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Original Article

Population Growth and the Changing Nature of Agricultural Productivity in Chhatrapati Sambhajinagar District

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Abstract

In semi-arid areas of India population growth is one of the significant determinants of land use, employment, food requirement and agricultural transformation. Chhatrapati Sambhajinagar District is an important agricultural district of Marathwada region of Maharashtra, which was earlier known as Aurangabad District. The district has all the above stated conditions which causes rapid increase in the population, urban development, rain fed agriculture, commercialization of crops and pressure on agricultural resources. The present paper discusses the correlation between population growth and the dynamics of agricultural productivity in Chhatrapati Sambhajinagar District. The secondary data used for the study is taken from Census of India, Maharashtra State Data Bank, Government of India agricultural reports, District agricultural profiles and relevant research literature. It is argued that the population growth has not merely created a pressure on land but has also shifted the nature of agriculture from a traditional cereal-pulse system to a more market oriented and risk bearing agricultural system based on cotton, maize, horticulture and selected commercial crops. Coinciding with this, the district is also highly dependent on monsoon rains with minimum irrigation and high rainfed area. Agricultural productivity has been transformed by a combination of factors—population pressure, urban expansion, fragmentation of land, migration of labour, and shifts in market dynamics. The results indicate that post-2016 productivity growth will rely less on an increase in the number of cultivated hectares in the district and more on increasing water-use efficiency, diversifying cultivated crops, improving soil health, expanding value chains, and promoting more climate smart farming.

Keywords: *population growth, agricultural productivity, Chhatrapati Sambhajinagar, Aurangabad, Marathwada, cotton, irrigation, land use, crop diversification.*

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Introduction

Natural factors like rainfall, soil, temperature are no longer the only factors that influence agriculture in India. Population pressure, urbanisation, market access, migration, the use of technology, input prices, water availability and climate risk are increasingly influencing it. Population growth has impact on agriculture in several ways. This raises needs of food, water, shelter, jobs, and infrastructure. Concurrently, it decreases per capita land availability and may exacerbate the competition between the agricultural and non-agricultural uses of land. In these semi-arid areas, the pressures become more severe given the already high reliance on the unpredictable nature of rainfall and limited access to irrigation. Chhatrapati Sambhajinagar District of Maharashtra is an important case to study these relationships. District is a part of Marathwada region which is often referred to as drought prone, agrarian distress and rainfed agriculture. The district has black soils which are appropriate for cotton, maize, sorghum, pulses, wheat, gram and horticultural crops such as sweet orange, mango, sapota and pomegranate. Its agriculture is influenced by the monsoon as well as the availability of wells and canals etc.The agriculture is influenced by the monsoon and availability of wells, canals, tanks, bore wells and farm ponds. The district's agriculture profile states that the annual rainfall is approximately 734.3 mm with the bulk of the rainfall occurring during the southwest monsoon from June to September (Ministry of Agriculture and Farmers Welfare, n.d.).

The district has also seen a huge population increase. The Census of India provides data that reveals the population of the district has grown by approximately 27.76 percent (2,902,602 to 3,701,282) during the last 10 years (2001-2011) (Office of the Registrar General & Census Commissioner, India, 2011). The expansion has significant implications for land use, food demand, labour supply and productivity in agriculture. Population growth has not been simplistic and unidirectional in its impact on agriculture. It has added pressure on land and water, on the other hand, it has caused water scarcity. It has on the other hand prompted intensification, diversification, commercialisation and adoption of higher-value crops.The population growth and its impact on the nature of agricultural productivity in Chhatrapati Sambhajinagar District has been the subject of study in this paper. The main thesis is that the shift of the district towards agriculture is not just about productivity per hectare. It is, also, a transformation of the structure of productivity. The most important factors correlated with productivity are now related to crop selection, availability of irrigated land, market orientation, input usage, risk management, and post-harvest value addition.

Study Area

Chhatrapati Sambhajinagar District is located in Marathwada region of Maharashtra. The district was formerly called the Aurangabad District, and most of the official data, particularly Census 2011 and earlier agricultural details, remain in the names of Aurangabad. The district has been divided into several talukas including Aurangabad, Paithan, Gangapur, Vaijapur, Khuldabad, Kannad, Sillod, Phulambri, Soegaon etc. which are of importance. It is a part of the Deccan Plateau and also exists in hot semi-arid agro-ecological conditions (Ministry of Agriculture and Farmers Welfare, n.d.).

