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Indian Agricultural Growth and Economic Reforms

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INTRODUCTION

Economic liberalization, it was maintained, would provide a positive shift in the terms of trade for agriculture in India, allowing farmers to plow back excess from farming to undertake long-term improvements on the land and increase agricultural productivity and growth rate. Contrary to expectations, the terms of trade for agriculture did not significantly increase during the reform period. Additionally, a considerable number of individuals who depend on agriculture now face greater livelihood insecurity due to a slowdown in agricultural growth and inadequate investment in irrigation and extension services in rural regions, as well as a lack of affordable institutional financing.

It was thought that the implementation of reforms, liberalization of international commerce, and corresponding pricing incentives would raise investment, make essential inputs more affordable, and increase agricultural output. A change in the terms of trade in favor of agriculture was also anticipated to boost agricultural exports and the growth rate (Ahluwalia 1994). Favorable terms of trade were anticipated to increase agricultural productivity and private investment in India (Misra 1998: 2105–09). Despite these hopes, policy changes made in the wake of economic reforms did not result in a faster pace of agricultural expansion. Economic liberalization involves several policies that are harmful to agriculture in particular as well as petty production in general. In that aspect, these laws discriminate against low-wage workers and the poor based on class. As a result of these policy initiatives, governmental funding for rural infrastructure, including irrigation systems and agricultural research and extension services, as well as the promotion of agricultural trade liberalization, has decreased. The impact of each of these measures on India's agriculture industry has been examined in this analysis.

Growth Rate of Agriculture

The agricultural sector's rapid growth is essential to the economy's overall development. Given that a sizeable portion of the population in India depends on agriculture for work, its significance is increased. According to the National Sample Survey Office (NSSO), in 2011–12, 75% of women and 59% of men who worked were dependent on agriculture (NSSO 2014: 14). To eliminate rural poverty, there must be strong agricultural growth. It was believed that decreasing income gaps between the agricultural and non-agricultural sectors would be possible by

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increasing agricultural growth from 2% to 4% and the economy's overall growth rate from 9%. (Planning Commission 2006In this context, it will be important to examine the agricultural sector's growth rates and assess how it performed relative to the rest of the economy in the years after the start of the reforms in 1991–1992.

Development of Sustainable Agriculture

Three main categories of farming systems—traditional production, modern agriculture, and sustainable agriculture—can be used to explore the concerns of sustainable development.

- **Ecological Sustainability:** The majority of conventional farming methods are not environmentally sustainable. They abuse natural resources, producing soil erosion, reduced soil fertility, and global climatic change.
- **Soil Fertility:** One of the biggest issues in many parts of India is the ongoing decline in soil fertility. Fertility and soil structure are enhanced by sustainable agriculture.
- **Water:** The largest user of fresh water is irrigation, and both surface and groundwater are contaminated by pesticides and fertilizers. By increasing the topsoil's organic matter content, sustainable agriculture increases the soil's capacity to hold onto and store rainwater.
- **Biodiversity:** Mixed cropping is a key component of sustainable agricultural techniques since it increases the variety of crops produced as well as the diversity of insects, other animals, and plants in and around the fields.
- **Health & Pollution:** The local ecology and population are both negatively impacted by chemicals, pesticides, and fertilizers. Pests are managed and toxic chemicals are used less in sustainable agriculture.
- **Land use Pattern:** Overuse of the land impairs its ability to grow crops by clogging irrigation systems, causing irrigation systems to get clogged, and causing land to slide, flood, and experience erosion. By boosting productivity, preserving the land, etc., sustainable agriculture avoids these issues.
- **Climate:** Conventional agriculture produces greenhouse gases in a variety of ways, including diminishing the amount of carbon stored in the soil and vegetation, producing methane in irrigated fields, manufacturing synthetic fertilizers, etc. This issue can easily be solved by using a sustainable agriculture system.

