failure and the previous years. This often conceals the true effect of a monsoon failure as the previous year may not be a normal year for agricultural production. The effect of monsoon rain on crop output is captured more accurately by the deviation in output from the underlying trend rather than by change in output from the previous year. Accordingly, the effect of deficiency of monsoon rainfall on crop output was examined by comparing direction of deviations in value of crop output measured in constant (1999-2000) prices from the semi log trend ($LnY_t = b_o + b_1T$) with deviations in rainfall (also expressed in log form) from the long period average. The deviations in crop output (Y_t - Est Y_t) were then expressed as a percentage of Est Y_t for each year and rainfall deviations were also expressed as a percentage of long period average. The series include the post-green revolution period from 1967-68 to 2007-08. Out of 41 years, deviation of actual output from the trend moved in the same direction as the direction of deviation in the amount of monsoon rainfall from the average in 31 years (Figure 1 and Table 3). It was only in 10 years, i e, less than 25%, of the cases, that the value of crop output in the country did not increase or decrease according to the direction of deviation of rainfall from the normal. Further, the frequency of deviations in output and rainfall moving in opposite direction was same for the years when the rain was above normal and when the rainfall was below normal. Correlation between per cent deviations (with ± sign) in rainfall from the average and per cent deviations in value of crop output from the trend values in the same year was 0.73. This shows that as negative rainfall deviations move towards zero, negative deviations of actual output move towards the trend and as the actual rainfall exceeds the normal level, it pulls the

Table 3: Frequency Distribution of Years According to Direction of Deviations in Crop Output from Trend and Deviations in Rainfall from the Average
(1967-68 to 2007-08)

Sl No	Deviations	Number of Years	Frequency %
1	Deviations in output and rainfall in same direction	31	75.6
2	Deviations in output and rainfall in opposite direction	10	24.4
3	Output deviation positive and rainfall deviation negative	4	9.8
4	Output deviation negative and rainfall deviation positive	6	14.6
5	Total	41	100.0

Source: Ministry of Agriculture, 2009.

Figure 1: Per Cent Deviation in Value of Crop Output from the Trend and in South-West Monsoon from Long-Run Average Expressed in Log



Source: Parthasarathy et al 1995, *Indian Agricultural Statistics at a Glance*, MoA, 2008.

output above the trend. This implies that more rainfall (even above long period average) is generally associated with increase in crop output.

Regional Effect

India being a large country, the national level shocks in crop production caused by monsoon failure do not reveal the full severity of adverse effects experienced at the regional level. This can be seen from the fluctuations in output of kharif foodgrains from the underlying (linear) trend, presented in Table 4. The table presents estimates of deviation in output at an all-India level and negative deviation for the top three states in terms of decline in the foodgrain production in various years during 1981-82 to 2005-06. The all-India output of kharif foodgrains during 1981-82 was 2% lower than the trend value. As compared to this, foodgrain production in states like Uttar Pradesh, Bihar and Orissa was 10% to 23% lower than the trend. Foodgrain production in some of the states was less than two-thirds of the normal level during 1985-86 when the all-India production was only 1% less than the normal. During the drought year 1987-88, foodgrain production in Rajasthan was less than one-third of the normal as against only 15.7% below trend production for the country as a whole. It is interesting to observe that when the country witnessed a bumper foodgrain production during 1992-93, the state of Madhya Pradesh experienced 36% reduction in foodgrain output. During the last drought in 2002-03, all-India production of foodgrains was 18.5% lower than the trend, while the deficiency in Tamil Nadu, Orissa and Rajasthan varied between 38% and 63%. Table 4 shows that in almost every year there were some states that suffered from serious shortfall in production of foodgrains, and severity of decline in foodgrain production at the state level was much larger than what was observed for the country as a whole. This underscores the need for dealing with monsoon failure in some states of the country every year.

