



ORIGINAL RESEARCH PAPER

Agricultural Economics

A STUDY OF CROPPING PATTERNS AND AGRICULTURAL PRODUCTION IN INDIA

KEY WORDS:

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ABSTRACT

Agriculture is an important economic activity in India. Agricultural patterns are affected by rainfall, weather conditions, soil characteristics, availability of irrigation, credit and technical knowledge. Present study is undertaken to understand cropping pattern characteristics of important agricultural crops. Agricultural growth has occurred less through expansion of cultivated land and more through increased productivity, irrigation, multiple cropping, technological improvements, and greater use of agricultural inputs. The Net Sown Area remained almost stable, while the Gross Sown Area increased, indicating greater cropping intensity. Food-grain production shows a strong long-term upward trend. Total food-grain production increased from 508 lakh tonnes in 1950–51 to 3,766 lakh tonnes in 2025–26. Rice and wheat remained the principal contributors to food-grain production, while coarse cereals and pulses also recorded considerable increases.

INTRODUCTION:

India is characterized by considerable geographical and climatic diversity. From the Himalayan region in the north to the tropical peninsula in the south, agricultural practices vary according to rainfall, temperature, soil characteristics, irrigation availability, and socio-economic conditions. Agriculture therefore exhibits refers to the proportion of agricultural land devoted to different crops during a particular period. It reflects the interaction of physical, economic, technological, and institutional factors. In India, cropping patterns have evolved over time in response to population growth, food requirements, market prices, irrigation development, technological changes, substantial regional variation in both the types of crops cultivated and the intensity with which land is used.

A cropping pattern refers to the proportion of agricultural land devoted to different crops during a particular period. It reflects the interaction of physical, economic, technological, and institutional factors. Agricultural production, meanwhile, refers to the quantity and value of crops and other agricultural commodities produced. Changes in cropping patterns can significantly influence production.

India is the second largest producer of wheat and rice. As per the 2010, Food and Agriculture Report, India is the world's largest producer of many fresh fruits, vegetables, fibrous crops such as Jute, staples such as millets and costar oil seeds. It is said that India exported \$ 39 billion worth of agricultural products at the value of 2013. The improvement in irrigation infrastructure in the last decades have supported India to make an improvement in food security, to reduce dependence on monsoons, to improve agricultural productivity and to create new job opportunity in rural areas (Rinku, 2018). Compared to other countries, India has achieved remarkable progress in the production of agricultural crops. Despite the challenges such as micro and macro environmental conditions and certain government policies, the production of various crops has shown an upward trend (Krishnegowda B S, 2024). Multiplicity of cropping systems has been one of main features of Indian agriculture and it is attributed to rainfed agriculture and prevailing socio-economic situations of farming community (P Das, 2004).

Agricultural Profile of India:

Agriculture has historically been a major component of India's economy. Economic Survey says that the Indian agriculture sector provides livelihood support to about 42.3 per cent of the population and has a share of 18.2 per cent in the country's GDP at current prices (Economic Survey (2023-24). India's agricultural diversity results largely from

variations in climate and physical geography. Paddy and wheat are the most important staple food crops in India in Asia. More than 90% of the world's paddy is grown and consumed in Asia, where 60% of the world's population lives. The area under paddy in India was reported 43.95 million hectares with the total production of 106.54 million tonnes, while productivity was recorded 24.249 quintal per hectare (Mishra & et.al, 2017). The country contains tropical, subtropical, temperate, arid, and semi-arid agricultural environments. The major factors influencing agricultural production and cropping pattern include:

- **Rainfall:** The monsoon is a major determinant of agricultural activity, particularly in rain-fed regions.
- **Temperature:** Different crops require different temperature ranges.
- **Soil:** Alluvial, black, red, laterite, desert, and other soils support different crops.
- **Topography:** Plains, plateaus, hills, and coastal areas have distinct agricultural systems.
- **Irrigation:** Canals, wells, tube wells, reservoirs, and micro-irrigation reduce dependence on rainfall.

