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# India's Monsoon Economy

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Indian economy is often called the 'monsoon economy'. It reflects the critical role of the monsoon in Indian agricultural economy. According to Dr T.N. Balasubramanian, Consultant to Dr M.S. Swaminathan Research Foundation (MSSRF), Chennai, the decline in the annual per capita food grain production in the country— from 207 kg in 1995 to 186 kg in 2006, with the present per capita food grains availability at 155 kg against 177 kg during 1989-1992—is attributable to the frequent weather aberrations and lesser capital investment in agricultural research and development. No doubt, the monsoons have a central role in defining the climate and, in turn, the agricultural production in India.

### **What is Monsoon?**

Monsoon is a seasonal prevailing wind that lasts for several months. The word is derived from the Arabic 'mawsim' or 'mausam' — also a word for 'weather' in Hindi, Urdu, and a few other Indian and Pakistani languages. The term was first used in the Indian subcontinent to refer to the big seasonal winds blowing from the Indian Ocean and the Arabian Sea, bringing heavy rainfall (monsoon rainfall) to the area.

Monsoon or rainy season, lasting from June to September, is dominated by the humid South-West Monsoon that slowly sweeps across the country in early June. Monsoon rains begin to recede from North India in the beginning of October. Post-monsoon season, lasting from October to December, brings in more precipitation to South India.

### **Origin of Indian Monsoons**

#### **1. Monsoons**

During the hot summer, the Great Indian Desert (Thar Desert) and the adjoining areas of the northern and central Indian subcontinent heat up to a large extent causing a low pressure area there. The moisture-laden winds from the Indian Ocean rushes in to fill the void, creating winds blowing storm clouds towards the subcontinent. However, the mountains on its way and the Himalayas act like high walls forcing them to rise with drop in temperature and result in precipitation.

#### **South-West (Summer) Monsoon**

The South-West (SW) Monsoon is generally expected to begin in early June and end by September. Due to its topology, the moisture-laden winds from the Indian Ocean on reaching the southernmost point of the Indian peninsula become divided into two parts:

- Arabian Sea branch of the SW Monsoon
- Bay of Bengal branch of the SW Monsoon

The Arabian Sea branch extends toward a low-pressure area over the Thar Desert and is roughly three times stronger than the Bay of Bengal branch.

The Arabian Sea branch hits the Western Ghats of the coastal state of Kerala— the first state in India to receive rain from the SW Monsoon. This monsoon moves further northwards along the Western Ghats giving rain to the coastal areas towards the west of the Western Ghats. It is noted that the eastern parts of the Western Ghats do not receive much rain from this monsoon as the wind does not cross the Western Ghats.

The Bay of Bengal branch of the SW Monsoon travels over the Bay of Bengal and heads towards north-eastern India and Bengal, picking up more moisture from the Bay of Bengal. It hits the eastern Himalayas, turns towards the west, and travels over the Indo-Gangetic Plain, pouring rain along its way to the regions of the North-East.

## North-East (Retreating) Monsoon

Around September, with the sun fast retreating south, the northern land mass of the Indian subcontinent begins to cool off rapidly. With this, air pressure begins to build over northern India. The cold wind sweeps down from the Himalayas and the Indo-Gangetic Plain towards the vast spans of the Indian Ocean, south of the Deccan peninsula, because of the heat that prevails over the Indian Ocean and its surrounding atmosphere. This is known as the North-East (NE) Monsoon or Retreating Monsoon.

While travelling towards the Indian Ocean, the dry cold wind picks up some moisture from the Bay of Bengal and pours it over peninsular India. Chennai, which get less rain from the SW Monsoon, receives rain from the Retreating Monsoon. About 50-60% of the rain received by Tamil Nadu is from the NE Monsoon.

However, it is noted that the NE Monsoon is not able to bring as much rain as the SW Monsoon.

## 2. Post-Monsoon

During the post-monsoon period of October to December, a different monsoon cycle, the NE Monsoon brings dry, cool, and dense central Asian air masses to large parts of India. Less and less precipitation falls, and vegetation begins to dry out. In most parts of India, this period marks the transition from wet to dry seasonal conditions.

The NE Monsoon— which begins in September, lasts through the post-monsoon season, and ends only in March—carries winds that have already lost their moisture while crossing central Asia and the vast rain shadow region lying north of the Himalayas. The winds cross India diagonally from north-east to south-west. However, the large indentation made by the Bay of Bengal into India's eastern coast means that the flows are humidified before reaching Kanya Kumari and the rest of Tamil Nadu, meaning that the state along with some parts of Kerala experiences significant precipitation in the post-monsoon and winter periods. However, parts of West Bengal, Orissa, Andhra Pradesh, Karnataka, and the North-East also receive minor precipitation from the NE Monsoon.