The overall geographical area of the district is around 1007.7 thousand hectares. Of this, some 812 thousand hectares are available for cultivation. The net sown area is about 654 thousand ha and gross cropped area is about 784.4 thousand ha. Cropping intensity is given as about 120 percent, meaning that a part of the land used for

agriculture is under cultivation more than once a year (Ministry of Agriculture and Farmers Welfare, n.d.). The district still, however, has a significant rainfed portion. The reported net irrigated area is around 163.3 thousand hectares, and gross irrigated area, around 200.2 thousand hectares. The area of rainfed is approximately 490.7 thousand hectares (Ministry of Agriculture and Farmers Welfare, n.d.). Major soils of the district are mainly the black soils. There are three agricultural profiles identified, deep black soils, medium deep black soils and shallow black soils. Moisture conservation is a great concern in agriculture as shallow black soils are the dominant landform in terms of geographical area (Ministry of Agriculture and Farmers Welfare, n.d.). The conditions are favorable for growing of cotton, sorghum, pearl millet, maize, pigeon pea, wheat, gram, safflower, sugarcane, and horticultural crops, although the optimum timing of the rains and availability of water greatly affects the productivity.

Objectives of the Study

The main objectives of this paper are:

1. To explore the issue of population growth in Chhatrapati Sambhajinagar District and its implications on Agricultural land and resources.
2. To study the trend in cropping pattern and productivity in the district.
3. To determine the factors and their contribution to productivity, such as demographic pressure, irrigation, rainfed condition, crop diversification and commercialisation etc.
4. To recommend steps towards uplifting district sustainable agricultural productivity.

Methodology

This study uses secondary data analysis. The population data has been sourced from Census of India and district level Demographic data. Data has been collected on Agriculture Land use, Rainfall, Irrigation, Crop Area, Agriculture Production and Productivity from Government of India Agricultural Contingency plan in Aurangabad district, Maharashtra state data bank and Area, Production and Yield data sources and recent district planning documents. The process of transition towards cotton and commercial agriculture is also explained based on published research on cropping-pattern change in Maharashtra.

The study uses descriptive analysis. It explores the changes in demography, rural-urban organization, land-use patterns in agriculture, irrigation facility, area of major crop and crop productivity. Analysis cannot prove a definite statistical relationship between population growth and productivity. Rather than by the actual relationship, it analyzes the relationship based on the observed trends of land pressure, cropping intensity, commercial crop expansion, and resource constraints.

The population growth rate in Chhatrapati Sambhajinagar District is 5%. The population growth rate in Chhatrapati Sambhajinagar District is 5%.

Agricultural transformation is greatly influenced by population growth in the district. The population of the district jumped from 2,902,602 in 2001 to 3,701,282 in 2011, resulting in an additional increase of approximately 798,680 persons over the decade (Office of the Registrar General & Census Commissioner, India, 2011). The decadal growth rate of 27.76 per cent was higher than the decadal growth rate of overall Maharashtra during the period. This indicates that there was a high demographic pressure in the district.

The district is a blend of rural and urban characteristics. In 2011, there were 43.77 percent urban and 56.23 percent rural population in the district (Office of the Registrar General & Census Commissioner, India, 2011). The balance between rural and

urban is important as agriculture is still a significant livelihood sector, but urbanisation of the area around Chhatrapati Sambhajinagar city is also putting pressure on agricultural areas. With the urban population increasing, land use around Roads, Towns, Industrial sites and Peri-urban settlements is frequently taken up for residential uses, infrastructure, business and industry.

Population growth has an impact on farming in five significant ways. First, there is an increase in food needs. Second, it reduces per capita availability of land. Third, it raises the likelihood of land fragmentation as a result of inheritance. Fourthly, it transforms labour markets as young people can move from rural to urban or industrial labor markets. Fifth, it stimulates farmers to grow crops which offer better cash income per unit area. Thus, population growth not only adds to the number of people who rely on agriculture, but shifts the rationale used for agricultural decision making.

The agricultural use of land and resource pressure:

The resource of agricultural land is limited in the district. About 654 thousand hectares of net sown area and 784.4 thousand hectares of gross cropped area are available in the district (Ministry of Agriculture and Farmers Welfare, n.d.). Net sown area is less than gross cropped area indicating multiple cropping. Multiple cropping, however, is not very high even in this relatively high cropping intensity (120 per cent) as compared with highly irrigated areas. This is largely related to reliance on rainfall and scarce availability of irrigation.