Table 4: Deviation in Kharif Foodgrain Production from the Trend at All-India Level and in Three Worst Affected States

Year	All India	Three Top Ranking States in Decline		
1981-82	-2.1	Uttar Pradesh (-22.9)	Bihar (-15.4)	Orissa (-12.4)
1982-83	-15.1	Uttar Pradesh (-33.9)	Bihar (-33.2)	Orissa (-30.4)
1983-84	6.8	Uttar Pradesh (-20.2)	West Bengal (-12.4)	J & K (-10.6)
1984-85	-0.3	Andhra Pradesh (-16.2)	Maharashtra (-12.2)	Orissa (-11)
1985-86	-0.9	Gujarat (-41.1)	Rajasthan (-36)	Maharashtra (-14.6)
1986-87	-8.1	Rajasthan (-33.1)	Maharashtra (-30)	Gujarat (-22)
1987-88	-15.8	Rajasthan (-67.3)	Haryana (-42.1)	Himachal Pradesh (-27.2)
1988-89	13.0	Punjab (-17.2)	Himachal Pradesh (-14.7)	Assam (-12.6)
1989-90	11.0	Haryana (-4.6)	Karnataka (-3.1)	Assam (-1.7)
1990-91	7.8	Karnataka (-13.2)	Tamil Nadu (-2.6)	
1991-92	-2.0	Rajasthan (-37.6)	Gujarat (-21.3)	Maharashtra (-19)
1992-93	7.0	Madhya Pradesh (-35.9)	Bihar (-12.3)	Orissa (-0.3)
1993-94	4.2	Rajasthan (-35.1)	Gujarat (-10)	Haryana (-8.6)
1994-95	4.0	Karnataka (-7.4)	Andhra Pradesh (-7.5)	
1995-96	-3.4	Rajasthan (-38.7)	Bihar (-38)	Haryana (-19.5)
1996-97	4.2	Orissa (-25.6)	J & K (-10.2)	Punjab (-6.6)
1997-98	0.6	Andhra Pradesh (-20)	Madhya Pradesh (-18)	Maharashtra (-11.3)
1998-99	0.7	Rajasthan (-22.8)	Bihar (-14.2)	Kerala (-13)
1999-2000	2.0	Rajasthan (-38.5)	Orissa (-18.7)	Gujarat (-14.7)
2000-01	-2.6	Gujarat (-47)	Madhya Pradesh (-33.3)	Rajasthan (-22.8)
2001-02	5.7	Karnataka (-11)	Maharashtra (-7.4)	J & K (-2.6)
2002-03	-18.5	Rajasthan (-62.7)	Orissa (-46.6)	Tamil Nadu (-37.7)
2003-04	7.9	Tamil Nadu (-37.9)	Karnataka (-27.4)	Kerala (-11.7)
2004-05	-5.8	Uttar Pradesh (-19.3)	Maharashtra (-15.5)	Assam (-12.1)
2005-06	-0.9	Bihar (-38.2)	Himachal Pradesh (-19.5)	Rajasthan (-13.6)

Source of basic data: Directorate of Economics and Statistics, Ministry of Agriculture, GOI.

4 Strategy

Monsoon failure and drought being, a recurrent phenomenon, call for an effective strategy to deal with such situations. This involves short-term as well as long-term measures. One of the strategies used to stabilise agricultural output in the country has been the development of irrigation. While monsoon failure results in heavy loss to crops in rainfed agriculture, it may not cause a decline in crop output in irrigated agriculture if the producers are able to compensate for the shortage in water due to poor rain by irrigation. However, monsoon failure results in decline in agricultural income due to cost of additional irrigation.