Table.1 States/Regions Producing Important Agricultural Crops

Food Crops	Major Producing Regions/States
Rice	West Bengal, Uttar Pradesh, Punjab, Odisha, Telangana, Andhra Pradesh, Chhattisgarh, Tamil Nadu
Wheat	Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, Rajasthan, Bihar
Maize	Karnataka, Madhya Pradesh, Bihar, Maharashtra, Telangana
Millets	Rajasthan, Karnataka, Maharashtra, Haryana, Uttar Pradesh
Barley	Rajasthan, Uttar Pradesh, Haryana, Punjab, Madhya Pradesh
Pulses	
Gram (Chickpea)	Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka
Pigeon Pea (Tur/Arhar)	Maharashtra, Karnataka, Madhya Pradesh, Uttar Pradesh, Gujarat
Lentil (Masur)	Madhya Pradesh, Uttar Pradesh, Bihar, Rajasthan
Moong (Green Gram)	Rajasthan, Maharashtra, Karnataka, Madhya Pradesh
Urad (Black Gram)	Madhya Pradesh, Uttar Pradesh, Rajasthan, Tamil Nadu, Maharashtra
Oilseeds	

Soybean	Madhya Pradesh, Maharashtra, Rajasthan
Groundnut	Gujarat, Rajasthan, Andhra Pradesh, Tamil Nadu, Karnataka
Rapeseed-Mustard	Rajasthan, Haryana, Uttar Pradesh, Madhya Pradesh, West Bengal
Sunflower	Karnataka, Maharashtra, Telangana, Haryana
Sesame	Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, West Bengal
Safflower	Maharashtra, Karnataka, Telangana
Commercial Crops	
Cotton	Gujarat, Maharashtra, Telangana, Karnataka, Rajasthan, Madhya Pradesh
Sugarcane	Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Gujarat, Bihar
Jute	West Bengal, Bihar, Assam, Odisha
Tobacco	Andhra Pradesh, Karnataka, Gujarat, Telangana, Uttar Pradesh
Tea	Assam, West Bengal, Tamil Nadu, Kerala, Karnataka

Source: Ministry of Agriculture & Farmers Welfare, Government of India

The major crops of India are grown in different regions according to climate, soil, rainfall, irrigation, and topography. Rice is mainly cultivated in West Bengal, Uttar Pradesh, Punjab, Odisha, Chhattisgarh, Telangana, Andhra Pradesh, and Tamil Nadu, while wheat is concentrated in Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, Rajasthan, and Bihar.

Maize is widely grown in Karnataka, Madhya Pradesh, Bihar, Maharashtra, Telangana, and Andhra Pradesh, whereas millets are important in Rajasthan, Karnataka, Maharashtra, Haryana, and Gujarat (Table.1). Similarly, Pulses such as gram, pigeon pea, lentil, moong, and urad are cultivated mainly in Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, and Bihar.

Major oilseeds are grown across several regions, with soybean concentrated in Madhya Pradesh and Maharashtra, groundnut in Gujarat, Rajasthan, Andhra Pradesh, Tamil Nadu, and Karnataka, and rapeseed-mustard mainly in Rajasthan, Haryana, Uttar Pradesh, Madhya Pradesh, and West Bengal. Commercial crops also have distinct regional concentrations: cotton is important in Gujarat, Maharashtra, Telangana, Karnataka, Rajasthan, and Madhya Pradesh; sugarcane in Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, and Gujarat; jute mainly in West Bengal, Bihar, Assam, and Odisha; and tea in Assam, West Bengal, Tamil Nadu, and Kerala.

Objectives and Methodology of the Study:

Present study is undertaken to examine the characteristics of cropping patterns in India. This study is primarily based on secondary information. The study is aimed to examine trends and changes in agricultural production. Data is collected from the Reports of Ministry of Agriculture and Farmers Welfare, and Directorate of Economics and Statistics, Government of India. The study uses a descriptive and analytical approach. Agricultural patterns are examined through factors such as irrigation, cropping intensity, and use of fertilizers and pesticides.

Results and Discussions:

Food grains are a fundamental part of Indian agriculture and play an important role in the country's food security, economy, employment, and rural livelihoods. The major food grains include rice, wheat, maize, millets, and other cereals. Food grains also provide carbohydrates, energy, proteins, minerals, and other nutrients. Millets in particular are recognized for their nutritional value and can contribute to dietary diversity. Moreover, given India's Socio-economic picture in mind, maintaining adequate and sustainable food-

grain production remains an important objective of Indian agricultural development.

