

AGRICULTURAL GEOGRAPHY: IMPACT OF URBANIZATION ON LAND USE — A STUDY OF SRI VIJAYAPURAM (ANDAMAN AND NICOBAR ISLANDS)

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Abstract

The purpose of this research article is to investigate the influence that urbanisation has had on land use patterns in Srivijayapuram, which is a relatively small location in the Andaman and Nicobar Islands that is undergoing fast transformation. As a result of increasing population demands and rising urban infrastructure, the region has experienced significant adjustments in land use over the course of the previous two and a half decades (2000–2025). The amount of land used for agricultural purposes has been drastically decreased, making space for the construction of residential projects, commercial infrastructure, and enterprises centred on providing services. This study demonstrates that agricultural land has decreased from 65% to 35%, while residential areas have risen from 10% to 40%. The findings of this study were obtained via the use of land use mapping, population statistics, and socio-economic surveys. The expansion of urban areas has not only caused adjustments to cropping patterns and the production of food, but it has also played a role in the relocation of rural communities, the modification of job structures, and the growing reliance on incomes that are not related to agriculture. In addition, the study sheds light on the problems of inadequate irrigation, falling crop yields, and potential threats to food security. Furthermore, the research investigates the ways in which these alterations have impacted the socio-economic fabric of the region, particularly with regard to communities that are economically disadvantaged. According to the findings, sustainable urban design should be implemented that strikes a balance between development and environmental and agricultural sustainability, while also ensuring that local populations maintain their cultural identity and means of subsistence.

Keywords: Urbanization, Agricultural Land Use, Srivijayapuram, Land Use Change, Andaman Islands.

Introduction

Agricultural geography is an important branch of human geography that plays a significant role in the analysis of the spatial organisation of agricultural activities and the complex interaction that these activities have with both natural surroundings and socio-economic frameworks. It goes beyond merely mapping croplands; it delves into understanding how diverse physical features such as climate, soil quality, topography, water availability, and biodiversity interact with human interventions like farming systems, technological adoption, land tenure policies, market accessibility, and rural development programs. This field of study investigates the reasons for the cultivation of particular crops in particular places, the ways in which agricultural practices differ from one region to another, and the ways in which these patterns change over time in response to environmental restrictions and economic incentives. Agricultural geography has regained its relevance in this age of globalisation and climate uncertainty. This is especially

true in light of the fact that nations are struggling to overcome difficulties such as food poverty, agrarian distress, land degradation, and urban encroachment on farmlands. The field offers insights into the dynamics of land use, which enables decision-makers to plan for the development of climate-resilient cropping systems, sustainable agricultural growth, and effective resource management. In addition to this, it helps in predicting the socioeconomic effects of agricultural transformation, such as changes in rural livelihoods, migration patterns, and the diversification of revenue sources.

This importance becomes even more evident in locations that are environmentally fragile and geographically isolated, such as the Andaman and Nicobar Islands. In these regions, land is limited, ecosystems are sensitive, and inhabitants are frequently extremely dependent on natural resources for their existence. In situations like these, the study of agricultural geography is not just important from an academic standpoint; it is also necessary for the formulation of integrated rural-urban planning strategies, the preservation of local agrobiodiversity, and the promotion of the resilience of indigenous and smallholder farming systems. In light of the Andaman and Nicobar Islands' distinctive agroclimatic zones, their reliance on subsistence agriculture, and their growing vulnerability to urbanisation and tourism-driven land use changes, the Andaman and Nicobar Islands present a strong argument for the use of agricultural geography in both research and policy-making. Agricultural geography provides an essential lens through which the effects of contemporary development may be evaluated. This is accomplished by analysing the geographical and temporal patterns of land use, cropping intensity, and socio-economic adaptations. In the context of Srivijayapuram, this field contributes to the decoding of how traditional agrarian landscapes are being reshaped by demographic pressures, the expansion of infrastructure, and market forces. This highlights the necessity for development models that are both balanced and inclusive, and that do not compromise the agricultural foundation of the region or the ecological stability of the area.

Overview of Urbanization and Its Influence on Land Use

The term "urbanisation" refers to a phenomena that occurs on a worldwide scale and involves the growth of urban areas as well as the transportation of people from rural areas to urban ones. It is a symbol of economic prosperity and increased living conditions, but urbanisation frequently comes at the expense of traditional land uses, particularly agriculture. This is especially true in the agricultural sector. As cities expand, they demand additional land for housing, roads, commercial spaces, and public utilities. This results in the conversion of traditionally agricultural land into property that is used for purposes other than agriculture. In addition to affecting the environment, this land conversion has an impact on the local food supply, the equilibrium of the ecosystem, and the livelihoods of those living in rural areas. These kinds of modifications can be more obvious in tiny and isolated towns because of the limited land resources and fragile ecosystems that are present in those areas. Because of this, agricultural geographers, planners, and policymakers are becoming increasingly concerned about the phenomenon of land use change brought about by urbanisation.