Table 1

Selected demographic and agricultural indicators of Chhatrapati Sambhajinagar District

Indicator	Value/Status	Interpretation
Population, 2001	2,902,602	Base population before rapid 2001–2011 growth
Population, 2011	3,701,282	Strong demographic expansion
Decadal population growth, 2001–2011	About 27.76%	Higher pressure on land, water, employment, and food systems
Rural population share, 2011	About 56.23%	Agriculture remains socially and economically important
Urban population share, 2011	About 43.77%	Urban expansion affects land conversion and labour mobility
Geographical area	1,007.7 thousand ha	Total district land base
Cultivable area	812 thousand ha	Large agricultural potential
Net sown area	654 thousand ha	Main cultivated land base
Gross cropped area	784.4 thousand ha	Includes area sown more than once
Cropping intensity	About 120%	Moderate intensity; scope for improvement
Net irrigated area	163.3 thousand ha	Irrigation remains limited
Rainfed area	490.7 thousand ha	Productivity remains rainfall-sensitive

Note. Data compiled from Census of India and district agricultural profile sources (Ministry of Agriculture and Farmers Welfare, n.d.; Office of the Registrar General & Census Commissioner, India, 2011).

The population growth has been adding pressure to a limited cultivated land; the figures show this. The ratio of land to people (land per person) decreases as the number of people increases. Smaller farms may result from divisions in the inheritance of rural households. Small and fragmented holdings can limit farmers' capacity to invest in irrigation, mechanisation, soil improvement and storage. They can also stimulate more intensive cultivation practices, vegetable cultivation, dairying, horticulture and other income generation activities.

The productivity is also affected by the irrigation pattern in the district. Open wells make up a significant portion of irrigation sources, followed by canals, tanks, bore wells, lift irrigation and farm ponds (Ministry of Agriculture and Farmers Welfare, n.d.). Groundwater recharge and variability of rainfall are important for wells. Groundwater availability reduces if precipitation is inadequate, and irrigation is unreliable. Population growth, thus increasing indirect pressure on groundwater as more households, farms, industries, and urban areas are competing for the same water resources.

Changing Cropping Pattern:

There has been a visible shift in the district agriculture from food crops to commercial and market-oriented crops. Sorghum, pearl millet, pulses, wheat and gram were important historically. These crops were adaptable to semi-arid climate and served food security purposes. There have been, however, developments in commercial crops, including cotton and maize, which are able to offer cash income and market opportunities. According to the district profile of agriculture, cotton, maize, pearl millet, pigeon pea, sorghum, sugarcane, wheat, gram, safflower, groundnut and sunflower are major field crops (Ministry of Agriculture and Farmers Welfare, n.d.). Cotton plays a special role due to black soils, market demand and being a cash crop. According to the research carried out in the cotton growing districts of Maharashtra, the area of cotton increased significantly from 148,167 hectares in the period 2000–01 to 495,284 hectares in the period 2017–18 in the Aurangabad District (Reddy et al., 2021). This is a significant shift in cropping pattern.

Reddy et al. (2021) reported that the area of cotton grown has expanded in 14 out of the 19 major cotton growing districts of Maharashtra. The rise was particularly high in Aurangabad. The study also revealed the expansion of cotton's acreage over crops like maize and pigeon pea in certain districts along with the stable price of cotton, stable yield and easier marketing of cotton were key factors which encouraged the farmers to grow cotton. This is significant because it indicates that agricultural productivity is not just biological productivity, but also economic productivity. A crop can be more favored by the farmer not only for the highest physical production, but also for the most consistent cash return

Table 2

Major crops and approximate area under cultivation in the district agricultural profile

Crop	**Area ('000 ha)**	**Main productivity implication**
Cotton	243.2	Major cash crop; high market orientation

Sorghum	166.5	Traditional food and fodder crop
Pearl millet	124.6	Drought-tolerant cereal
Maize	106.9	Expanding cereal with feed and industrial demand
Wheat	43.7	Irrigation-dependent rabi crop
Gram	43.2	Important pulse crop for rabi season
Pigeon pea	39.9	Pulse crop; often linked with intercropping
Sugarcane	17.7	High water requirement; limited suitability in water-stressed areas
Safflower	14.8	Dryland oilseed crop
Groundnut	3.3	Limited area
Sunflower	1.7	Limited area

Note. Crop-area values are compiled from the district agricultural profile and represent reported field-crop area categories (Ministry of Agriculture and Farmers Welfare, n.d.).