Table.2 Pattern of Land Use and Select Inputs for Agricultural Production (1980-81 to 2024-25)

Year	Net Sown Area	Gross Sown Area	Net Irrigated Area	Gross Irrigated Area	Area under High Yielding Varieties	Consumption of Fertilisers (N+P+K) (lakh tonnes)	Consumption of Pesticides (Technical Grade Material) ('000 tonnes)
1980-81	1,400.0	1,726.3	387.2	497.8	430.8	55.2	45.00
1981-82	1,419.3	1,767.5	405.0	514.1	464.9	60.6	47.00
1982-83	1,402.2	1,727.5	406.9	518.3	474.9	63.9	50.00
1983-84	1,428.4	1,795.6	419.5	538.2	537.4	77.1	55.00
1984-85	1,408.9	1,763.3	421.5	545.3	541.4	82.1	56.00
1985-86	1,409.0	1,784.6	418.7	542.8	554.2	84.7	52.00
1986-87	1,395.8	1,764.1	425.7	557.6	561.7	86.5	50.00
1987-88	1,340.9	1,707.4	428.9	560.4	541.0	87.8	66.90
1988-89	1,418.9	1,822.8	461.5	611.3	601.1	110.4	75.89
1989-90	1,423.4	1,822.7	467.0	618.5	611.7	115.7	72.00
1990-91	1,430.0	1,857.4	480.2	632.0	649.8	125.5	75.00
1991-92	1,416.3	1,822.4	498.7	656.8	647.1	127.3	72.13
1992-93	1,427.2	1,857.0	502.9	667.6	654.0	121.6	70.79
1993-94	1,423.4	1,865.8	513.4	682.6	669.9	123.7	63.65
1994-95	1,429.6	1,880.5	530.0	706.5	709.3	135.6	61.36
1995-96	1,422.0	1,874.7	534.0	713.5	721.1	138.8	61.26
1996-97	1,429.3	1,895.0	551.1	760.3	764.0	143.1	56.11
1997-98	1,419.5	1,899.9	552.1	756.7	760.0	161.9	52.24
1998-99	1,427.5	1,916.5	574.4	786.7	783.5	168.0	49.16
1999-00	1,410.6	1,884.0	575.3	792.2	-	180.7	46.20
2000-01	1,413.4	1,853.4	552.0	761.9	-	167.0	43.58
2001-02	1,407.3	1,880.1	569.4	783.7	-	173.6	47.02
2002-03	1,319.4	1,738.9	539.0	730.6	-	160.9	48.30
2003-04	1,407.1	1,896.6	570.6	780.4	-	168.0	41.00
2004-05	1,406.4	1,911.0	592.3	810.8	-	184.0	40.67
2005-06	1,411.6	1,927.4	608.4	842.8	-	203.4	39.77
2006-07	1,398.2	1,923.8	627.4	867.5	-	216.5	43.40
2007-08	1,410.2	1,952.2	631.9	880.6	-	225.7	41.60
2008-09	1,419.0	1,953.3	636.4	889.0	-	249.1	43.86
2009-10	1,391.7	1,891.9	619.5	850.9	-	264.9	41.82
2010-11	1,413.7	1,981.3	638.7	893.2	-	281.2	55.50
2011-12	1,407.9	1,955.5	660.1	919.3	-	277.9	52.98
2012-13	1,397.5	1,944.6	665.9	927.8	-	255.4	45.62
2013-14	1,412.4	2,013.0	684.2	962.7	-	244.8	60.28
2014-15	1,394.5	1,982.8	685.8	978.5	-	255.8	56.27
2015-16	1,389.7	1,981.2	677.7	977.5	-	267.5	56.72
2016-17	1,390.0	2,011.6	692.7	996.2	-	259.5	58.63
2017-18	1,387.7	2,008.8	701.6	1,014.7	-	265.9	63.41
2018-19	1,384.4	2,011.8	722.4	1,047.1	-	273.8	59.67
2019-20	1,399.0	2,113.6	754.7	1,124.4	-	293.7	61.70
2020-21	1,415.4	2,161.1	777.3	1,189.3	-	325.4	62.19
2021-22	1,410.1	2,191.6	779.2	1,203.8	-	298.0	69.89
2022-23	1,407.1	2,193.6	793.1	1,222.9	-	298.4	64.51
2023-24	1,391.6	2,179.2	824.2	1,305.5	-	306.4	67.96
2024-25	1,413.7	2,257.9	845.0	1,369.1	-	329.3	-
CAGR	0.02%	0.61%	1.79%	2.33%	3.38%	4.14%	0.96%

Note: Area in Lakhs Hectares, Source : Ministry of Agriculture & Farmers Welfare, Government of India.