Economic Sustainability

Agriculture needs to be economically viable in the long run to be sustainable. In the long run, conventional agriculture entails greater economic risk than sustainable agriculture. Domestic demand, and in particular food security, should be treated equally essential by policies as the visible trade balance. The national market may be overrun by inexpensive foreign food, leaving Indian producers with no customers. The Indian government is under pressure to deregulate and open its economy to the global market since it is a signatory to the World Trade Organization and cannot shield its farmers behind tariff walls. Farming is the primary source of employment for rural residents. Specialization and mechanization trends may boost narrowly defined "efficiency," but they decrease jobs in the agricultural sector. When developing national

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agricultural support programs, the welfare costs of unemployment must be taken into consideration. With its focus on small-scale, labor-intensive operations, sustainable agriculture helps to solve these issues.

Mile Stones in Indian Agriculture

Policymakers and planners who were worried about a country's independence, security, and political stability understood that food self-sufficiency was a crucial prerequisite for the establishment of a sustainable agriculture industry. The following policies are thought to be landmarks in the nation's development of agriculture:

- **Green Revolution (1968):** The Intensive Agriculture District Program (IADP), which eventually gave rise to the Green Revolution, is one of the programs included in this revolution. It was decided to create the National Bank for Agriculture Development (NABARD).
- **Ever Green Revolution (1996):** Prof. M.S. Swamina, the leader of India's green revolution, declares that he is an advocate for women, the environment, and the underprivileged. The key to the ongoing green revolution is the preservation of biodiversity, maintenance of soil fertility, and increased climatic resistance of food crops, all in conjunction with greater and more widespread knowledge and technical advancement.
- **White and Yellow Revolution:** The Green Revolution created a sense of self-assurance in our abilities to advance agriculture, which paved the way for the following phase, known as the Technology Mission. The emphasis of this strategy was on trade, consumption, and conservation.
- **Blue Revolution (Water, Fish):** It has been influenced in part by a movement toward healthier eating that has seen an increase in fish consumption. The availability of wild fish is also dwindling.
- **Bio-Technology Revolution:** India is in a good position to become a big player in the international biotech market. By 2010, India might lead the world in the development of numerous additional genetically modified vegetables and transgenic crop production, a sector with enormous economic potential.

The salient features of the new agricultural policy are:

i) Over the next two years, over 4% annual growth rate is desired; ii) Greater involvement of the business sector through contract farming; iii) Farmer price protection; iv) Introducing a national farm insurance program; v) Reducing barriers to prevent the national circulation of agricultural goods; vi) Rational use of the nation's water resources to fully realize the potential for irrigation; vii) Animal agricultural, poultry, dairy, and fishery development should be given high priority; viii) Flows of capital and secure markets for the production of crops; ix) Exclusion from paying capital gains tax on land acquired through forced acquisition; x) Reduce commodity price fluctuation; xi) International prices are continuously being analyzed; xii) Regulation to protect some plant species; xiii) Supply of high-quality inputs to farmers on schedule and at sufficient

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levels; xiv) Giving rural electricity a high priority; xv) Establishment of agro-processing facilities and development of non-farm jobs in rural areas.

The objective of the study

1. To analyze the impact of economic reforms on the agrarian structure.
2. To suggest remedial measures as may be appropriate for the development of agriculture in India
3. To analyze the dimensions and direction of agricultural development in India.
4. To evaluate its strength, weakness, and opportunities

Literature Review

(Vrang, Bazin et al. 1987) observed that agriculture is expanding gradually, ruling out any nationwide abrupt shifts in the increase of agricultural output due to the introduction of new agricultural technologies. Additionally, crop modifications indicated that, except for a few commercial crops like sugarcane and potatoes, the new agricultural technology had little to no effect on food crops, inferior cereals, or cereal substitutes.

(Hwa 1989) Emphasis is made on accelerating agricultural growth and minimizing fluctuation, policy changes regarding prices and subsidies, significant production-oriented investment in rural infrastructure, and improvements to the quality of life in rural areas are all suggested to sustain the benefits of agricultural development and growth.

