

Agriculture in India

The history of **agriculture in India** dates back to [Indus Valley Civilization](#).¹ India [ranks](#) second worldwide in farm outputs. As per 2018, agriculture employed more than 50% of the Indian work force and contributed 17–18% to country's GDP. According to latest report, agriculture is primary source of livelihood for 58% population in India

In 2016, agriculture and allied sectors like [animal husbandry](#), [forestry](#) and [fisheries](#) accounted for 15.4% of the [GDP](#) (gross domestic product) with about 31% of the workforce in 2014. India ranks first in the world with highest net cropped area followed by US and China. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of [India](#). India exported \$38 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide and the sixth largest net exporter. Most of its agriculture exports serve developing and least developed nations. Indian agricultural/horticultural and processed foods are exported to more than 120 countries, primarily to the Japan, [Southeast Asia](#), [SAARC](#) countries, the [European Union](#) and the [United States](#).

Overview

As per the 2014 [FAO](#) world agriculture statistics India is the world's largest producer of many fresh [fruits](#) like banana, mango, guava, papaya, [lemon](#) and vegetables like chickpea, okra and [milk](#), major [spices](#) like chili pepper, ginger, fibrous crops such as [jute](#), staples such as [millets](#) and [castor oil](#) seed. India is the second largest producer of [wheat](#) and [rice](#), the world's major [food staples](#).

India is currently the world's second largest producer of several [dry fruits](#), agriculture-based [textile](#) raw materials, [roots](#) and [tuber](#) crops, [pulses](#), farmed [fish](#), [eggs](#), [coconut](#), [sugarcane](#) and numerous [vegetables](#). India is ranked under the world's five largest producers of over 80% of agricultural produce items, including many [cash crops](#) such as [coffee](#) and [cotton](#), in 2010. India is one of the world's five largest producers of livestock and [poultry meat](#), with one of the fastest growth rates, as of 2011.

One report from 2008 claimed that India's population is growing faster than its ability to produce rice and wheat. While other recent studies claim that India can easily feed its growing population, plus produce wheat and rice for global exports, if it can reduce food staple spoilage/wastage, improve its infrastructure and raise its farm productivity like those achieved by other developing countries such as [Brazil](#) and [China](#).

In fiscal year ending June 2011, with a normal monsoon season, Indian agriculture accomplished an all-time record production of 85.9 million tonnes of wheat, a 6.4% increase from a year earlier. Rice output in India hit a new record at 95.3 million tonnes, a 7% increase from the year earlier. Lentils and many other food staples production also increased year over year. Indian farmers, thus produced about 71 kilograms of wheat and 80 kilograms of rice for every member of Indian population in 2011. The per capita supply of rice every year in India is now higher than the per capita consumption of rice every year in Japan.

India exported \$39 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide, and the sixth largest net exporter. This represents explosive growth, as in 2004 net exports were about \$5 billion. India is the fastest growing exporter of agricultural products over a 10-year period, its \$39 billion of net export is more than double the combined exports of the European Union (EU-28). It has become one of the world's largest supplier of rice, cotton, sugar and wheat. India exported around 2 million metric tonnes of wheat and 2.1 million metric tonnes of rice in 2011 to [Africa](#), [Nepal](#), [Bangladesh](#) and other regions around the world.

[Aquaculture and catch fishery](#) is amongst the fastest growing industries in India. Between 1990 and 2010, the Indian fish capture harvest doubled, while aquaculture harvest tripled. In 2008,

India was the world's sixth largest producer of marine and freshwater capture fisheries and the second largest aquaculture farmed fish producer. India exported 600,000 metric tonnes of fish products to nearly half of the world's countries. Though the available nutritional standard is 100% of the requirement, India lags far behind in terms of [quality protein](#) intake at 20% which is to be tackled by making available protein rich food products such as eggs, meat, fish, chicken etc. at affordable prices.

India has shown a steady average nationwide annual increase in the kilograms produced per hectare for some agricultural items, over the last 60 years. These gains have come mainly from India's [Green Revolution](#), improving road and power generation infrastructure, knowledge of gains and reforms. Despite these recent accomplishments, agriculture has the potential for major productivity and total output gains, because crop yields in India are still just 30% to 60% of the best sustainable crop yields achievable in the farms of developed and other developing countries. Additionally, post harvest losses due to poor infrastructure and unorganised retail, caused India to experience some of the highest food losses in the world.



History

[Vedic literature](#) provides some of the earliest written record of agriculture in India. [Rigveda](#) hymns, for example, describes plowing, fallowing, irrigation, fruit and vegetable cultivation. Other historical evidence suggests rice and cotton were cultivated in the [Indus Valley](#), and plowing patterns from the [Bronze Age](#) have been excavated at [Kalibangan](#) in [Rajasthan](#). Bhumivargaha, an Indian [Sanskrit](#) text, suggested to be 2500 years old, classifies agricultural land into 12 categories: urvara (fertile), ushara (barren), maru (desert), aprahata (fallow), shadvala (grassy), pankikala (muddy), jalaprayah (watery), kachchaha (contiguous to water), sharkara (full of pebbles and pieces of limestone), sharkaravati (sandy), nadimatruka (watered from a river), and devamatruka (rainfed). Some archaeologists believe that rice was a domesticated crop along the banks of the river Ganges in the sixth millennium BC. So were species of winter cereals (barley, oats, and wheat) and legumes (lentil and chickpea) grown in northwest India before the sixth millennium BC. Other crops cultivated in India 3000 to 6000

years ago, include sesame, linseed, safflower, mustard, castor, mung bean, black gram, horse gram, pigeon pea, field pea, grass pea (khesari), fenugreek, cotton, jujube, grapes, dates, jack fruit, mango, mulberry, and black plum. Indians might have domesticated buffalo (the river type) 5000 years ago.