The crop-area distribution implies three general changes: Firstly, cotton has become the major commercial crop. Second, the importance of maize stems from the demand from the poultry feed industry, starch industry, and local markets. Third, traditional cereals and pulses are still significant but are competing with market crops. This shifting trend is driven by population growth, evolving consumption patterns, access to markets and to cash income.

Agricultural Productivity: Yield to Value:

Output per hectare is a measure of agricultural productivity. But, in an evolving district economy, productivity needs to be understood in a broader context. It encompasses yield/ha, income/ha, labour productivity, water productivity, cropping intensity, risk-adjusted returns and post-harvest value addition Values of production and productivity are given in the district agricultural profile for major crops. Average productivity reported for cotton is 282 kg/ha over the average period in the profile and for maize is 2,548 kg/ha in kharif conditions. The productivity of pearl millet is reported as 980kg/ha, pigeon pea as 614kg/ha, wheat as 1,810kg/ha, gram as 544kg/ha and groundnut as 1,272kg/ha (Ministry of Agriculture and Farmers Welfare, n.d.). These are quite variable from one crop to another. The productivity challenge in the district is not the same for all crops. The problem for cotton is mostly yield, infestation by pests, input cost, and risk of rainfall. The district annual action plan shows that productivity of rainfed cotton is 2.52 q/ha and there is a gap of 6 q/ha in the productivity of rainfed cotton as about 80 per cent of the total cotton cultivation is rainfed (District Administration Chhatrapati Sambhajinagar, 2024). This indicates that cotton productivity is an area of priority. The problem is for maize is to improve the yield by developing high-value varieties, precision farming, grading and sorting of maize, and value chain development (District Administration Chhatrapati Sambhajinagar, 2024). Quality, water management, disease resistance, sorting & grading, packhouses, and market connection are the challenges for horticulture. As a result of population growth, demand for

agricultural products grows and the district cannot essentially meet this demand by increasing the area of cultivation. Much of the land used for growing crops is already in use. Hence, the productivity has to be improved in the form of intensification, better management of inputs, improved seeds, moisture conservation, drip irrigation, mechanisation, farmer producer organisation, storage, and better marketing.

Irrigation and Rainfed Farming

The main water-use element of the district's agricultural productivity is water. The district gets the majority of its rainfall during southwest monsoon. With an annual rainfall average of approximately 734.3 mm, there is a high degree of rainfall variability in terms of distribution and timing (Ministry of Agriculture and Farmers Welfare, n.d). Yields can be reduced due to rainfall delays, long dry spells, too much rain, and uneven distribution of rainfall.The net irrigated area of the district is approximately 163.3 thousand hectares whereas the net sown area in the district is approximately 654 thousand hectares (Ministry of Agriculture and Farmers Welfare, n.d.). This implies high proportion of rain-fed agriculture. Rain fed agriculture is more susceptible to drought, particularly in shallow black soils where moisture holding capacity could be small. Population growth puts pressure on water for agricultural purposes, as well as for drinking water, urban provision, industry, livestock and services.

There is direct relationship between irrigation and productivity. Assured water is more critical for crops like wheat, sugarcane, vegetables and horticultural crops. Cotton and maize can be grown under rainfed situation; however, they may perform better under moisture stress management. The district action plan highlights the following moisture conservation strategies: in-situ moisture conservation, broad bed furrow techniques, dead furrow opening, expansion of drip irrigation and micro-irrigation (District Administration Chhatrapati Sambhajinagar, 2024). These interventions demonstrate that the future productivity growth should be water efficient and not water intensive.

Food Security and Nutrition:

Agricultural labor is related in multifaceted ways with population growth. A rising rural population could boost the availability of labour, as could urbanisation and industrialisation, diverting younger workers from farm work. Non-farm jobs are provided by Chhatrapati Sambhajinagar city and the surrounding industrial areas. This can lead to a shortage of farm labour at the time of peak demand, particularly in crops like cotton, which require a lot of labour.Reddy et al. (2021) found labour non-availability as one of the reasons for some farmers to exclude cotton even in the face of stable prices and marketability of cotton. There is heavy labour involved in cotton cultivation in the process of weeding, spraying, picking etc. Labour scarcity for farmers as rural youth move towards education, services, construction, transport, and industry. This promotes mechanisation, the use of herbicides, the hiring of workers or a change in crop to reduce labour requirements. This is because population growth does not necessarily lead to greater farm labour. Labour quality, availability and cost is determined by rural-urban mobility and alternative employment. Household income requirements also are affected by an increase in population. When the family is large, cash flow for education, health care, housing, transportation, consumer goods, etc. is needed, and will be recurring on a regular basis. This will stimulate farmers to cultivate cash crops like cotton, maize, onion, vegetables, sweet orange and pomegranate. So, commercialisation of agriculture is brought about by population pressure.