In India, from 1980-81 to 2024-25, the Net Sown Area shows almost no long-term growth, increasing only from 1,400.0 to 1,413.7 lakh hectares, with a CAGR of just 0.02%. This indicates that India's expansion of agricultural production has not primarily resulted from bringing substantially more land under cultivation. In contrast, the Gross Sown Area increased at a CAGR of 0.61%, indicating greater use of existing

agricultural land through multiple cropping. This difference suggests an increase in cropping intensity over the period.

The most significant growth is visible in irrigation. Net Irrigated Area increased from 387.2 lakh hectares to 845 lakh hectares, recording a CAGR of 1.79%, while Gross Irrigated Area increased from 497.8 lakh hectares to 1,369.1 lakh hectares, recording a higher CAGR of 2.33%. This indicates considerable expansion in irrigation and repeated use of irrigated land. The area under High-Yielding Varieties (HYV) increased from 430.8 lakh hectares in 1980–81 to 783.5 lakh hectares in 1998–99, with a CAGR of approximately 3.38%.

Further, Fertilizer consumption recorded the highest CAGR among the indicators with a complete long-term series, increasing from 55.2 lakh tonnes to 329.3 lakh tonnes, with CAGR of 4.14% per year. This reflects the increasing use of modern agricultural inputs. Pesticide consumption increased from 45.00 thousand tonnes in 1980–81 to 67.96 thousand tonnes in 2023–24, giving a CAGR of approximately 0.96%. In total, it can be said that India's agricultural development has been driven more by increased irrigation, multiple cropping, improved technology, and greater input use than by expansion of the net cultivated area.

From the Figure.1, the long-term growth of food-grain production in India from 1950–51 to 2025–26 is depicted. The Overall, total food-grain production increased from 508 lakh Tonnes in 1950–51 to 3,766 Lakh Tonnes in 2025–26, indicating substantial growth over the period. Rice production rose from 206 Lakh Tonnes to 1,540 Lakh Tonnes, while wheat increased from 65 Lakh Tonnes to 1,207 Lakh Tonnes. Coarse cereals also increased from 154 Lakh Tonnes to 745 Lakh Tonnes, although their production fluctuated considerably across different years. Pulses increased from 84 Lakh Tonnes to 274 Lakh Tonnes, but their growth was slower and more variable than that of cereals.

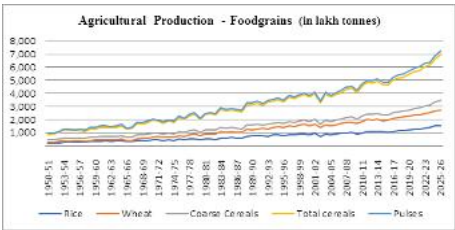
Food production in India has increased substantially since independence, supported by expansion of irrigation, improved seeds, fertilizers, mechanization, agricultural research, and improved farming practices. Food-grain production is particularly important because cereals and pulses form the foundation of India's food-security system. A major turning point can be observed during the late 1960s and 1970s, corresponding with the expansion of the Green Revolution and the adoption of improved seeds, irrigation, fertilizers, and modern farming practices. Wheat production increased particularly rapidly, rising from 123 Lakh Tonnes in

1964–65 to 165 Lakh Tonnes in 1967–68, and subsequently reaching 318 Lakh Tonnes by 1977–78. Rice production also expanded substantially during this period. Although production experienced fluctuations in years affected by drought and other conditions, the overall trend remained upward. By 2000–01, total food-grain production had reached 1,968 Lakh Tonnes, almost four times the level recorded in 1950–51 (Figure.1).