(Williams, Parker, et al. 1995) have reached an additional conclusion. According to their research, liberalizing just the agricultural sector would enhance terms of trade for Indian agriculture by around 2%, whereas liberalizing both the agricultural and non-agricultural sectors would increase terms of trade for agriculture by 27%. However, they forecast that liberalization will primarily benefit rural farmers who are poor and that wealthy farmers will suffer. The findings from this research are obviously at odds with one another.

(Gallup, Sachs, et al. 1999) Measures to achieve macroeconomic stabilization and structural reforms to place the Indian economy on a better growth path were included in the program of economic policy changes in India that was launched in July 1991.

(Ahluwalia 2002) India has seen a lot of debate regarding how economic reforms will affect the poor. The pro-reform faction contends that the reforms will benefit the underprivileged by promoting quick and effective growth. This would entail 15 employment-producing, labor-intensive growths, which would aid in reducing the poverty issue. However, the detractors contend that this process will take time and even continue to be out of the reach of the vast majority of the poor. Due to structural changes brought about by the reforms, some areas may even suffer when specific types of products and processes are replaced. To ensure that the poor received adequate benefits even in the short term, the Indian structural reforms program combined structural improvements with an effective poverty alleviation program.

(Jodha 1991) now it has been observed that reorienting agricultural research to meet the unique requirements of these regions is necessary to make agriculture in fragile resource zones

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sustainable by use of appropriate technologies. As consequence, this is mostly an institutional issue rather than a technological one.

(Dean, Desai et al. 1994) Regarding agricultural growth and development that is sustainable, it has been suggested that interest rates be lowered, especially in economically underdeveloped areas. According to Acharya (1993), the growth rate of oilseed production from 1981–1982 to 1991–1992 at 5.83 a was significantly higher than that of cereal, wheat, and rice during the post–green revolution period. It is important to note that the improvement in yield per hectare has made a significant contribution to the growth of production. During the 1980s, mustard yield increased at a faster rate than wheat or rice during the 1970s or 1980s.

(Kanta Kaushik 1993) it was observed that during the pre-green revolution period (1949–1950 to 1964–1965), the increase in production of oilseeds in general and groundnut, in particular, was primarily due to the increase in the area rather than due to the increase in productivity, whereas the situation has changed during the post–green revolution period (1991-92). The rise in productivity is the main cause of the growth in oilseed production. The productivity growth rates for groundnut rappelled mustard, and all oilseeds were 0.91, 3.09, and 1.96 p.p., respectively, whereas the growth was only.

(Malik 1994) It has been noted that the development strategies followed as a whole are based on insufficient information about the social value of production; as a result, even unwittingly, the development policies themselves have frequently been accountable for supporting unsustainable patterns of development.

(Bhalla 1995) observed that with the use of new technology, Eastern Uttar Pradesh was further expanded into Punjab and Haryana. The main region producing more output is still the North Western United States. Because of its developed infrastructure, the northwestern region must continue to make efforts to increase incremental output. The production of food grains has given this area a district comparative advantage, and it has the potential to produce even more food due to Eastern Uttar Pradesh's vast potential for increased productivity. The policy of switching from high-productivity cereals to oilseeds in this region by offering substantial discounts on the latter's price will only result in resource misallocation and is misguided.

(Sengupta 1995) An interest rate policy with only two components was recommended by research on the effects of India's banking sector and economic reforms, a maximum on the interest rate for lenders and a floor on the interest rate for deposits, both of which must be met before they may be finished. The author underlined that the biggest threat to liberalization comes from poorly thought out and half-baked liberalization plans.

(Panda 1996) Examine how the new economic policy will affect agricultural credit because it has been shown through an investment that a decrease in commercial bank lending to agriculture in response to the new economic policy and the recommendations of the Churro Committee and Narasinghan may result in a decrease in farm investment and impede agricultural growth. As a result, any reduction in commercial bank lending to agriculture should be a farm- and region-specific. It should be demanded of the wealthier areas and farms to provide a larger portion of

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their resources to the agricultural industry. Commercial banks should also have a lenient credit policy toward less developed areas.