According to some scientists agriculture was widespread in the Indian peninsula, 10000–3000 years ago, well beyond the fertile plains of the north. For example, one study reports 12 sites in the southern Indian states of [Tamil Nadu], [Andhra Pradesh] and [Karnataka] providing clear evidence of agriculture of pulses [*Vigna radiata*] and [*Macrotyloma uniflorum*], millet-grasses ([Brachiaria ramosa](#) and [Setaria verticillata](#)), wheats ([Triticum dicoccum](#), [Triticum durum/aestivum](#)), barley ([Hordeum vulgare](#)), [hyacinth bean](#) ([Lablab purpureus](#)), pearl millet ([Pennisetum glaucum](#)), [finger millet](#) ([Eleusine coracana](#)), [cotton](#) ([Gossypium](#) sp.), [linseed](#) ([Linum](#) sp.), as well as gathered fruits of [Ziziphus](#) and two [Cucurbitaceae](#).

Some claim Indian agriculture began by 9000 BC as a result of early cultivation of plants, and domestication of crops and animals. Settled life soon followed with implements and techniques being developed for agriculture. Double [monsoons](#) led to two harvests being reaped in one year. Indian products soon reached trading networks and foreign crops were introduced. Plants and animals—considered essential to survival by the Indians—came to be worshiped and venerated.

The [middle ages](#) saw irrigation channels reach a new level of sophistication, and Indian crops affected the economies of other regions of the world under [Islamic](#) patronage. Land and water management systems were developed with an aim of providing uniform growth.

Despite some stagnation during the later modern era the independent [Republic of India](#) was able to develop a comprehensive agricultural programme.

Agriculture and colonialism

Over 2500 years ago, Indian farmers had discovered and begun farming many spices and [sugarcane](#). It was in India, between the sixth and four BC, that the [Persians](#), followed by the [Greeks](#), discovered the famous "reeds that produce honey without bees" being grown. These were locally called साखर, (Sākhara). On their return journey, the [Macedonian](#) soldiers carried the "honey bearing reeds," thus spreading [sugar](#) and [sugarcane](#) agriculture. People in India had invented, by about 500 BC, the process to produce sugar crystals. In the local language, these crystals were called *khanda* (खण्ड), which is the source of the word *candy*.

Before the 18th century, cultivation of sugarcane was largely confined to India. A few merchants began to trade in sugar – a luxury and an expensive spice in Europe until the 18th century. Sugar became widely popular in 18th-century Europe, then graduated to become a human necessity in the 19th century all over the world. This evolution of taste and demand for sugar as an essential food ingredient unleashed major economic and social changes. Sugarcane does not grow in cold, frost-prone climate; therefore, tropical and semitropical colonies were sought. Sugarcane plantations, just like [cotton](#) farms, became a major driver of large and forced human migrations in the 19th century and early 20th century – of people from Africa and from India, both in millions – influencing the ethnic mix, political conflicts and cultural evolution of Caribbean, South American, Indian Ocean and Pacific Island nations.

The history and past accomplishments of Indian agriculture thus influenced, in part, colonialism, slavery and slavery-like indentured labour practices in the New World, [Caribbean wars](#) and world history in 18th and 19th centuries.



Indian agriculture after independence

The [Green Revolution in India](#) started in 1965. It was founded by M.S Swaminathan. The Bengal famine of 1943 under the British rule was one of the most severe famines that killed over 3 million people. There was no help from the industrial sector, so the agricultural sector during the British rule was a disaster for the people of India. Shortly after independence from the British in 1947 India realized that there was a need to become self-sufficient. This ushered in India's [Green Revolution](#). It began with the decision to adopt superior yielding using disease resistant wheat varieties in combination with better farming knowledge to improve productivity. The major parties involved in executing the plan were the Government of India, multilateral and bilateral donors, International Agricultural Research Institution, farmers, and peasants.

The Green Revolution in India marked a period of time when agricultural practices shifted from traditional practices to more technological methods. Traditional farming included better irrigation systems, mixed cropping and the planting of local species. Technological approaches have given rise to input intensive and unsustainable agricultural practices that ultimately reduce the ground water table, causing erosion and loss in biodiversity. As part of this shift, farmers shifted from using wheel-barrow and bullock carts to mechanized vehicles.

The Green Revolution focused on the introduction and growth of high yielding varieties (HYVs) of plants and grains. This practice spread across various states in India such as Punjab, Haryana, Western Uttar Pradesh, Tamil Nadu and Kerala. This shift in agricultural technique has caused and continues to cause irreversible changes including deterioration in soil health and nutrients.. This practice makes it difficult to shift back to organic farming on the same land.