According to the official estimate, India can expand its irrigation up to 140 million hectares which can provide irrigation to about 72% of the area under cultivation. This will certainly help in moderating the effect of the monsoon failure on crop output. However, it needs to be kept in mind that sustenance of most irrigation sources ultimately depends upon the monsoon rain. Second, when irrigation becomes available, farmers switch over to more water-intensive crops because of which actual area under irrigation turns out to be lower than the potential created. Thus, even after exploitation of full irrigation potential, a large area under cultivation in the country will remain rainfed. Of late, the effect of monsoon failure is felt strongly in irrigated areas where the water table has gone down due to over-exploitation and where water supply in surface irrigation sources like canals and tanks depends on the monsoon rains. There is considerable scope to raise efficiency of water use and to conserve rain water through development of watershed, ponds and other traditional water harvesting structures. These should form part of long-term strategy to face rainfall deficiency.

Alternative Employment

Any slack in crop production activity first affects agricultural labourers, then producers and ultimately consumers. The response to monsoon failure should also follow this sequence. The immediate effect of monsoon failure is felt by wage labour who depend on employment in agriculture. The effect on producers is felt with some time lag, i e, around the time when kharif crops reach maturity. The effect on consumers starts with the increase in price following the signal of a lower crop output. Different types of strategies are needed to moderate and mitigate the effect of monsoon failure on different sections of society. Traditionally, programmes such as the National Food for Work Programme (NFFWP) and Sampooran Grameen Rozgar Yojana (SGRY) were used to provide alternative source of employment in the drought-affected areas. With the implementation of the National Rural Employment Guarantee Scheme (NREGS), most of the rural employment relief programmes have been subsumed under this scheme. However, employment in the NREGS is restricted to a maximum of 100 days and only below poverty line (BPL) families are eligible for the job. In a situation of monsoon failure, agricultural labour require more employment than what is available under the NREGS. Similarly, under drought-like conditions, many landowning families who do not have BPL status also need some employment to generate income. Therefore, in the areas affected by monsoon failure, additional employment needs to be provided either by extending the number of days of employment under the NREGS or through continuation of the earlier schemes for employment. The eligibility for jobs in such schemes should be extended to include non-BPL families of cultivators who are in need of employment during monsoon failure.

Price Stabilisation

There are two options for price stabilisation, viz, trade and buffer stock. Past experience shows that global prices often shoot up with the news of imports by India. In many cases the price paid for the import of agricultural commodities is exorbitantly higher than the price received from the export in the previous year (Chand 2001). This makes trade a very costly proposition to stabilise domestic prices. It has been empirically demonstrated that over a longer period, buffer stock for commodities like rice and wheat are a much better proposition than trade, both for producers as well as consumers (Chand 2003). India needs to build a buffer stock of all those commodities where trade is a costly option to stabilise prices (as is being experienced in the case of sugar).[1]

There is no formal institutional mechanism in the country to have advance information on crop and market outlook. This results in delays in timely action for supply management to address price shocks caused by events like monsoon failure, which further aggravates the price situation. Once the shortfall in a commodity in a large country like India becomes public knowledge, prices in the global market go up and domestic traders manipulate their inventories to maximise benefits from the price rise. India needs an effective system of market intelligence about all major agricultural commodities in global and domestic markets to take appropriate import measures to face the scarcity created by a monsoon failure.

Alternative Production Plans

Agricultural scientists claim to have developed technologies and varieties of crops for diverse climatic situations like early or late sowing, and for different rainfall regimes. This has made it possible to optimise crop production by choosing appropriate varieties and agronomic practices to suit variation in weather. Normally, a farmer would go for those varieties and crops which are expected to give the highest return under normal weather conditions. A farmer would choose crops other than these, only if he/she is sure that the weather is going to be different. This requires credible advance information about monsoons, such as the date of onset, date of withdrawal, dry spells and magnitude of deficiency for different locations. Similarly, options to switch to other crops and varieties in the event of likely failure of crops planted in the beginning of the season has also been available for some time. This requires that seeds of crops and varieties that can be sown late are made available. This puts special responsibility on public sector institutions like the National Seeds Corporation and state level Seed Corporations to maintain stock of seeds of such crops and varieties. Thus, switching to an alternative crop plan requires three things (a) location-specific credible information about monsoon, (b) availability of seeds, and (c) resources with the farmers to make fresh investment in seeds and other inputs.