(Maheshwari 1998) To provide a more complete view of trends, researchers looked at agricultural growth in Karnataka throughout various periods and published estimates of growth rates. They discovered that the yield improvements brought on by HYV seeds in Karnataka were not particularly innovative. Before the "green revolution," there was expansion, which persisted from 1967–1968 through 1979–1980. However, there was a qualitative distinction. The gross irrigated area increased by 3.10% annually from 1955–1956 to 1966–1967, with the first trend break being notable at a 1% level. On the other hand, the average amount of fertilizer used per acre increased from 2.22 kg from 1955–1956 to 1966–1967 to 19.08 kg from 1967–1968 to 1979–80 to 47.38 kg from 1980–81 to 1989–90. Accordingly, irrigation was responsible for growth from 1955–1956 to 1966–1967, but HYV seeds and chemical fertilizers were responsible for growth from 1966–1967 to 1978–1980.

Result and Discussion

Table 1: Growth Rates of GDP of Agriculture Sector and GDP of the Economy, 1981–82 to 2013–14

Periods	Growth Rate of Agriculture	GDP Growth rate
1981–82 to 1989–90	2.9	4.7
1990–91 to 1999–00	2.8	5.3
2000–01 to 2009–10	2.4	6.8
2010–11 to 2013–14	2.1	3.7
2016-17	6.3	8.6
2019-20	2.8	3.74
2020-21	3,6	7.3
2021-22	3.9	6.5

Source: Handbook of Statistics, Reserve Bank of India, various years

Table 1 demonstrates that since India's economic reforms began, the growth rate of the agricultural sector's gross domestic product (GDP) has slowed. Except for the two years between 2010–11 and 2013–14, GDP growth rates have increased across this period. The table illustrates the growing difference between India's economies and agriculture's GDP growth rates, demonstrating that agriculture's role in the country's development path is decreasing.

Table 2: Share of Output from Agriculture in GDP, 1981–82 to 2000-2022 %

Years	Share
1981–82	29.6
1989–90	25.2
1994–95	23.5
1999–2000	19.6
2004–05	16

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2009–10	12.3
2013–14	11.8
2015-16	15
2018-19	17.6
2019-20	18.4
2020-21	20.2

Source: Handbook of Statistics, Reserve Bank of India, various years

Consistently falling agricultural GDP share is another indicator of agriculture's declining contribution to the economy. According to Table 2, between 1989–1990 and 2013–2014, the proportion of agricultural output in the GDP decreased by 50%. This decline started in the 1980s, but it increased in the 1990s and the 2000s, the start of the new millennium. This demonstrates that as India's reforms begin, the agricultural sector is rapidly losing its significance as a source of income.

Table 3(A): Growth Rate of Area, Production, and Yield of Major Crops, 1981–82 to 1999-2000

Crops	1981–82 to 1989–90			1990–91 to 1999–2000		
	Area	Production	Yield	Area	Production	Yield
Foodgrains	0.2	2.8	3.02	-0.37	1.75	2.13
Rice	0.39	3.66	3.25	0.56	1.9	1.33
Wheat	0.66	3.23	2.55	1.3	3.31	1.99
Coarse cereals	-1.31	1.25	2.58	-2.1	-0.75	1.4
Total cereals	-0.2	2.95	3.15	-0.12	1.94	2.05
Pulses	-0.2	1.24	1.43	-1.53	-0.6	0.94
Oilseeds	2.1	3.81	1.67	0.05	1.07	1.02
Groundnut	1.78	1.29	-0.49	-1.88	-3.51	-1.64
Rapeseed and mustard	1.36	6.31	4.9	0.42	1	0.6
Soyabean	18.73	20	0.87	9.28	10.54	1.15
Cotton	-0.52	4.2	4.75	1.59	1.6	0
Sugar cane	0.84	2.14	1.31	1.35	2.19	0.82

Source: Computed from the Handbook of Statistics, Reserve Bank of India, various years.