Agricultural land conversion and urbanisation:

One of the major consequences of population growth is urban expansion. The city of Chhatrapati Sambhajinagar is one of the important cities of Marathwada. As the city expands, land at the city's periphery is increasingly eyed for residential, road, warehouse, industrial, school and business development. This places a pressure on land conversion.

Urbanisation has an impact both positive and negative on agricultural productivity. On the other hand, it takes up land for crops in peri-urban regions and drives up land values. The farmers could sell land rather than invest in agriculture. The scattered nature of urban development can also affect the water supply, common grazing land and water competition. The positive side of urbanisation is that it develops markets for milk, vegetable, fruit, flower, poultry and processed food and high value crops. If water, transport and markets are available, farmers around urban areas can change their options to more profitable agricultural activities. Hence, planning has a significant impact on the impact of urbanisation on agricultural productivity. When urban development is unplanned, it can harm productive land and water systems. It can augment farm income when it is connected with cold chains, market yards, food processing, farmer producer companies and logistics.

Risk: The Challenge of Climate Change for Agriculture in Africa and Asia:

One of the most apparent changes in the productivity of agriculture in the district is the expansion of cotton. Cotton is a crop that can be grown on black soils and is marketable. It can be stored and sold in favourable market conditions. This is the advantage over the perishables. The stable and good prices, ease of marketing, and stable yield were cited as major factors contributing to the preference of cotton amongst farmers by Reddy et al. (2021). But, there's risk in cotton, too. It entails investing in seeds, fertilisers and pesticides, labour, and pest management. Pest damage can cause loss of yield and cost. Cotton production problems such as pest attacks and their resistance have been mentioned repeatedly in the District Annual Action plan for Bt cotton (District Administration Chhatrapati Sambhajinagar, 2024). Cotton production may be unpredictable in the rainfed area because of delays or poor distribution of rainfall.

This demonstrates that commercialization is not necessarily associated with sustainable productivity. In so far as a district can expand the acreage of cash crops but still suffer an agrarian stress if the yields are low, the input costs are high, market prices are volatile and water is not guaranteed. Thus, the evolution of productivity should be measured by not only the area harvested, but also by the adjusted income of the farm in terms of risks.

Horticulture and Diversification:

Another aspect of agricultural change is horticulture. The district is known for cultivation of sweet orange, mango, sapota, custard apple, pomegranate, onion, chilli, tomato, brinjal, okra, ginger and turmeric etc., (Ministry of Agriculture and Farmers Welfare, n.d.). Horticulture can be used as an avenue for enhancing income per hectare and provide a job in grading, sorting, processing, packaging and marketing. But improved water control, disease management, market access and post-harvest facilities are needed in horticulture. Horticultural expansion is possible with population growth and urban demand, but farmers could experience price collapses if it were not for the cold storage and processing. The district action plan suggests the classification and grading of units, pulp extraction units, packhouses and formation of FPO/FPC based

value chain development for fruit crops (District Administration Chhatrapati Sambhajinagar, 2024). These measures are important because their future productivity will be increasingly dependent on the quality and market value of the product and not on the physical product itself.

Climate Vulnerability and Productivity:

The district's semi-arid climate puts agriculture at risk of climate variability. Precipitation is seasonal and falls during a brief monsoon season. Yields are impacted by delayed plantings, drought, excess rainfall, hailstorms, and pest outbreaks. Agricultural contingency plan for the district has been prepared with four scenarios i.e. delayed monsoon, early season drought, mid-season drought and limited water availability (n.d.) Ministry of Agriculture and Farmers Welfare. These are short-duration varieties, intercropping, seeding densities in late sown crops, stress to reduced fertiliser in sown crops and crop substitution. More people mean more reliance on the same pool of climate resources and makes them more vulnerable to climate change. As productivity falls as a result of drought, there are more households affected. Climate resilient agriculture is thus not a choice, but a key component of food security and rural stability. Farm ponds, watershed development, mulching, intercropping, drought-tolerant varieties, improving soil organic matter, micro-irrigation, weather advisories, and crop insurance are all important measures.