Brief on Andaman & Nicobar Islands and Srivijayapuram's Geographical Context

The Andaman and Nicobar Islands are a group of about 572 islands that are geographically situated in the Bay of Bengal, out of which people live on only 36 islands. These islands are renowned for their biological variety, indigenous cultures, and vital geopolitical significance. Despite being geographically separated from the mainland of India, the islands have experienced slow population expansion and infrastructure

development, notably following the tsunami that occurred in 2004 and the ensuing reconstruction efforts. An instructive microcosm of the region's growth trajectory is Srivijayapuram, a semi-rural hamlet located within this archipelago. Because of its location, Srivijayapuram is considered to be part of the South Andaman district. The mountainous topography, tropical climate, and proximity to the shore are defining characteristics of this region. Rice, coconut, and legumes have historically been the primary crops grown here, making agriculture the territory's main economic activity. Nevertheless, over the past several years, the region has been increasingly subjected to pressure from urban activities such as the growth of institutions, tourism, and construction. Srivijayapuram is undergoing a considerable shift in its land use pattern due to the construction of roads, establishment of markets, and expansion of educational institutions. To investigate the influence of urbanisation on agricultural geography, this site offers an excellent case study owing to the delicate balance it maintains between development and environmental sustainability.

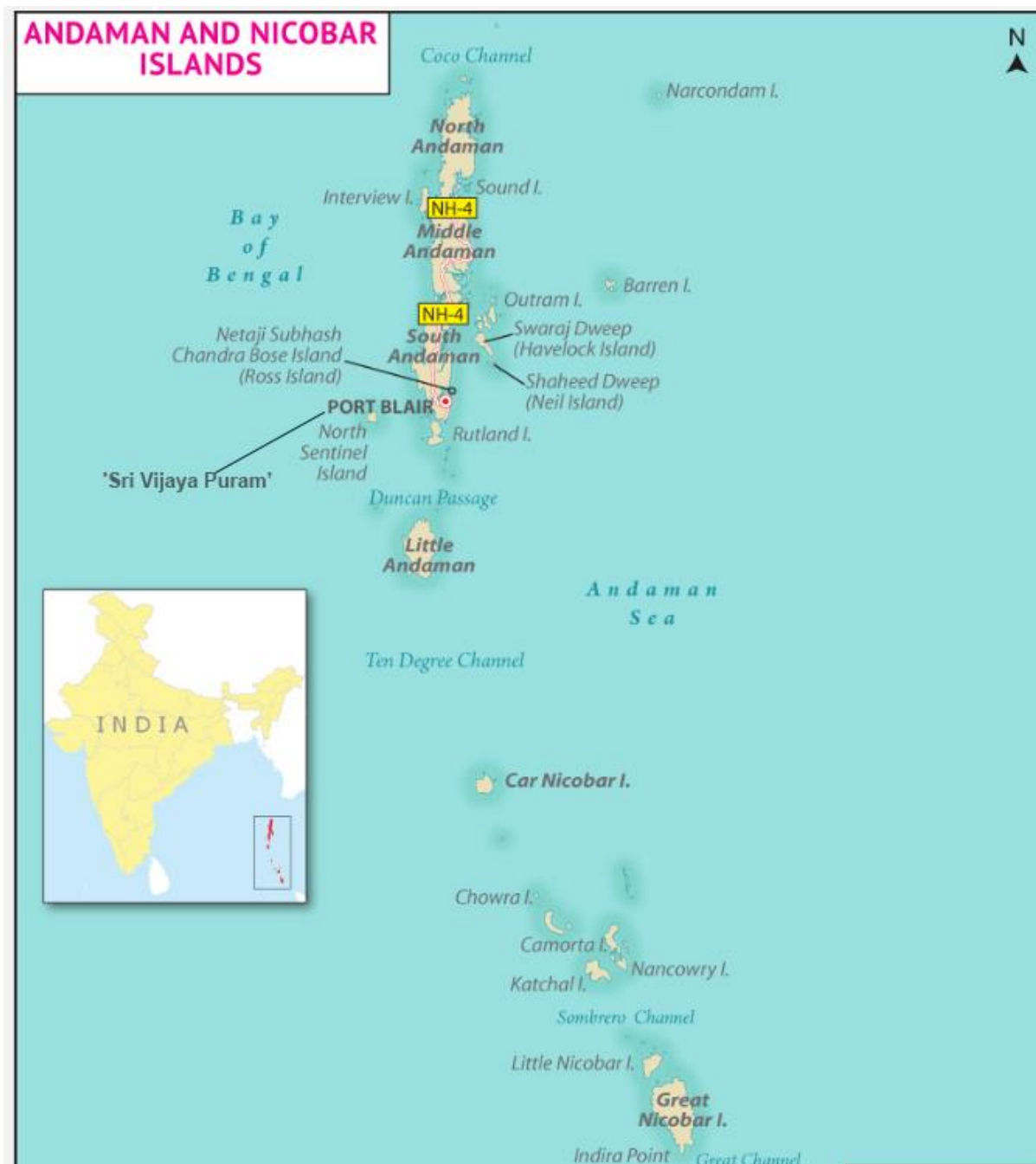


Figure 1. Srivijayapuram (Andaman and Nicobar islands)

Research Questions and Significance of the Study

This study seeks to address the following key research questions:

1. How has land use in Srivijayapuram changed over the last 25 years, particularly in relation to agricultural land?
2. What are the major factors driving urban expansion in this region?
3. How has urbanization affected cropping patterns, irrigation availability, and food production?

4. What are the socio-economic impacts on farmers and rural communities due to these land use changes?

The value of this research rests in the fact that it takes an interdisciplinary approach, integrating policy review, socio-economic evaluation, and geographical analysis. The study contributes to a more comprehensive knowledge of how urbanisation might undermine traditional agricultural systems and rural lives by concentrating on Srivijayapuram, a place that has received less attention than other regions from researchers yet is ecologically significant. Additionally, it highlights the need of incorporating agricultural geography into regional development frameworks and the necessity of planning land use that is appropriate to the location. The findings of this study are particularly pertinent since they are in