Table 3(B): Growth Rate of Area, Production, and Yield of Major Crops, 2000–01 to 2020–22

Crops	2000–01 to 2009–10			2010–11 to 2014–15		
	Area	Production	Yield	Area	Production	Yield
Foodgrains	0.02	1.03	1.01	-0.75	0.66	1.4
Rice	-0.64	0.47	1.12	0.46	1.77	1.31
Wheat	1.01	1.49	0.47	1.27	0.47	-0.7
Coarse cereals	-0.88	0.77	1.67	-3.15	-0.77	2.46
Total cereals	-0.26	0.9	1.19	-0.26	0.8	1.07

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Pulses	1.35	2.85	1.47	-2.63	-0.12	1.5
Oilseeds	1.32	3.04	1.69	-1.12	-3.85	-2.76
Groundnut	-1.78	-1.6	0.14	-4.35	-4.5	-0.16
Rapeseed and mustard	2.24	4.66	2.38	-3.45	-5.06	-1.67
Soybean	4.25	6.55	2.22	2.93	-3.73	-6.47
Cotton	1.73	9.7	7.8	3.07	1.46	-1.6
Sugar cane	-0.33	-0.12	0.2	1.04	0.97	-0.06

Source: Computed from the Handbook of Statistics, Reserve Bank of India, various years.

The approach paper for the Eleventh Plan (Planning Commission, 2006) underlined expectations for the performance of the agricultural sector, but these expectations have not been met. Table 3 demonstrates that, compared to the 1980s, the growth rates of output and yield of the majority of the key crops have decreased in the years since the start of economic reforms. The growth rates of production and yield for pulses and cotton (2000-01 to 2009-10) have increased, and for sugar cane and wheat (1990-91 to 1999-2000), whose production increased very slightly compared to the 1980s. Foodgrain output increased between 1981–1982 and 2014–2015, mostly as a result of the yield's growth rate. The 1980s, the second phase of the green revolution, saw the highest growth rates in the yield of food grains during the study period. Since the 1990s, rice and wheat have accounted for the majority of the expansion in foodgrain output. The extension of the area under cultivation was a major factor in the increasing rate of wheat output, which has been more significant since 2000–2001With the implementation of reforms, there has been a sharper drop in the area planted with wheat in all of the sub-periods between 1981–82 and 2014–15.

One could argue that the increase in the area planted with wheat and rice has been at the expense of wheat. Due to growth in the yield rate that was observed in each of the sub-periods, the fall in the area of grain wheat cultivation did not result in a sharp decline in production. The adoption of the new seed technology, according to Dev and Pandey (2013: 82), can be substantially blamed for the increase in the yield rate of small grains. The government's drive to modernize technology as part of the Technological Mission on Oilseeds and quantitative import limits led to a significant increase in oilseed output in the late 1980s and early 1990s. There was a dramatic decrease in the area under cultivation and production of oilseeds as a result of an increase in imports as part of trade liberalization measures. This is evident from Table 3, which shows that, when compared to the decade before, the expansion of the area under cultivation and the growth rate of oilseed yield both significantly decreased in the 1990s. During 2000, there was a growth in area and production due to the reinstatement of import levies on oilseed imports in 2001 and more favorable prices on the domestic market (Ramachandran 2011). In 2010–2011, import taxes on crude edible oil were abolished after reaching a peak of 75% in 2004. Domestic producers of oilseeds were negatively impacted by this.

Table 3 displays the decrease in acreage, production, and yield of various oilseed types from 2010–11 to 2014–15. (Sharma 2013). Cotton has experienced the fastest rate of increase in the post-reform era, specifically between 2000-01 and 2009-10, of all the key crops examined in Table 3. According to cotton production trends, increases in yield were the primary drivers of output growth in the 1980s and 2000s, whereas increases in area under cultivation were mostly to

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blame for output growth in other periods. The implementation of BT cotton technology in cotton-growing regions of India was the cause of the sharp gains in yield rate between 2000-01 and 2009-10. Between 2010–11 and 2014–15, cotton production and yield rate increase both decreased. It was stated that cotton production was unprofitable because of the high costs and dangers connected with BT cotton technology, especially for subsistence farmers in low-yield areas. Additionally, even with the introduction of Bt cotton, greater pesticide use meant that pests (such as bollworms) that were not serious problems in Indian kinds of cotton began to negatively affect cotton yield rates (Gutierrez et al 2015).