## Monsoons and Indian Climate

The climatic conditions in India are greatly affected by the phenomena of monsoons. The climatic seasons are defined around the monsoons, with most of India having four seasons as below:

1. Winter: The season following the NE Monsoon rainy season; i.e., the period between January and March.
2. Summer: The pre-monsoon season from March to June (April to July in North-Western India).
3. Monsoon: The rainy season from June to September. The monsoon rains begin to recede from North India in the beginning of October.
4. Post-monsoon season: The season lasting from October to December, when South India typically receives more precipitation from receding monsoon rains.

The temperate Himalayan states experience two more seasons: Autumn and Spring.

## Importance of Monsoon in India's Economy

The Indian monsoon affects a larger number of people, owing to the high density of population. The four-month period of the SW Monsoon is acknowledged as the Earth's most productive wet season, in terms of total precipitation and total area covered.

Products of South-East trade winds originating from a high-pressure mass centered over the southern Indian Ocean, the monsoonal torrents supply over 70% of India's annual rainfall and, in the process, affect the fortunes of Indian agriculture (which accounts for 17.8% of the GDP in FY2009 and employs 60% of the population). Indian agriculture is heavily dependent on the monsoons, especially crops like cotton, rice, oilseeds, and coarse grains. A delay of a few days in the arrival of the monsoon can badly affect the economy, as evidenced by droughts in the 1990s.

In urban areas, the monsoon provides relief from the summer heat in June. However, because of the lack of adequate infrastructure in place, most major cities are often adversely affected as well. The roads, already shoddy, take a battering each year; houses and streets at the bottom of slopes and beside rivers are waterlogged, slums are flooded, and the sewers and the rare hurricane drain start to back up and pour out toxic filth rather than drain it away. This translates into various minor casualties most of the time. Lack of city infrastructure coupled with changing climate patterns also causes severe damage to property and loss of life. Assam and some areas of West Bengal experience heavy flood, which claims a large number of lives, a huge loss of property, and causes severe damage to economy. Also, in the recent past, areas in India that used to receive scanty rainfall throughout the year, like the Thar Desert, have surprisingly ended up receiving heavy rainfall due to the prolonged monsoon season.

Monsoon rains impact the health of the Indian economy. Good monsoons correlate with a booming economy. Weak or failed monsoons (droughts) result in widespread agricultural losses and substantially hinder overall economic growth. The rains reduce temperatures and replenish groundwater levels.

## Dependence of States on Monsoon Rains

No	State	% Rainfall from Monsoons	Remarks
1	Gujarat	98.83	> 90% SW
2	Goa	96.8	> 90% SW
3	Maharashtra	96.03	> 90% SW
4	Madhya Pradesh	95.46	
5	Rajasthan	94.21	>90% SW
6	Chhattisgarh	94.11	
7	Uttar Pradesh	93.27	
8	Bihar	90.7	
9	Andhra Pradesh	90.52	67% SW and 23% NE
10	Jharkhand	90.33	
11	Orissa	89.71	
12	Karnataka	88.48	
13	Haryana	87.59	
14	West Bengal	86.05	
15	Kerala	85.33	
16	Punjab	83.74	
17	Uttaranchal	82.76	
18	Tamil Nadu	82.03	34% SW and 47% NE
19	A&N Islands	81.81	58% SW and 23% NE
20	Meghalaya	80.74	
21	Nagaland	79.2	
22	Sikkim	73.93	
23	Manipur	73.72	
24	Mizoram	73.54	
25	Assam	71.46	
26	Tripura	70.84	
27	Arunachal Pradesh	70.8	
28	Himachal Pradesh	66.87	
29	Jammu & Kashmir	53.47	

NOTE: Of the total rainfall, nearly 72% is from SW Monsoon and 10 % from NE Monsoon.

The rainfall data presented above clearly demonstrates the importance of the monsoon rains in meeting the annual rainfall targets by various states. The monsoons contribute significantly to the rainfall of states (between 53.5 % and 98.8 % of the total annual rainfall target).

### India's Food Production and Monsoons

The rain-fed agriculture constitutes about 60% of India's total net sown area, wherein food grains such as rice, bajra, maize, jowar, and pulses such as tur and gram are grown. India gets nearly 53% of its food from the Kharif season (June–October) as compared to the Rabi season (November–February), where the production is around 47%. The constraints for production of food grain during the Kharif season is soil moisture (influenced by the seasonal rainfall from the SW Monsoon), and for the Rabi season it is the minimum temperature and stored soil moisture.

The dependence of food grain production on the onset and further progress of the SW Monsoon was clearly demonstrated in the year 2002, when the food grain production fell sharply to 174.77 MMT from the previous year's figure of 212.85 MMT, primarily due to declines in Kharif production (87.22 MMT from 112.07 MMT during the previous year). The sharp decline in food grain production was assigned to a rain fall deficiency of 19% of Long Period Average (LPA) during the critical month of July. As a result 29% of the area was declared drought-hit.