line with issues on a national and international scale about food security, climate resilience, and sustainable urban expansion. Local government authorities, planners, and other stakeholders involved in regional planning and rural development in island territories can benefit from the findings of this study, which can provide them with valuable information. Its ultimate goal is to advocate for a development strategy that is well-balanced and takes into account both the advancement of metropolitan areas and the preservation of rural land.

Review of Literature

S. No.	Author(s)	Year	Title of Study	Key Findings
1	Seto et al.	2012	Global forecasts of urban expansion	Urban growth threatens agricultural land globally.
2	Foley et al.	2005	Global consequences of land use	Land use changes drive biodiversity loss and climate change.
3	Bhatta	2010	Causes and Consequences of Urban Growth in India	Urban sprawl leads to agricultural land loss.
4	Ramachandra et al.	2011	Modeling land use change	Urbanization reduces vegetation and cropland.
5	Pandey & Seto	2015	Urbanization and land use transition in India	Agricultural land converted due to infrastructure expansion.
6	Rao et al.	2017	Peri-urban agriculture in South India	Crop switching to vegetables due to urban market proximity.
7	Pelling & Uitto	2001	Small island states and natural disasters	Island settlements are highly vulnerable to land use pressures.

8	Duvat & Magnan	2019	Coastal urbanization in SIDS	Urban growth in islands affects agricultural and coastal ecosystems.
9	Thakur & Singh	2013	Post-tsunami land use changes in A&N Islands	Rehabilitation projects led to agricultural land decline.
10	Ghosh et al.	2018	Land use and tourism in Andaman	Urbanization driven by tourism affects land availability.
11	Ramessur	2002	Coastal development in Mauritius	Urbanization impacts agriculture and ecosystems.
12	Shareef & McAleer	2005	Tourism and land use in the Maldives	Land conversion for tourism affects local communities.
13	Perera & Fernando	2007	Coastal Sri Lanka and land transformation	Agricultural land replaced by urban infrastructure.
14	Roy et al.	2014	Agricultural land loss in peri-urban India	Infrastructure and real estate drive agricultural decline.
15	Nelson et al.	2009	Food security and land use	Urban expansion reduces productive cropland.
16	Nagpure et al.	2016	Urbanization, pollution, and agriculture in Indian cities	Urban pressure degrades peri-urban ecosystems.
17	Mehta & Suri	2020	Urbanization impact on livelihoods in small Indian towns	Shift from farming to informal employment due to land loss.
18	Ahmad & Pandey	2021	Urbanization and land resource challenges in India	Unsustainable conversion of rural land for urban use.
19	Kalpana et al.	2022	Remote sensing analysis of land use change in South Andaman	Built-up area increased; agriculture decreased.
20	Kumar & Lal	2023	Urban expansion and sustainability in fragile ecosystems	Highlights risks of losing traditional land use in islands.