Agricultural Growth Influenced by Non-Price Factors

Capital formation in agriculture: The long-term growth potential of agriculture must be increased through capital generation.

Table 4: Capital Formation in Agriculture, 1981–82 to 2020-2022

Year	Public Investment	Private investment	Total
1981–82	12,723	11,549	24,272
1982–83	12,665	13,467	26,132
1983–84	12,962	14,816	27,778
1984–85	12,488	12,938	25,426
1985–86	11,248	12,960	24,208
1986–87	10,667	13,051	23,719
1987–88	10,981	17,816	28,797
1988–89	10,302	15,564	25,866
1989–90	8,909	17,132	26,041
1990–91	8,938	29,116	38,054
1991–92	7,901	16,634	24,535
1992–93	8,167	22,862	31,030
1993–94	8,907	19,230	28,137
1994–95	9,706	17,183	26,890
1995–96	9,560	17,777	27,336
1996–97	9,225	20,589	29,814
1997–98	7,812	24,692	32,504
1998–99	7,949	24,956	32,905
1999–20	8,668	41,483	50,151
2000–01	8,085	37,395	45,480
2001–02	9,712	47,266	56,978
2002–03	8,734	46,934	55,668
2003–04	10,805	42,737	53,542
2004–05	16,187	38,309	54,496
2005–06	19,940	42,629	62,569
2006–07	22,987	44,167	67,154
2007–08	23,257	52,745	76,002

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2008–09	20,572	68,137	88,709
2009–10	22,693	70,640	93,333
2010–11	19,854	72,181	92,035
2011–12	21,184	86,958	1,08,142
2012–13	23,886	88,371	1,12,257
2013–14	23,191	72,446	95,637
2014-15	47,319	2,84,545	3,31,863
2015-16	56,167	2,42,388	2,98,555
2016-17	66,863	2,82,628	3,49,491
2017-18	78,989	2,87,112	3,66,101
2018-19			
2019-20			
202-21			

Source: Planning Commission of India and Agricultural Statistics

According to Chand and Kumar (2004), public capital formation has a long-term positive influence on agriculture as opposed to subsidies, which have a short-term positive impact. They calculated that over 58 years, every rupee spent on public sector capital formation increases agriculture's GDP by 35.21. They argued that shifting 1% of funds from subsidies to public investment increases output by more than 2% and is highly desired to ensure that the GDP of agriculture grows (2004: 5611–16). Table 4 displays the trend of total capital formation in agriculture from 1981–1982. According to Table 4, overall capital formation stayed flat in the 1980s. Public and private capital formations took different paths. Public capital creation continued to decline well into the 1990s, and it wasn't until 2004–05 that public investment levels surpassed those of 1981–1982. The 1990s saw private investment grow more quickly than governmental investment, which was crucial to the decade's increase in total investment. Between 2004–2005 and 2012–2013, both public and private investments expanded, but the former did so more quickly. Over the three decades between 1981–1982 and 2012–2013, private investment nearly doubled while governmental investment increased by double. Public capital formation made for 21% of all capital formation in agriculture in 2012–13, down from 52% in 1981–82.

Table 5: Productivity of Irrigation for Food grains in Indian Agriculture (growth rates in %)

Year	**1981–82 to 1989–90**	**1990–91 to 1999–2000**	**2000–01 to 2009–10**	**2010–11 to 2012–13**	**2019-20 t0 2020-21**
The growth rate of gross irrigated area	2.07	2.28	1.11	1.36	1.38
The growth rate of output of food grains	2.8	1.75	1.03	0.66	0.86
Productivity of irrigation	0.73	-0.53	-0.08	-0.7	-0.7

Source: Computed from the Handbook of Statistics, Reserve Bank of India, various years.