The state of [Punjab](#) led India's [Green Revolution](#) and earned the distinction of being the country's bread basket. The initial increase in production was centered on the irrigated areas of the states of [Punjab](#), [Haryana](#) and western [Uttar Pradesh](#). With the farmers and the government officials focusing on farm productivity and knowledge transfer, India's total food grain production soared. A hectare of Indian wheat farm that produced an average of 0.8 tonnes in 1948, produced 4.7 tonnes of wheat in 1975 from the same land. Such rapid growth in farm productivity enabled India to become self-sufficient by the 1970s. It also empowered the smallholder farmers to seek further means to increase food staples produced per hectare. By 2000, Indian farms were adopting wheat varieties capable of yielding 6 tonnes of wheat per hectare.

There have been various discrepancies regarding crop yield since the start of the Green Revolution. Proponents of the Green Revolution say that it solved the problem of malnutrition but adversaries say that it made it worse. One of the reasons is because monoculture and chemical fertilizers have taken the nutrition out of the food and the soil. There have been many myths regarding soil, high yielding varieties (HYV) and industrial breeding in comparison to organic breeding of plants. The myth of the HYVs - they produce a high partial yield, low total system yield, indigenous varieties get a better yield than the HYVs. Industrial breeding focuses on

quantity rather than nutrition per acre, partial yield rather than multiple crops, this type of breeding and planting also removes the focus from local varieties of plants and shifts it to plants that are traded worldwide.

In the years since its independence, India has made immense progress towards food security. Indian population has tripled, and food-grain production more than quadrupled. There has been a substantial increase in available food-grain per capita.

Before the mid-1960s India relied on imports and food aid to meet domestic requirements. However, two years of severe drought in 1965 and 1966 convinced India to reform its agricultural policy and that they could not rely on foreign aid and imports for food security. India adopted significant policy reforms focused on the goal of food grain self-sufficiency. This ushered in India's [Green Revolution](#). It began with the decision to adopt superior yielding, disease resistant wheat varieties in combination with better farming knowledge to improve productivity. The state of [Punjab](#) led India's [Green Revolution](#) and earned the distinction of being the country's bread basket

The initial increase in production was centred on the irrigated areas of the states of [Punjab](#), [Haryana](#) and western [Uttar Pradesh](#). With the farmers and the government officials focusing on farm productivity and knowledge transfer, India's total food grain production soared. A hectare of Indian wheat farm that produced an average of 0.8 tonnes in 1948, produced 4.7 tonnes of wheat in 1975 from the same land. Such rapid growth in farm productivity enabled India to become self-sufficient by the 1970s. It also empowered the smallholder farmers to seek further means to increase food staples produced per hectare. By 2000, Indian farms were adopting wheat varieties capable of yielding 6 tonnes of wheat per hectare.

With agricultural policy success in wheat, India's Green Revolution technology spread to rice. However, since irrigation infrastructure was very poor, Indian farmers innovated with tube-wells, to harvest [ground water](#). When gains from the new technology reached their limits in the states of initial adoption, the technology spread in the 1970s and 1980s to the states of eastern India – [Bihar](#), [Odisha](#) and [West Bengal](#). The lasting benefits of the improved seeds and new technology extended principally to the irrigated areas which account for about one-third of the harvested crop area. In the 1980s, Indian agriculture policy shifted to "evolution of a production pattern in line with the demand pattern" leading to a shift in emphasis to other agricultural commodities like oil seed, fruit and vegetables. Farmers began adopting improved methods and technologies in dairying, fisheries and livestock, and meeting the diversified food needs of a growing population.

As with rice, the lasting benefits of improved seeds and improved farming technologies now largely depends on whether India develops infrastructure such as irrigation network, flood control systems, reliable electricity production capacity, all-season rural and urban highways, cold storage to prevent spoilage, modern retail, and competitive buyers of produce from Indian farmers. This is increasingly the focus of Indian agriculture policy.

India ranks 74 out of 113 major countries in terms of [food security index](#). India's agricultural economy is undergoing structural changes. Between 1970 and 2011, the GDP share of agriculture has fallen from 43% to 16%. This isn't because of reduced importance of agriculture or a consequence of agricultural policy. This is largely because of the rapid economic growth in services, industrial output, and non-agricultural sectors in India between 2000 and 2010.

Agricultural scientist [MS Swaminathan](#) has played a vital role in the green revolution. In 2013 NDTV awarded him as 25 living legend of India for outstanding contribution to agriculture and making India a food sovereign country.



An irrigation canal in Punjab. [Irrigation](#) contributes significantly to agriculture in India.

Two states, Sikkim and Kerala have planned to shift fully to [organic farming](#) by 2015 and 2016 respectively.

Irrigation

Indian irrigation infrastructure includes a network of major and minor canals from rivers, groundwater well-based systems, tanks, and other [rainwater harvesting](#) projects for agricultural activities. Of these, the groundwater system is the largest. Of the 160 million hectares of cultivated land in India, about 39 million hectare can be irrigated by groundwater wells and an additional 22 million hectares by irrigation canals. In 2010, only about 35% of agricultural land in India was reliably irrigated. About 2/3rd cultivated land in India is dependent on [monsoons](#). The improvements in irrigation infrastructure in the last 50 years have helped India improve food security, reduce dependence on monsoons, improve agricultural productivity and create rural job opportunities. Dams used for irrigation projects have helped provide drinking water to a growing rural population, control flood and prevent drought-related damage to agriculture. However, free electricity and attractive minimum support price for water intensive crops such as sugarcane and rice have encouraged ground [water mining](#) leading to [groundwater depletion](#) and poor water quality. A news report in 2019 states that more than 60% of the water available for farming in India is consumed by rice and sugar, two crops that occupy 24% of the cultivable area.