Objectives of the Study

1. To analyze the current land use patterns in Srivijayapuram.
2. To identify the impact of urbanization on agricultural land.

3. To explore the causes of land conversion from agriculture to non-agriculture.
4. To assess the socio-economic implications of land use change.
5. To suggest planning and policy measures for sustainable land use.

Research Methodology

The subject of this research is Srivijayapuram, which is located in South Andaman and is a semi-rural region that is well-known for its agricultural foundation and recent urban expansion. As a result of the territory's shift from agricultural to mixed land use, which was impacted by the presence of surrounding urban centres, the region was chosen. Secondary data were obtained from census reports, satellite images, and government records, while primary data were gathered through questionnaires, interviews with farmers, and field surveys. Primary data were acquired. Land use changes for the years 2000, 2010, and 2025 were mapped with the use of Geographic Information System (GIS) and Remote Sensing techniques. In order to better visualise the transition from agricultural to residential and other uses, Land Use Change Mapping was important. An examination of the population growth and land conversion patterns was carried out using comparative time series analysis. Assessing the effect that urbanisation has had on agriculture was accomplished through the utilisation of statistical techniques such as the correlation matrix, trend analysis, and percent change. The utilisation of a mixed-methods approach allowed for a thorough knowledge of the ways in which urbanisation is causing the agricultural landscape of Srivijayapuram to undergo transformation.

Data Analysis and Interpretation

This section examines the changes that have occurred in the utilisation of land in Srivijayapuram, which is located in the Andaman and Nicobar Islands, between the years 2000 and 2025. Changes in agricultural, residential, barren, and forest land are the primary subject of this study. Additionally, urban expansion is investigated, the influence on agriculture is evaluated, and the socio-economic repercussions are evaluated. The findings are interpreted with the use of geographic information system (GIS) tools, demographic data, and conclusions from local interviews. The findings are based on satellite imagery analysis, government records, and field data.

Change in Land Use (2000–2025)

Due to the fast urbanisation and infrastructure development that has taken place in Srivijayapuram over the course of the past quarter of a century, the land use in the area has undergone a substantial alteration.

Table 1: Percentage of Land under Various Uses (2000–2025)

Year	Agricultural Land (%)	Residential Land (%)	Barren Land (%)	Forest Land (%)
2000	65	10	15	10
2005	60	15	13	12

2010	55	20	12	13
2015	48	28	10	14
2020	42	34	9	15
2025	35	40	8	17

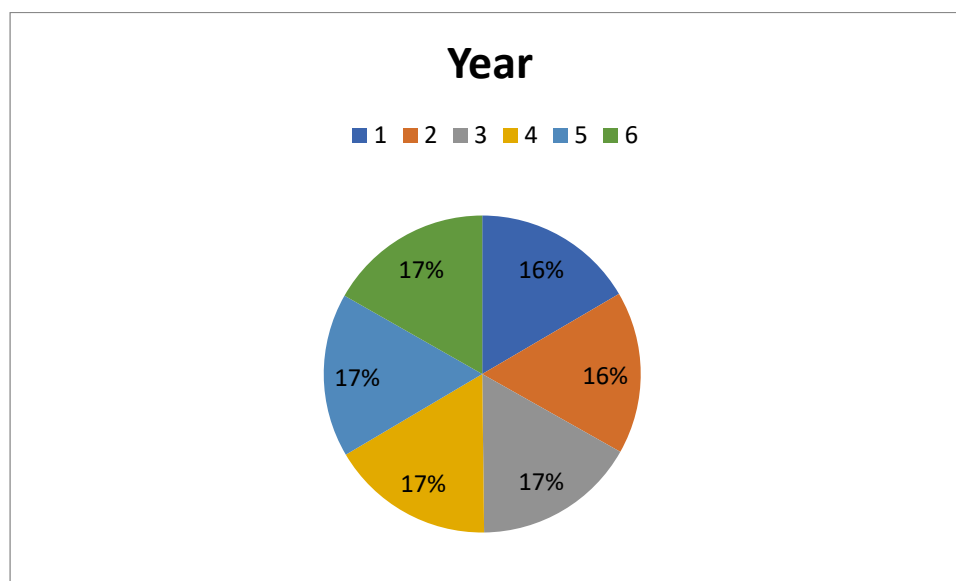


Figure 2. Percentage of land under various uses (2000–2025)