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Public and private capital formation and participation in the production processes differ in nature, with the former typically taking the form of public assets like irrigation systems and road networks. These won't be funded by private money. Therefore, the growth in private investment in agriculture does not properly make up for the fall in public capital creation until 2004–2005 in terms of contribution to the production process (Balakrishnan et al 2008). 90% of the gross capital formation in agriculture in India is attributable to irrigation. Table 5 displays irrigation productivity for food grains in Indian agriculture. It was suggested that increasing the irrigated area under food grains was mostly responsible for increasing the production of food grains. As a result, increasing the production of food grains relative to increasing irrigation is a useful indicator of changes in the productivity of irrigation water (Rao 2002). Table 5 demonstrates that the 1980s saw the peak of irrigation productivity. It was a time when the green revolution was widespread, encompassing rice-growing areas in eastern India. Compared to the 1980s, the growth rate of the irrigated area somewhat increased in the 1990s; however, the output of food grains decreased during this time. The decline in irrigation productivity in the 1990s was brought on by a slowdown in the development of technology that could increase yields, such as the growing of crops that could withstand drought. The decrease in public spending on research is directly responsible for this momentum loss. Additionally, a significant factor in the 1990s productivity decline of irrigation was the political economy of irrigation from groundwater sources. Rao stated that "there was a substantial fall in agricultural growth in east UP due to severe cuts in the availability of power for pumping water, which was shifted to the west UP to appease the powerful agriculture lobby" (2002: 1743). In comparison to the decades before, the growth rates of gross irrigated area and productivity drastically decreased from 2000 to 2001.

Although it is well known in policy circles that a reliable supply of water is essential for strong agricultural growth, the government's reaction in terms of allocating resources for the expansion of irrigation systems in India has been insufficient.

Table 6: Share of Outlays on Irrigation and Flood Control in GDP (%)

Year	Share
1981–82	1.4
1990–91	0.7
1995–96	0.7
2000–01	0.7
2005–06	0.8
2011–12	0.6
2013–14	0.6
2019-20	0.8

Source: Computed from the Economic Survey of India, various years.

Table 6 charts the reduction in the GDP share of expenditures on irrigation from the already low levels in the 1980s over time. Given the growth in GDP over this period, less money is being used to improve the facilities for an input that is essential for the expansion of agriculture. The

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declining ratio indicates that the policy declarations about irrigation funding were not put into action.

Research and extension services: The government must take the lead in funding these endeavors because they are public goods that are vulnerable to market failures. In a study on the productivity of Indian agriculture conducted between 1953 and 1971 in 15 Indian states, Mohan (1974) argued that the states with the biggest productivity gains during this time had higher research intensity than the others.

Table 7: Public Expenditure on Research and Extension in Agriculture and Allied Sector as Share of GDP of Agriculture and Allied Activities

Year	Research and Education	Extension
1960–62	0.21	0.09
1970–72	0.23	0.14
1980–82	0.39	0.11
1989–91	0.41	0.16
1992–94	0.40	0.15
1995–97	0.38	0.14
1998–2000	0.44	0.15
2001–03	0.52	0.13
2004–06	0.52	0.13
2009–10	0.30	0.06
2011-12	0.32	0.05
2016-18	0.32	0.06
20219-20	0.35	0.07

Source: Finance Accounts, Comptroller, and Auditor General of India.

As a percentage of the GDP of agriculture and related sectors, Table 7 indicates public spending on research and extension in the agricultural and allied industry**.** It demonstrates that public spending on research and extension as a percentage of the GDP of agricultural and related activities has been low during the 1960s and throughout the following decades. In other words, public funding for agricultural extension and research did not rise following reforms.