Output

As of 2011, India had a large and diverse agricultural sector, accounting, on average, for about 16% of GDP and 10% of export earnings. India's arable land area of 159.7 million hectares (394.6 million acres) is the second largest in the world, after the United States. Its gross irrigated crop area of 82.6 million hectares (215.6 million acres) is the largest in the world. India is among the top three global producers of many crops, including wheat, rice, pulses, cotton, peanuts, fruits and vegetables. Worldwide, as of 2011, India had the largest herds of buffalo and cattle, is the largest producer of milk and has one of the largest and fastest growing poultry industries.



Major products and yields

The following table presents the 20 most important agricultural products in India, by economic value, in 2009. Included in the table is the average productivity of India's farms for each produce. For context and comparison, included is the average of the most productive farms in the world and name of country where the most productive farms existed in 2010. The table suggests India has large potential for further accomplishments from productivity increases, in increased agricultural output and agricultural incomes.

Largest agricultural products in India by value

Rank	Commodity	Value (US\$, 2016)	Unit price (US\$ / kilogram, 2009)	Average yield (tonnes per hectare, 2017)	Most productive country (tonnes per hectare, 2017)	
1	Rice	\$70.18 billion	0.27	3.85	9.82	Australia
2	Buffalo milk	\$43.09 billion	0.4	2.00	2.00	India
3	Cow milk	\$32.55 billion	0.31	1.2	10.3	Israel
4	Wheat	\$26.06 billion	0.15	2.8	8.9	Netherlands
5	Cotton (lint & seeds)	\$23.30 billion	1.43	1.6	4.6	Israel
6	Mangoes, guavas	\$14.52 billion	0.6	6.3	40.6	Cape Verde
7	Fresh vegetables	\$11.87 billion	0.19	13.4	76.8	United States
8	Chicken meat	\$9.32 billion	0.64	10.6	20.2	Cyprus
9	Potatoes	\$8.23 billion	0.15	19.9	44.3	United States
10	Banana	\$8.13 billion	0.28	37.8	59.3	Indonesia
11	Sugar cane	\$7.44 billion	0.03	66	125	Peru

Largest agricultural products in India by value

Rank	Commodity	Value (US\$, 2016)	Unit price (US\$ / kilogram, 2009)	Average yield (tonnes per hectare, 2017)	Most productive country (tonnes per hectare, 2017)	
12	Maize	\$5.81 billion	0.42	1.1	5.5	Nicaragua
13	Oranges	\$5.62 billion				
14	Tomatoes	\$5.50 billion	0.37	19.3	55.9	China
15	Chick peas	\$5.40 billion	0.4	0.9	2.8	China
16	Okra	\$5.25 billion	0.35	7.6	23.9	Israel
17	Soybeans	\$5.13 billion	0.26	1.1	3.7	Turkey
18	Hen eggs	\$4.64 billion	2.7	0.1	0.42	Japan
19	Cauliflower and broccoli	\$4.33 billion	2.69	0.138	0.424	Thailand
20	Onions	\$4.05 billion	0.21	16.6	67.3	Ireland

The Statistics Office of the Food and Agriculture Organization reported that, per final numbers for 2009, India had grown to become the world's largest producer of the following agricultural products:

- Fresh fruit
- Lemons and limes
- [Buffalo milk](#), whole, fresh

- [Castor oil seeds](#)
- [Sunflower seeds](#)
- [Sorghum](#)
- [Millet](#)
- Spices
- [Okra](#)
- [Jute](#)
- [Beeswax](#)
- [Bananas](#)
- [Mangoes](#), mangosteens, [guavas](#)
- Pulses
- Indigenous buffalo meat
- Fruit, tropical
- [Ginger](#)
- [Chick peas](#)
- [Areca nuts](#)
- Other [bastfibres](#)
- [Pigeon peas](#)
- Papayas
- [Chillies](#) and [peppers](#), dry
- [Anise](#), [badian](#), [fennel](#), [coriander](#)
- Goat milk, whole, fresh

Per final numbers for 2009, India is the world's second largest producer of the following agricultural products:

- [Wheat](#)
- [Rice](#)
- Fresh vegetables
- [Sugar cane](#)
- [Groundnuts](#), with shell
- [Lentils](#)
- [Garlic](#)
- [Cauliflowers](#) and [broccoli](#)
- [Peas](#), green
- [Sesame seed](#)
- [Cashew nuts](#), with shell
- Silk-worm cocoons, reelable
- Cow milk, whole, fresh
- [Tea](#)
- [Potatoes](#)
- [Onions](#)
- [Cotton lint](#)
- Cotton seed
- [Eggplants](#) (aubergines)
- [Nutmeg](#), [mace](#) and [cardamoms](#)
- Indigenous goat meat
- [Cabbages](#) and other brassicas
- [Pumpkins](#), [squash](#) and [gourds](#)

In 2009, India was the world's third largest producer of eggs, oranges, coconuts, tomatoes, peas and beans.