The period after 2000–01 shows another substantial expansion in agricultural production. Total food grains increased from 1,968 Lakh Tonnes in 2000–01 to 3,766 Lakh Tonnes in 2025–26. Rice reached 1,502 Lakh Tonnes, wheat 1,179 Lakh Tonnes, coarse cereals 745 Lakh Tonnes, and pulses 274 Lakh Tonnes by 2025–26. The particularly strong growth in coarse cereals in the later years is notable, increasing from 311 Lakh Tonnes in 2000–01 to 745 in 2025–26.

It is observed that India's transition from relatively low food-grain production in the early post-independence period to much higher production in recent decades, while also showing that agricultural output has experienced periodic fluctuations due to factors such as weather conditions, water availability, and changes in agricultural practices. Moreover, the increase has not been uniform every year. Production has fluctuated because of monsoon conditions, droughts, floods, temperature variations, and other agricultural factors. Nevertheless, the long-term trend has been upward (Figure.1)

Figure.1 Food Grains Production in India (1950-51 to 2015-26)



Note: Data for 2025-26 are based on Third Advance Estimates

Source: Ministry of Agriculture & Farmers Welfare, Government of India.

Table.3 Agricultural Production - Major Commercial Crops from 1980-81 to 2024-25 (in Lakh Tonnes)

Year	Groundnut	Rapeseed & Mustard	Soyabean	Coffee	Cotton	Raw Jute & Mesta	Sugarcane	Tea	Tobacco
1980-81	50	23	4	1187	70	82	1543	5696	5
1981-82	72	24	4	1521	79	84	1864	5604	5
1982-83	53	22	5	1300	75	72	1895	5607	6
1983-84	71	26	6	1050	64	77	1741	5815	5
1984-85	64	31	10	1951	85	78	1703	6399	5
1985-86	51	27	10	1225	87	127	1707	6562	4
1986-87	59	26	9	1921	69	86	1861	6246	5
1987-88	59	35	9	1227	64	68	1967	6743	4
1988-89	97	44	16	2147	87	79	2030	7011	5
1989-90	81	41	18	1181	114	83	2256	6841	6
1990-91	75	52	26	1697	98	92	2411	7203	6
1991-92	71	59	25	1800	97	103	2540	7542	6
1992-93	86	48	34	1694	114	86	2280	7039	6
1993-94	78	53	48	2121	107	84	2297	7608	6
1994-95	81	58	39	1801	119	91	2755	7529	6
1995-96	76	60	51	2230	129	88	2811	7560	5
1996-97	86	67	54	2050	142	111	2776	7801	6
1997-98	74	47	65	2283	109	110	2795	8356	6
1998-99	90	57	71	2650	123	98	2887	8552	7
1999-00	53	58	71	2920	115	106	2993	8369	5

2000-01	64	42	53	3012	95	106	2960	8484	3
2001-02	70	51	60	3006	100	117	2972	8514	6
2002-03	41	39	47	2753	86	113	2874	8460	5
2003-04	81	63	78	2705	137	112	2339	8787	6
2004-05	68	76	69	2755	164	103	2371	9068	6
2005-06	80	81	83	2740	185	108	2812	9489	5
2006-07	49	74	89	2880	226	113	3555	9731	5
2007-08	92	58	110	2620	259	112	3482	9870	4
2008-09	72	72	99	2623	223	104	2850	9728	6
2009-10	54	66	100	2896	240	118	2923	9912	7
2010-11	83	82	127	3020	330	106	3424	9667	9
2011-12	70	66	122	3140	352	114	3610	10955	8
2012-13	47	80	147	3182	342	109	3412	11351	7
2013-14	97	79	119	3045	359	117	3521	12088	7
2014-15	74	63	104	3270	348	111	3623	11972	9
2015-16	67	68	86	3480	300	105	3484	12331	8
2016-17	75	79	132	3120	326	110	3061	12505	8
2017-18	93	84	109	3160	328	100	3799	13251	10
2018-19	67	93	133	3195	280	98	4054	13500	7
2019-20	100	91	112	2980	361	99	3705	13608	8
2020-21	102	102	126	3340	352	94	4054	12830	8
2021-22	101	120	130	3420	311	101	4394	13444	8
2022-23	103	126	150	3520	337	94	4905	13750	8
2023-24	102	133	131	3600	325	97	4532	13820	9
2024-25	119	127	153	3630	297	88	4546	13158	10
2025-26	131	138	126	3730	290	94	5001	13827	-
CAGR%	0.0216	0.0406	0.0797	0.026	0.032	0.003	0.0265	0.02	0.0159