Table 8: Selected Agricultural Commodities' Annual International Prices, 1981 to 2020

Period	1981	1986	1991	1995	2000	2005	2010	2015	2020
Commodities									
Wheat, US	178	115	129	179	119	158	243	232	245
Wheat, Argentina	191	89	100	167	120	131	253	226	236
Rice, Thailand	483	210	314	322	204	288	521	380	404
Sugar (cents/pound)	9	6	9	13	8	10	21	13	16
Soyabean, US	288	209	240	259	212	275	450	390	430

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Soyabean oil, The Netherlands	507	343	454	625	338	544	1,005	757	800
Sunflower oil, EU	639	366	474	693	392	677	1,074	846	1090
Groundnut oil, The Netherlands	1, 043	570	895	991	714	1,060	1,404	1,337	1678
Cotton, Egypt (cents/pound)	155	147	226	NA	109	101	170	NA	N/A
Cotton, US (cents/pound)	89	57	82	104	66	66 59	103	75	85

Prices of sugar and cotton are in US cents/pound, the rest are in US dollars/tonne. Source: United Nations Conference on Trade and Development.

Increased exposure to price fluctuations from trading more agricultural commodities will put the livelihood security of significant portions of the population in rural areas at risk in India, where nearly 91% of households are marginal, small, or medium farmers who cultivate on less than 2 hectares (5 acres) of land. In a 2005–2007 survey of eight villages in various Indian states, it was found that a sizable fraction of households in villages with various agroecological settings and cropping patterns had negative earnings, primarily as a result of losses sustained during the production of crops. This indicates the significant danger to agriculture's ability to generate income (Swaminathan and Rawal 2011).

Conclusion

It was argued that with the start of reforms in 1991–1992, there would be a decrease in the bias against agriculture, a change in the terms of trade in its favor, and pricing incentives that would encourage producers to boost production. As a result, the farmers would be able to purchase machinery and farm equipment that would boost the productivity of the land and increase the surplus from the cultivation of crops that can be plowed back to make long-term improvements on the property. Contrary to expectations, the agriculture industry did not fare particularly well in the post-reform era when compared to the era before the reform. The importance of agriculture as a source of revenue has decreased, along with growth rates for the sector as a whole and the main crops are grown in India. However, the industry continues to be India's primary employer. This suggests that the gap between the income generated by agriculture and other industries, particularly services, has widened. The 1990s saw no improvement in the share of agriculture in gross capital creation, with the public capital formation in agriculture suffering the highest losses. The post-reform period has seen a drop in the share of expenditures in GDP and productivity for irrigation, which follows a similar pattern. After the reforms, there was no improvement in trading terms for agriculture as anticipated. Additionally, home producers are now more vulnerable to the fluctuations in global agricultural commodity prices, which have rendered agriculture an unprofitable profession. Studies conducted in various regions of India also revealed that a sizeable fraction of households were experiencing a loss of income from crop output. Following reforms, neither the terms of trade have changed much in favor of agriculture, nor have cultivators benefited from increased exposure to global markets and pricing.

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Policy Implications

- It is extremely concerning that the majority of crops have experienced a post-reform drop in yield growth rates. In the years following the reform, agriculture's expansion was no longer driven by technology. The green revolution, which increased agricultural crop productivity, appears to be losing steam.
- The process of economic reforms and India's agriculture's gradual opening up to the global market has improved the terms of trade and the environment for agriculture. To take full advantage of this opportunity, significant reforms in the supply-side factors of technology, fertilizers, irrigation, infrastructure, and credit are required, in addition, to the complete removal of all export restrictions on agricultural commodities, especially food grains.
- Particularly in the field of agricultural biotechnology, it is important to foster results-oriented research, which should then be effectively disseminated to farmers through extension services.
- India needs to encourage contract farming and regulate the land leasing process. Small and marginal farmers would greatly profit from contract farming by having access to high-quality technological inputs, guaranteed prices, and market support that would support farmer income growth, agricultural value addition, and agricultural diversification.
- Accelerating the reform process for agriculture is important, and all stakeholders must be fully involved. The only way to do this is to increase their level of confidence and involve them in the reformation process.
- To maintain its position in international trade and the national reform process, the state must make an effort to establish incentives and disincentives.
- Infrastructure development must be completed quickly, efficiently, and completely. It consists of fundamental rural infrastructures (road, electricity, communication, etc).
- Investment in technologies targeted at small farmers, innovative agricultural techniques, and collaborative intervention programs. Improve the efficiency and accountability of the service delivery system by using a more public-private model.

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