In addition to growth in total output, agriculture in India has shown an increase in average agricultural output per hectare in last 60 years. The table below presents average farm productivity in India over three farming years for some crops. Improving road and power generation infrastructure, knowledge gains and reforms has allowed India to increase farm productivity between 40% to 500% over 40 years. India's recent accomplishments in crop yields while being impressive, are still just 30% to 60% of the best crop yields achievable in the farms of developed as well as other developing countries. Additionally, despite these gains in farm productivity, losses after harvest due to poor infrastructure and unorganised retail cause India to experience some of the highest food losses in the world.

Agriculture productivity in India, growth in average yields from 1970 to 2010			
Crop	Average YIELD, 1970–1971	Average YIELD, 1990–1991	Average YIELD, 2010–2011
	kilogram per hectare	kilogram per hectare	kilogram per hectare
Rice	1123	1740	2240
Wheat	1307	2281	2938
Pulses	524	578	689
Oilseeds	579	771	1325
Sugarcane	48322	65395	68596
Tea	1182	1652	1669
Cotton	106	225	510

India and China are competing to establish the world record on rice yields. Yuan Longping of China National Hybrid Rice Research and Development Centre set a world record for rice yield in 2010 at 19 tonnes per hectare in a demonstration plot. In 2011, this record was surpassed by an Indian farmer, Sumant Kumar, with 22.4 tonnes per hectare in Bihar, also in a demonstration plot. These farmers claim to have employed newly developed rice breeds and system of rice intensification (SRI), a recent innovation in farming. The claimed Chinese and Indian yields have yet to be demonstrated on 7 hectare farm lots and that these are reproducible over two consecutive years on the same farm.

Horticulture

The total production and economic value of horticultural produce, such as fruits, vegetables and nuts has doubled in India over the 10-year period from 2002 to 2012. In 2012, the production from horticulture exceeded grain output for the first time. The total horticulture produce reached 277.4 million metric tonnes in 2013, making India the second largest producer of horticultural products after China. Of this, India in 2013 produced 81 million tonnes of fruits, 162 million tonnes of vegetables, 5.7 million tonnes of spices, 17 million tonnes of nuts and plantation products (cashew, cacao, coconut, etc.), 1 million tonnes of aromatic horticulture produce and 1.7 million tonnes of flowers (7.6 billion [cut flowers](#)).



Horticultural productivity in India, 2013

Country	Area under fruits production (million hectares)	Average Fruits Yield (Metric tonnes per hectare)	Area under vegetable production (million hectares)	Average Vegetable Yield (Metric tonnes per hectare)
 India	7.0	11.6	9.2	52.36
 China	11.8	11.6	24.6	23.4
 Spain	1.54	9.1	0.32	39.3
 United States	1.14	23.3	1.1	32.5
World	57.3	11.3	60.0	19.7

During the 2013 fiscal year, India exported horticulture products worth ₹144 billion (US\$2.0 billion), nearly double the value of its 2010 exports. Along with these farm-level gains, the losses between farm and consumer increased and are estimated to range between 51 and 82 million metric tonnes a year.

Organic agriculture

Organic agriculture has fed [India](#) for centuries and it is again a growing sector in India. Organic production offers clean and green production methods without the use of synthetic [fertilisers](#) and [pesticides](#) and it achieves a premium price in the market place. India has 650,000 organic producers, which is more than any other country. India also has 4 million hectares of land certified as organic wildculture, which is third in the world (after [Finland](#) and [Zambia](#)). As non-availability of edible biomass is impeding the growth of animal husbandry in India, organic production of protein rich cattle, fish and poultry feed using [biogas](#) /methane/natural gas by cultivating [Methylococcus capsulatus](#) bacteria with tiny land and water foot print is a solution for ensuring adequate protein rich food to the population.



Agriculture based cooperatives

India has seen a huge growth in [cooperative societies](#), mainly in the farming sector, since 1947 when the country gained independence from Britain. The country has networks of cooperatives at the local, regional, state and national levels that assist in agricultural marketing. The commodities that are mostly handled are food grains, jute, cotton, sugar, milk, fruit and nuts. Support by the state government led to more than 25,000 cooperatives being set up by the 1990s in the state of [Maharashtra](#).

Sugar industry

Most of the [sugar production in India](#) takes place at mills owned by local cooperative societies. The members of the society include all farmers, small and large, supplying [sugarcane](#) to the mill. Over the last fifty years, the local sugar mills have played a crucial part in encouraging political participation and as a stepping stone for aspiring politicians. This is particularly true in the state of [Maharashtra](#) where a large number of politicians belonging to the [Congress party](#) or [NCP](#) had ties to sugar cooperatives from their local area and has created a symbiotic relationship between the sugar factories and local politics. However, the policy of "profits for the company but losses to be borne by the government", has made a number of these operations inefficient.

Marketing

As with sugar, cooperatives play a significant part in the overall marketing of fruit and vegetables in India. Since the 1980s, the amount of produce handled by Cooperative societies has increased exponentially. Common fruit and vegetables marketed by the societies include bananas, mangoes, grapes, onions and many others.