Monsoon Forecast

Some idea about the various aspects of monsoon rainfall like date of arrival, date of withdrawal, total quantity and major dry spells is a prerequisite for advance planning and for implementing alternative production plans and other strategies to minimise or mitigate the effects of monsoon failure. The India Meteorological Department (IMD) has been issuing seasonal forecast for the south-west monsoon during the period from June to September since 1886 (Krishnan 2006). The method of forecast has undergone several changes over time. Currently the IMD is using a six-parameter ensemble statistical model which has a model error of ± 4%. IMD makes the first stage forecast on the south-west monsoon some time in April and the second stage forecast in June, which includes the date of onset of monsoon rainfall over Kerala and the quantity of rainfall as a percentage of long period average rainfall. In addition to all India average, the forecast for the south-west monsoon season (June-September) is also made for the four broad geographical regions, namely, southern peninsula, north-west India, central India, and east India, using separate multiple linear regression models with a model error of ± 8%. Obviously, these forecasts give only a broad idea about the range of total rainfall for a very large geographic region.

We need to discuss two aspects of this forecast. One, the credibility and usefulness and two, action taken based on these forecasts. The forecast by the IMD is available for a very large geographic area comprising many states with a lot of diversity and variation in rainfall. As the forecast is not location-specific, it is considered too general and is not owned by any state. Second, the regional forecast is available for the entire period of four months. It is very unlikely that each subperiod from June to September would receive rainfall in the same proportion as is the average of the four months. For instance, if the IMD forecasts a deficiency of, say 10%, there is no knowledge of whether the entire deficiency would occur in the first month or in any subsequent month. The lack of information on distribution of rainfall renders the forecast almost irrelevant for crop planning. Moreover, actual rainfall often turns out to be quite different from the IMD forecast which further reduces its credibility.

Due to lack of location-specific monsoon forecasts (state or zone within a state), low credibility and lack of knowledge about likely rainfall in different phases of the crop season, the IMD forecasts are not taken seriously for taking concrete action. For instance, the IMD forecast for monsoon in north-west India in 2009 was 81% of long period average with a model error of ± 8%. This implied that the north-west region could get 73% of normal rainfall; which involves 27% deficiency in June to September rainfall. As the rainfall is rarely distributed according to long term monthly average, the actual rainfall was likely to fall more than 27% in the sowing period of the kharif season. But this information, which was available as early as 24 June, was not used in advance to prepare for deficient rainfall. The reason could be a lack of faith in the IMD forecast, or, to proceed with the hope that nothing adverse would happen. This could also be due to the fact that there is no concrete strategy to deal with deficiency in rainfall and it is taken as fait accompli. The net result is that kharif crops could not be sown on 6.86 million hectares area in the country till the first week of September.

There is an urgent need to improve usefulness and accuracy of the IMD forecasts and to follow it up in terms of action. This requires forecast at a disaggregate level (for state or regions within large states), and on a fortnightly basis, rather than for four months. IMD must develop database and a new model to accomplish this.

States' Response: More Money

The effectiveness of any strategy to deal with the situation of deficient rainfall and events like drought requires very close coordination between the states, the central government and agencies. Agriculture being a state subject requires any plan to combat monsoon failure to be implemented by state governments. Experience shows that most of the time the states do not take prompt action to put in place a strategy to adjust to monsoon failure, and when the situation deteriorates considerably, the ball is thrown in the centre's court by submitting large amount of claims to face the resulting situation. It is interesting to look at the figures for drought claims during 2009 made by various states (Table 5). Bihar sought a special financial assistance of Rs 23,071 crore from the centre to deal with the drought situation in the state. This amount is higher than the value of crop produced in the state in the entire year. The data since 1990-91 shows that the highest decline in crop output faced by Bihar in any year did not exceed 30% of value of the crop sector. Preliminary indications are that loss in crop output in Bihar due to deficit monsoon this year will not be even equal to half of the value of kharif output. The rationale for demanding drought relief on the scale of more than 100% of the value of crop output seems strange. Though Bihar's claim for drought relief is very high, the claims made by other states are also highly exaggerated. The claim by Madhya Pradesh stands close to 40% of the value of crop output (VCO) while the state did not suffer more than 16% loss due to drought in the past.