Source : Ministry of Agriculture & Farmers Welfare, Government of India

Along with food grains- cereals and pulses, Oil seeds and commercial crops have also contributed significantly to the growth of agricultural sector in India. Table.3 presents the trends in the production of selected major commercial, oilseed, and plantation crops in India from 1980–81 to 2025–26, namely, Groundnut, Rapeseed and Mustard, Soybean, Total Oilseeds, Coffee, Cotton, Raw Jute and Mesta, Sugarcane, Tea, And Tobacco.

The oilseed sector shows considerable growth over the period. Total oilseed production increased from 94 lakh tonnes in 1980–81 to 431 lakh tonnes in 2025–26, recording a CAGR of 3.44%. Among individual oilseeds, soybean recorded the highest CAGR of 7.97%, increasing dramatically from only 4 lakh tonnes to 126 lakh tonnes. Rapeseed and mustard also grew strongly, from 23 to 138 lakh tonnes, with a CAGR of 4.06%. Groundnut increased from 50 to 131 lakh tonnes, recording a CAGR of 2.16%. The rapid expansion of soybean reflects its increasing importance as an oilseed and commercial crop in Indian agriculture.

Among the other commercial crops, sugarcane recorded substantial growth in absolute production, increasing from 1,543 lakh tonnes to 5,001 lakh tonnes, with a CAGR of 2.65%. Coffee increased from 1,187 to 3,730 lakh tonnes, recording a CAGR of 2.58%, while cotton increased from 70 to 290 lakh tonnes, with a CAGR of 3.21%. These increases reflect improvements in cultivation practices, varieties, irrigation, technology, and market demand. Tea had the largest absolute production figures in this table, increasing from 5,696 to 13,827 lakh tonnes, although its CAGR was comparatively moderate at 1.99%.

Raw jute and Mesta showed very little long-term growth, increasing from 82 to 94 lakh tonnes, resulting in the lowest CAGR of only 0.30%. Tobacco increased from 5 to 10 lakh tonnes, with a CAGR of 1.59%. Overall, India's commercial-crop production has expanded considerably since 1980–81, but growth has differed substantially across crops. Soybean recorded the fastest relative growth, while jute and mesta showed almost stagnant long-term production.

CONCLUSION:

The analysis of India's cropping pattern and agricultural production from 1950–51 to 2025–26 reveals a significant transformation in the agricultural sector. Agricultural growth has occurred less through expansion of cultivated land and more through increased productivity, irrigation, multiple cropping, technological improvements, and greater use of agricultural inputs. The Net Sown Area remained almost stable, while the Gross Sown Area increased, indicating greater cropping intensity. At the same time, substantial growth in net and gross irrigated areas demonstrates the increasing role of irrigation in reducing dependence on rainfall and supporting agricultural production.

Food-grain production shows a strong long-term upward trend. Total food-grain production increased from 508 lakh tonnes in 1950–51 to 3,766 lakh tonnes in 2025–26. Rice and wheat remained the principal contributors to food-grain production, while coarse cereals and pulses also recorded considerable increases. The major acceleration in production during the late 1960s and 1970s reflects the impact of the Green Revolution, particularly through improved varieties, irrigation, fertilizers, and modern farming practices. The continued increase after 2000–01 indicates that technological and infrastructural improvements have remained important drivers of agricultural production. The analysis of commercial and oilseed crops also reveals considerable changes in India's cropping pattern. Total oilseed production increased from 94 lakh tonnes to 431 lakh tonnes, with soybean showing the highest CAGR of 7.97%. Rapeseed and mustard and cotton also recorded relatively strong growth. Sugarcane, coffee, and tea experienced substantial increases in production, whereas raw jute and mesta showed very limited long-term growth. This indicates a gradual shift within commercial agriculture toward crops with growing domestic and industrial demand.

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