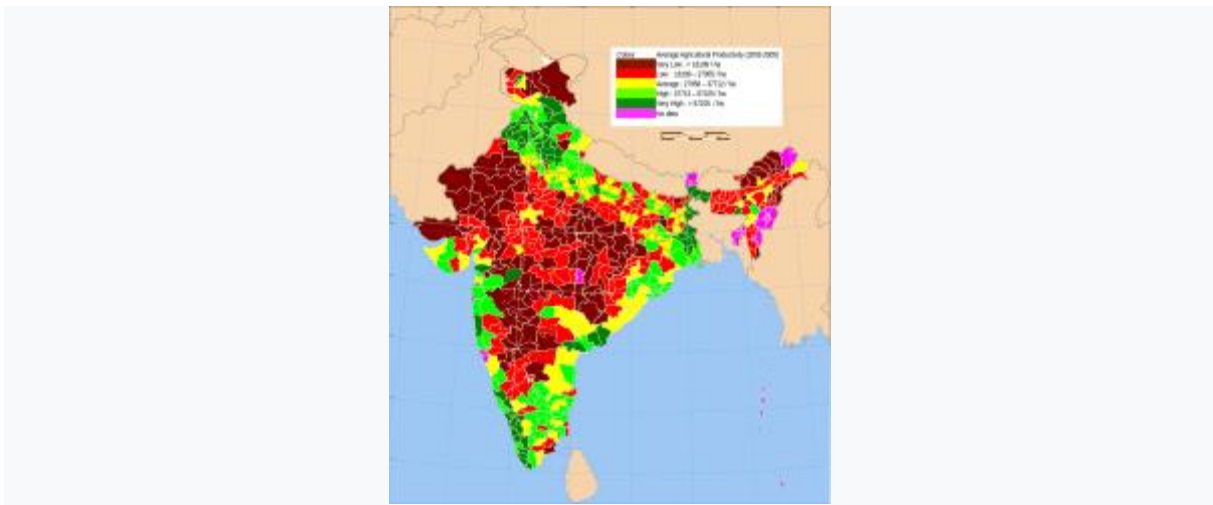
Dairy industry

Dairy farming based on the [Amul Pattern](#), with a single marketing cooperative, is India's largest self-sustaining industry and its largest rural employment provider. Successful implementation of the Amul model has made India the world's largest milk producer. Here small, marginal farmers with a couple or so heads of milch cattle queue up twice daily to pour milk from their small containers into the village union collection points. The milk after processing at the district unions is then marketed by the state cooperative federation nationally under the [Amul](#) brand name, India's largest food brand. With the Anand pattern three-fourths of the price paid by the mainly urban consumers goes into the hands of millions of small dairy farmers, who are the owners of the brand and the cooperative.

Banking and rural credit

[Cooperative banks](#) play a great part in providing credit in rural parts of India. Just like the sugar cooperatives, these institutions serve as the power base for local politicians.

Problems



District wise agricultural productivity in India (2003–05). Productivity varies highly across regions.



Spices at a store, at Khari Baoli, Old Delhi – farmers with limited marketing options sell their surplus produce



India lacks cold storage, food packaging as well as safe and efficient rural transport system. This causes one of the world's highest food spoilage rates, particularly during monsoons and other adverse weather conditions. Food travels to the Indian consumer through a slow and inefficient chain of traders. Consumers buy agricultural produce in suburban markets known as 'sabzi mandi' such as one shown or from roadside vendors.



Indian agriculture includes a mix of traditional to modern farming techniques. In some parts of India, traditional use of cattle to plough remains in use. Traditional farms have some of the lowest per capita productivities and farmer incomes.



Since 2002, India has become the world's largest manufacturer of [tractors](#) with 29% of world's output in 2013; it is also the world's largest tractor market. Above a tractor in Rewari, Haryana.

"Slow agricultural growth is a concern for policymakers as some two-thirds of India's people depend on rural employment for a living. Current agricultural practices are neither economically nor environmentally sustainable and India's yields for many agricultural commodities are low. Poorly maintained irrigation systems and almost universal lack of good extension services are among the factors responsible. Farmers' access to markets is hampered by poor roads, rudimentary market infrastructure, and excessive regulation."

"With a population of just over 1.3 billion, India is the world's largest democracy. In the past decade, the country has witnessed accelerated economic growth, emerged as a global player with the world's fourth largest economy in purchasing power parity terms, and made progress towards achieving most of the Millennium Development Goals. India's integration into the global economy has been accompanied by impressive economic growth that has brought significant economic and social benefits to the country. Nevertheless, disparities in income and human development are on the rise. Preliminary estimates suggest that in 2009–10 the combined all India poverty rate was 32 % compared to 37 % in 2004–05. Going forward, it will be essential for India to build a productive, competitive, and diversified agricultural sector and facilitate rural, non-farm entrepreneurship and employment. Encouraging policies that promote competition in agricultural marketing will ensure that farmers receive better prices."

A 2003 analysis of India's agricultural growth from 1970 to 2001 by the [Food and Agriculture Organization](#) identified systemic problems in Indian agriculture. For food staples, the annual growth rate in production during the six-year segments 1970–76, 1976–82, 1982–88, 1988–1994, 1994–2000 were found to be respectively 2.5, 2.5, 3.0, 2.6, and 1.8% per annum.