Discussion

From the available evidences, it has been found that the transition from land-expansion based agriculture to productivity and market-based agriculture is taking place in Chhatrapati Sambhajinagar District. The net sown area in the district can't cope with the pressure, caused by population growth, on agricultural land. Rather, the answer has been cropping diversification, commercialisation, moderate cropping intensity and efforts to increase the water-use efficiency.

Population increases in the district from 2001 to 2011 led to increased demand for food, cash income, land, water and jobs. Agriculture has responded with the greater importance of cotton, maize, horticulture and other market-oriented crops. This transition has brought new challenges though. Cotton is attractive and risky crop under the rain fed conditions. Maize has a high industrial and feed demand, and a need for productivity improvement and value chain support. Irrigation, quality control and post-harvest infrastructure are needed for horticulture to generate income.

The overall productivity issue is thus multi-dimensional. Increasing yields are not enough; the question must also be raised to determine if they have increased by a sufficient amount. A more relevant question is: How more able is agriculture to feed a growing population in the presence of land, water, labour and climate limitations? The response is complex. The district has good potential for agriculture, but it is constrained by dependence on rainfall, moderate irrigation, land fragmentation, prices and risks.

Recommendations

First and foremost, water-use efficiency should be the district's focus. Farm ponds, recharge structures, watershed development and drip irrigation and sprinkler irrigation should be considered first, as large-scale irrigation expansion may be difficult. Second, Cotton productivity should be improved by applying integrated pest management, moisture conservation, soil testing, balanced fertilisation and training farmers. Greater risk may be a consequence of expanding cotton area while not

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increasing yields. Third, diversification of crops should be promoted. Pulses, oilseeds, fodder crops, horticulture and intercropping can help reduce risk and enhance soil health.

Fourth, farmer producer organisations and farmer producer companies to be strengthened. Multiplication of inputs, machines, storage, grading, processing and markets is required for small farmers.

Fifth, Agricultural planning should be integrated with Urban planning. Preserving peri-urban agricultural areas as productive land, as well as encouraging farmers to engage in vegetable, dairy, fruit and value-added agriculture in the area near urban markets is recommended.

Sixth, the main-streaming of climate-resilient agriculture is necessary. Must include weather advisories, drought contingency planning, crop insurance, resilient varieties and local water budgeting.

Conclusion

Population growth has played a significant role in the transformation in the agricultural productivity of Chhatrapati Sambhajinagar District. The district's population grew dramatically from 2001 to 2011, straining its land, water, job and food systems. In response, agriculture has evolved into a mix of mainly food crops and commercial crops like cotton, maize and horticultural farming flourishing. But the transformation is constrained by rainfed conditions, limited irrigation, climate variability, labour deficiency, market risk etc.It is not just a matter of increasing productivity per hectare; the changing nature of productivity in the district is also a matter of changing the productivity. It's about creating more value, less water, less land per capita, greater climate risk, and increased market uncertainty. Coordinated irrigation, soil health, crop diversification, control of pests, post-harvest infrastructure, value chains led by FPOs and agricultural planning with climate resilience will be critical for sustainable productivity growth. With the effective implementation of these measures, Chhatrapati Sambhajinagar District can make use of the population pressure as a catalyst for innovative agriculture and not as a catalyst for stress.

Suggested Figures and Graphs for the Paper

Figure 1. Location map of Chhatrapati Sambhajinagar District.

Source: District map or official/state GIS source.