Forecast Rainfall and Actual of SW Monsoon (India Meteorology Department or IMD)*			Kharif Area and Production of Food Grains (MoA) (Jun- Oct)	
Year	Forecast	Actual	Area	Production
1997	92	102	74.15	101.58
1998	99	106	73.99	102.91
1999	111	96	73.24	105.51
2000	99	92	75.22	102.09
2001	98	92	74.23	112.07
2002	101	81	68.56	87.22
2003	96	102	75.44	117.00
2004	100	87	72.26	103.31
2005	98	99	72.72	109.87
2006	92	99	72.67	110.58
2007	95-94	105	73.58	120.95**
2008	99	98	N.A.	118.79***
2009	93***	-	-	-

\*% of LPA (Long Period Average is 89 cm – a simple arithmetic average of rainfall over 1941 to 1990)

\*\* Final Estimate as on 8th May,2009 by the Directorate of Economics and Statistics, Ministry of Agriculture (MoA), Government of India

\*\*\*3rd Advance Estimate as on 8th May,2009 by the Directorate of Economics and Statistics, Ministry of Agriculture (MoA), Government of India

The SW Monsoon is important because nearly 72% of India's annual rainfall is from the SW Monsoon, which supports nearly 75% of the Kharif crop. Thus the SW Monsoon is critical to India's food security. A timely and 'good' monsoon (normal levels of rainfall) with temporal and spatial distribution contributes to a bountiful harvest. An anticipated bountiful harvest holds the key to controlling inflation. Hence it is natural that the entire nation eagerly awaits and follows the progress of the SW Monsoon.

### Monsoon Forecasts for 2009

Rainfall Forecasts by the IMD for 2009 (SW Rainfall as on 24th June 2009)

Area	Long Period Average (mm)	Forecast (% of LPA)
All India (June to September)	890	93
All India (July)	293	93
All India (August)	262	101
NW India	612	81
Central India	994	99
NE India	1429	92
South Peninsula	725	93

Source: [www.imd.gov.in](http://www.imd.gov.in)

Looking at an average all India rainfall forecast of 93% of LPA by the IMD for the year 2009 appears reassuring. The forecast for the North and Central India at 92 to 99 % of LPA bodes well for food grain production. With more than normal levels of carryover stock and overshooting of procurement target for the year year (wheat at 22.68 MMT from 11.1 MMT the previous year and Rice at 32.8 MMT from 26.3 MMT from the previous year, figures as on 02.07.2009) by the government agencies, the food situation is not worrisome. Thus the facts and the current estimates assure that India's food production in 2009-2010 can be satisfactory with little concern of inflation or slowdown in economy. This is particularly so





assuming that the latest long-term forecast announced by the IMD on 24th June 2009 holds good for the rest of the season and that the rest of the monsoon follows a fairly 'normal' or expected spatial and temporal distribution pattern. The last point is critical as suggested in a recent RBI report, which says, "Despite significant advances in technology, Indian agriculture continues to be rain-dependent and fluctuations in agricultural production continue to be driven by variations in spread and intensity of monsoon. Consequently, even transient aberrations in spatio-temporal distribution of rainfall exacerbate moisture stress leading to drought-like conditions."

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#### Glossary:

**Precipitation** is rain, sleet, hail, snow, and other forms of water falling from the sky. In meteorology, precipitation is any product of the condensation of atmospheric water vapour that is deposited on the Earth's surface.

**Weather** is a set of all the phenomena occurring in a given atmosphere at a given time. Weather refers, generally, to day-to-day temperature and precipitation activity.

**Climate** is the term for the average atmospheric conditions over longer periods of time.

**Kharif** is the cropping season starting with the onset of the South-West Monsoon and that goes on till October. This is the main and substantial cropping season in most of the districts. Most of the rain-fed, tank-fed, and canal-fed areas are cropped during this season.

**Rabi** is the cropping season following the Kharif season. However, it is difficult to make a hard and fast rule since the Rabi sowings of different crops start in the month of September in some areas while it extends up to November-end in some other areas. Mostly, the southern districts of the coastal Andhra Pradesh receiving the North-East Monsoon rains have maximum cropped area during this season. The cropping season extends up to February-March.

**LPA** (Long Period Average) is the average rainfall over the period of 1941 to 1990. The LPA is 89 cm for the season.

**Drought** is an extended time period (months or years) when a region experiences a deficiency in its water supply. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy. This occurs when a region receives consistently below average precipitation impacting the ecosystem and agriculture of the affected region. This global phenomenon has a widespread impact on agriculture.

**Temporal** means sequential or time sequential or chronological.

**Spatial** relates to occupying, or having the character of space, of or pertaining to space.