Corresponding analyses for the index of total agricultural production show a similar pattern, with the growth rate for 1994–2000 attaining only 1.5% per annum.

The biggest problem of farmers is the low price for their farm produce. A recent study showed that proper pricing based on energy of production and equating farming wages to Industrial wages may be beneficial for the farmers.

Impact of climate change

India plays a large role in global food security. India produced 148.8 million tons of rice and 78.6 million tons of wheat in 2008. Climate change has reduced this number since 1980 though. The effect of climate change on the Indian agriculture is a combination of the long lived global emissions of greenhouse gases (LLGHGs) and short lived climate pollutants (SLCPs) among precipitation and black carbon. Wheat and rice yield dropped from 1980-2010 by over 36% and 20% respectively in Uttar Pradesh and Uttaranchal. There was a reduction in wheat production of 3.5% throughout India. The impacts of climate change on agriculture in India would not only affect the practices of agriculture and the country's economy but will also have major socio-economic implications as 56% of employment is under the agricultural sector.

Infrastructure

India has very poor rural roads affecting timely supply of inputs and timely transfer of outputs from Indian farms. Irrigation systems are inadequate, leading to crop failures in some parts of the country because of lack of water. In other areas regional floods, poor seed quality and inefficient farming practices, lack of cold storage and harvest spoilage cause over 30% of farmer's produce going to waste, lack of [organised retail](#) and competing buyers thereby limiting Indian farmer's ability to sell the surplus and commercial crops.

The Indian farmer receives just 10% to 23% of the price the Indian consumer pays for exactly the same produce, the difference going to losses, inefficiencies and middlemen. Farmers in developed economies of Europe and the United States receive 64% to 81%.

Productivity

Although India has attained self-sufficiency in food staples, the productivity of its farms is below that of Brazil, the United States, France and other nations. Indian [wheat](#) farms, for example, produce about a third of the wheat per hectare per year compared to farms in France. Rice productivity in India was less than half that of China. Other staples productivity in India is similarly low. Indian [total factor productivity](#) growth remains below 2% per annum; in contrast, China's total factor productivity growths is about 6% per annum, even though China also has smallholding farmers. Several studies suggest India could eradicate its hunger and malnutrition and be a major source of food for the world by achieving productivity comparable with other countries.

By contrast, Indian farms in some regions post the best yields, for sugarcane, cassava and tea crops.

Crop yields vary significantly between Indian states. Some states produce two to three times more grain per acre than others.

As the map shows, the traditional regions of high agricultural productivity in India are the north west (Punjab, Haryana and Western Uttar Pradesh), coastal districts on both coasts, West Bengal and Tamil Nadu. In recent years, the states of Madhya Pradesh, Jharkhand, Chhattisgarh in central India and Gujarat in the west have shown rapid agricultural growth.

The table compares the statewide average yields for a few major agricultural crops in India, for 2001–2002.

Crop	Average farm yield in Bihar	Average farm yield in Karnataka	Average farm yield in Punjab
------	-----------------------------	---------------------------------	------------------------------

	kilogram per hectare	kilogram per hectare	kilogram per hectare
Wheat	2020	unknown	3880
Rice	1370	2380	3130
Pulses	610	470	820
Oil seeds	620	680	1200
Sugarcane	45510	79560	65300

Crop yields for some farms in India are within 90% of the best achieved yields by farms in developed countries such as the United States and in European Union. No single state of India is best in every crop. Tamil Nadu achieved highest yields in rice and sugarcane, [Haryana](#) in wheat and coarse grains, Karnataka in cotton, Bihar in pulses, while other states do well in horticulture, aquaculture, flower and fruit plantations. These differences in agricultural productivity are a function of local infrastructure, soil quality, micro-climates, local resources, farmer knowledge and innovations.

The Indian food distribution system is highly inefficient. Movement of agricultural produce is heavily regulated, with inter-state and even inter-district restrictions on marketing and movement of agricultural goods.

One study suggests Indian agricultural policy should best focus on improving rural infrastructure primarily in the form of irrigation and flood control infrastructure, knowledge transfer of better yielding and more disease resistant seeds. Additionally, cold storage, hygienic food packaging and efficient modern retail to reduce waste can improve output and rural incomes.

The low productivity in India is a result of the following factors:

- The average size of land holdings is very small (less than 2 hectares) and is subject to fragmentation due to land ceiling acts, and in some cases, family disputes. Such small holdings are often over-manned, resulting in disguised unemployment and low productivity of labour. Some reports claim smallholder farming may not be cause of poor productivity, since the productivity is higher in China and many developing economies even though China smallholder farmers constitute over 97% of its farming population. A Chinese smallholder farmer is able to rent his land to larger farmers, China's organised retail and extensive Chinese highways are able to provide the incentive and infrastructure necessary to its farmers for sharp increases in farm productivity.
- Adoption of modern agricultural practices and use of [technology](#) is inadequate in comparison with Green Revolution methods and technologies, hampered by ignorance of such practices, high costs and impracticality in the case of small land holdings.
- According to the [World Bank](#), Indian branch's *Priorities for Agriculture and Rural Development*, India's large [agricultural subsidies](#) are hampering productivity-enhancing investment. This evaluation is based largely on a productivity agenda and does not take any ecological implications into account. According to a neo-liberal view, over-regulation of agriculture has increased costs, price risks and uncertainty because the government intervenes in labour, land, and credit markets. India has inadequate infrastructure and

services. The World Bank also says that the allocation of water is inefficient, unsustainable and inequitable. The [irrigation](#) infrastructure is deteriorating. The overuse of water is being covered by over-pumping aquifers but, as these are falling by one foot of groundwater each year, this is a limited resource. The [Intergovernmental Panel on Climate Change](#) released a report that food security may be a big problem in the region post 2030.