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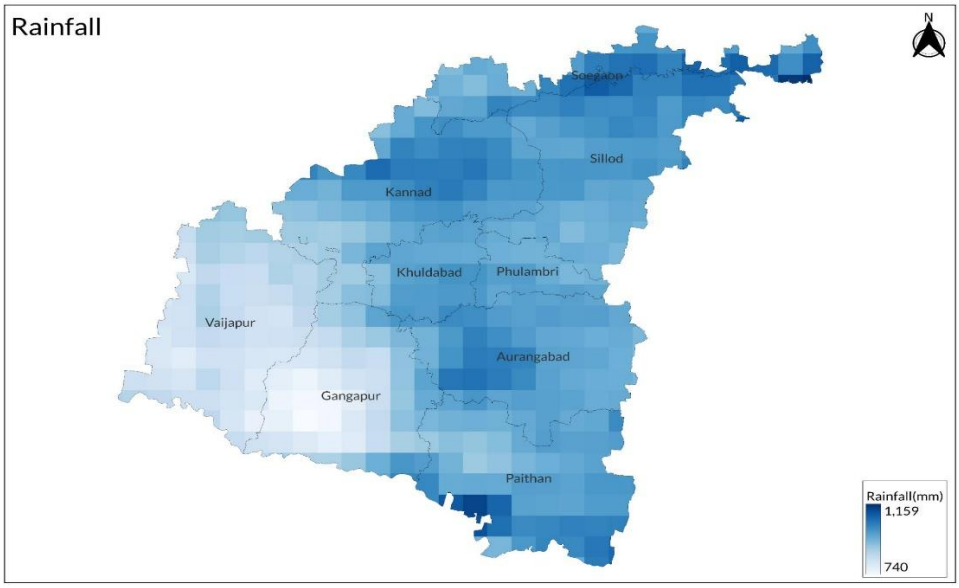
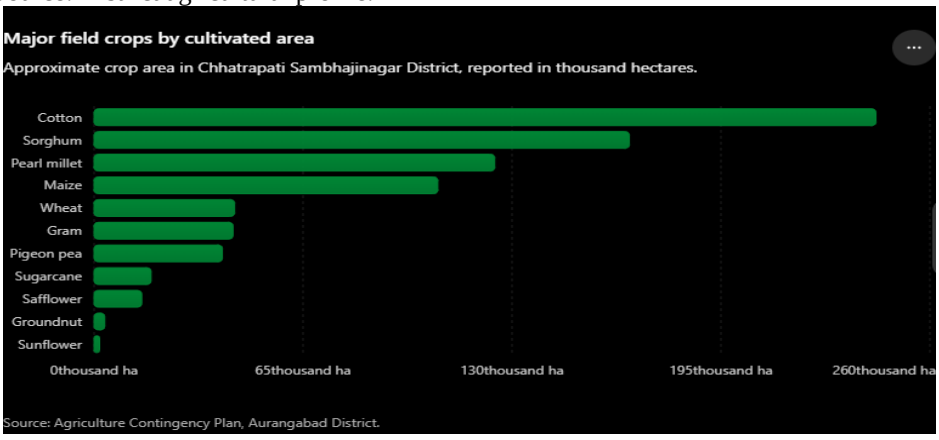
Figure 2. Rainfall distribution map of Chhatrapati Sambhajinagar District.
Source: CRU/IMD-based rainfall map or official district planning source.



Graph 1. Major field crops by cultivated area in Chhatrapati Sambhajinagar District.
Source: District agricultural profile.



Graph 2. Population growth from 2001 to 2011.
Source: Census of India.

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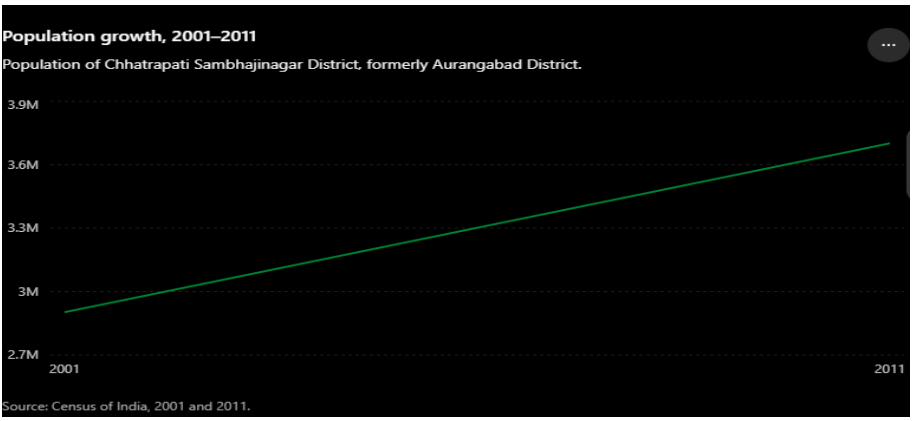

Image 1. Cotton cultivation in Chhatrapati Sambhajinagar District.
Source: Wikimedia Commons or properly licensed agriculture photograph.

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