Table 5: Extent of Drought Relief Claims Made by Various States during 2009 in Relation to Value of Crop Output and Its Decline

State	Claim (Rs Crore)	Claims as % of VCO during 2003-04 to 2005-06	Highest Decline in VCO Witnessed during Last Decade
Andhra Pradesh	4,200	11.54	-15.3
Bihar	23,071	126.49	-29.6
Haryana	3,169	16.98	
Himachal Pradesh	608	14.44	-0.6
Madhya Pradesh	11,670	39.51	-15.8
Maharashtra	15,060	26.68	-11.7
Punjab	7,410	27.47	-1.3
Rajasthan	12,691	46.70	-31.6
Uttar Pradesh	7,789	11.09	0.2

Source: Claims taken from newspaper reports and VCO taken from CSO.

Rather than grapple with drought in terms of a production strategy, some states indulge in trivial blame game, as this is an easier approach when compared to the option of combating drought. This must stop if we are serious in dealing with the natural events.

Public Distribution System

As the price elasticity of demand for most of the food commodities is less than one, any reduction in the supply of these commodities causes more than a proportionate increase in their prices. The situation is further aggravated by profit-seeking private trade through hoarding and stocking to take advantage of food inflation. Public distribution system (PDS) protects consumers against such price hike in more than one ways. Physical distribution of food items through the PDS acts as a check on abnormal increase in open market price, and physical access to subsidised food provides a safety net against hunger and malnutrition. PDS thus, is a better option than income transfer measures like food stamps and food coupons in situations like drought.

5 Conclusions

India faces drought and monsoon failure frequently. Even if rainfall is normal at the country level, some region in the country always suffers from serious deficiency of monsoon rainfall which adversely affects agriculture labour, food production, farmers' income and often results in abnormal increase in prices of food. Due to increasing pressure on water resources, the effect of a monsoon failure is now felt more strongly than before. It is also felt that with the improvement in infrastructure, communication and technology we should be better equipped to moderate the adverse effects of a monsoon failure. Thus, besides relief measures, more attention needs to be paid to maintain production activity during the monsoon failure. This requires both a short-term and a long-term strategy. Agricultural scientists have developed varieties of rice, coarse grain, pulses and oilseeds that are of much shorter duration and are drought tolerant. They also have alternative crop plans for different rainfall regimes in different agro-ecological settings. These options give a lesser return than the main crops and varieties in a normal situation, but they are much better choices under moisture stress, rainfall deficiency and monsoon failure. Such options can be effectively implemented if reliable information is available on rainfall and its distribution in different periods. The IMD forecasts on monsoon rains are too general and aggregate to be used in planning for alternative production strategies in the event of monsoon failure in a particular area like a district. We need to improve the capacity of the IMD to provide credible, usable and specific forecasts on monsoon rainfall at a disaggregate level like a large district; and also put in place an early warning system for events like drought. Implementing an alternative production plan also requires prompt action in terms of supply of seed of alternative crops and institutional credit, the latter being important to prevent small and marginal farmers from falling into the trap of moneylenders.

The initiative to implement a strategy to face monsoon failure has to come from the concerned state since agriculture is a state subject. Each state should have an alternative crop plan for different scenarios of rainfall distribution. Implementation of such plans entails keeping adequate seed of those varieties and crops ready which can quickly replace the normal duration crops/varieties. The efficacy of such a strategy is largely dependent on very close coordination between the states, the central government and agencies.

NOTE

1 India's export of sugar fetched Rs 13.27 per kg during the year 2008. The cost of sugar prepared from imported raw sugar works out to be more than Rs 24 a kg.

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