- Illiteracy, general socio-economic backwardness, slow progress in implementing land reforms and inadequate or inefficient finance and marketing services for farm produce.
- Inconsistent government policy. Agricultural subsidies and taxes are often changed without notice for short term political ends.
- Irrigation facilities are inadequate, as revealed by the fact that only 52.6% of the land was irrigated in 2003–04, which result in farmers still being dependent on rainfall, specifically the [monsoon](#) season. A good monsoon results in a robust growth for the economy, while a poor monsoon leads to a sluggish growth. Farm credit is regulated by [NABARD](#), which is the statutory apex agent for rural development in the subcontinent. At the same time, over-pumping made possible by subsidised electric power is leading to an alarming drop in aquifer levels.
- A third of all food that is produced rots due to inefficient supply chains and the use of the "[Walmart model](#)" to improve efficiency is blocked by laws against foreign investment in the retail sector.

Farmer suicides

In 2012, the [National Crime Records Bureau](#) of India reported 13,754 farmer suicides. Farmer suicides account for 11.2% of all suicides in India. Most of the farmer suicides were happening in Andhra Pradesh, Maharashtra, Chhattisgarh, Kerala and Karnataka. At the time, financial debt was increasing and showed no signs of reducing. Some of the reasons for debt come from increasing cost of cultivation on farms due to price increase of chemical fertilizers and seeds, more frequent crop failures, water scarcity, unstable income and trade liberalization. Financial debt is one of many reasons such as monsoon failure, high debt burdens, [genetically modified crops](#), government policies, public mental health, personal issues and family problems.

Diversion of agricultural land for non-agricultural purpose

Indian National Policy for Farmers of 2007 stated that "prime farmland must be conserved for agriculture except under exceptional circumstances, provided that the agencies that are provided with agricultural land for non-agricultural projects should compensate for treatment and full development of equivalent degraded or wastelands elsewhere". The policy suggested that, as far as possible, land with low farming yields or that was not farmable should be earmarked for non-agricultural purposes such as construction, industrial parks and other commercial development.

[Amartya Sen](#) offered a counter viewpoint, stating that "prohibiting the use of agricultural land for commercial and industrial development is ultimately self-defeating." He stated that agricultural land may be better suited for non-agriculture purposes if industrial production could generate many times more than the value of the product produced by agriculture. Sen suggested India needed to bring productive industry everywhere, wherever there are advantages of production, market needs and the locational preferences of managers, engineers, technical experts as well as unskilled labour because of education, healthcare and other infrastructure. He stated that instead of government controlling land allocation based on soil characteristics, the market economy should determine productive allocation of land.

Please check the validity of the source listed above.

Initiatives

The required level of investment for the development of marketing, storage and cold storage infrastructure is estimated to be huge. The government has not been able to implement schemes to raise investment in marketing infrastructure. Among these schemes are 'Construction of Rural Godowns', 'Market Research and Information Network', and 'Development / Strengthening of [Agricultural Marketing](#) Infrastructure, Grading and Standardisation'.

The [Indian Council of Agricultural Research](#) (ICAR), established in 1905, was responsible for the search leading to the "[Indian Green Revolution](#)" of the 1970s. The ICAR is the apex body in agriculture and related allied fields, including research and education. The Union Minister of Agriculture is the president of the ICAR. The [Indian Agricultural Statistics Research Institute](#) develops new techniques for the design of agricultural experiments, analyses data in agriculture, and specialises in statistical techniques for animal and plant breeding.

Recently (May 2016) the government of India has set up the Farmers Commission to completely evaluate the agriculture programme. Its recommendations have had a mixed reception.

In November 2011, India announced major reforms in [organised retail](#). These reforms would include logistics and retail of agricultural produce. The announcement led to major political controversy. The reforms were placed on hold by the government in December 2011.

In the summer of 2012, the subsidised electricity for pumping, which has caused an alarming drop in aquifer levels, put additional strain on the country's electrical grid due to a 19% drop in monsoon rains and may have contributed to a blackout across much of the country. In response the state of [Bihar](#) offered farmers over \$100 million in subsidised diesel to operate their pumps.

In 2015, prime minister [Narendra Modi](#) announced to double farmer's income by 2022.

Startups with niche technology and new business models are working to solve problems in Indian agriculture and its marketing. Kandawale is one of such e-commerce website which sells Indian red onions to bulk users direct from farmers, reducing unnecessary cost escalations.

For Agriculture of India Information Click Hear

<http://agriculture.gov.in/>

For Gujarat Agriculture Information Click hear

<https://agri.gujarat.gov.in/useful-links.htm>

Right to information about agriculture click hear

<https://agri.gujarat.gov.in/rti-guj.htm>