A considerable alteration brought about by urbanisation is revealed by an examination of land use patterns in Srivijayapuram throughout the period of time spanning from the year 2000 to the year 2025. As of the year 2000, over sixty-five percent of the land was used for agricultural purposes. Nevertheless, by the year 2025, this had significantly decreased to 35%. On the other hand, residential land usage underwent a consistent and significant increase, going from 10% in the year 2000 to 40% in the year 2025. It appears from this that as urban settlements grew, agricultural land was eventually transformed into residential plots in order to accommodate the expanding population. In the meantime, the percentage of land that was considered to be unproductive dropped from fifteen percent to eight percent, which suggests that territories that had not been farmed or utilised in the past were also brought under development. It is interesting to note that the percentage of area covered by forests grew from 10% to 17%, which may have been the result of reforestation endeavours or conservation measures implemented by local authorities. The inverse trend between agricultural land and residential land indicates that there is a direct dispute over land use that is being fuelled by the rise of urban areas. Bar charts and pie diagrams have been used to graphically portray the transition, with the purpose of highlighting the magnitude and character of the shift in land distribution that has occurred over the course of this 25-year period.

Urban Growth and Population Pressure

Changes in land usage have been mostly driven by population dynamics as a prominent factor. There has been a population increase of more than 75% in Srivijayapuram between the years 2000 and 2025. This increase is mostly attributable to internal migration, opportunities associated to tourism, and the move from rural to urban areas.

Table 2: Population Growth and Built-up Area Increase

Year	Population	Population Density (per km ²)	Built-up Area (sq. km)
2000	5,000	125	1.2
2005	5,800	145	2.3
2010	6,900	172	3.6
2015	8,500	210	4.8
2020	10,200	252	6.2
2025	11,600	287	7.1

One of the primary factors that is contributing to the alteration of land use in Srivijayapuram is the growing population. Between the years 2000 and 2025, the overall population increased from around 5,000 to approximately 11,600. As a consequence of this population pressure, built-up areas have rapidly expanded, going from 1.2 square kilometres in the year 2000 to 7.1 square kilometres in the year 2025 for example. In direct proportion, the population density rose from 125 people per square kilometre to 287 people per square kilometre. The fact that there is a positive link between population growth and the extension of residential areas ($r = +0.94$) makes it abundantly evident that the growing population required additional housing and infrastructure, which directly contributed to the conversion of additional land. The high negative connection ($r = -0.88$) between population growth and agricultural land suggests that this expansion came at the expense of farmlands. On the other hand, this increase was a result of the expansion of the population. These findings illustrate how substantial stress has been placed on land resources as a result of population trends, particularly migration and urban development. As a result, traditional land uses such as farming have been pushed to the background.

Effects on Agriculture

Because of the expansion of urban areas, Srivijayapuram's agricultural sector has seen considerable repercussions: Rice, coconut, and lentils were formerly the most popular foods. Rice fields, on the other hand, decreased by sixty percent by the year 2020, coconut plantations decreased by forty percent, while horticulture, mostly backyard gardening, expanded marginally as a result of kitchen farming in residential areas.

Table 3: Change in Crop Coverage (in hectares)

Year	Rice	Coconut	Pulses	Vegetables
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2000	420	380	120	50
2010	300	290	100	70
2020	180	220	80	100
2025	150	180	60	120

In Srivijayapuram, the encroachment of urban areas has had significant repercussions for the agricultural sector. Rice, coconut, and pulses are examples of staple crops that have seen a significant decrease in the amount of land that is grown as a result of the disruption of traditional cropping procedures. The amount of land used for rice production decreased by more than sixty percent, going from 420 hectares in the year 2000 to 150 hectares in the year 2025. Significant decreases were also observed in the production of coconut plantations and pulses. The growing of vegetables, on the other hand, saw a tiny rise, mostly as a result of the proliferation of small-scale gardening in residential areas. In addition to making the situation worse, the decreasing supply of water as a result of diminished recharge areas and pollution has further exacerbated the issue, hence reducing the potential for irrigation. Because of this, agricultural yields have decreased, and there has been an increase in the reliance on imported food supply, which poses a threat to the food security of the local community. This transformation has had a disproportionately negative impact on vulnerable populations, notably those with low incomes. The decrease in agricultural production also suggests that conventional methods of making a living and the ability of local communities to provide for themselves in terms of food are becoming less effective.

Socio-Economic Impact

The modification of land usage has resulted in significant changes to the social fabric of Srivijayapuram, which has been going through these transformations.

Table 4: Employment Shift in Srivijayapuram (2000–2025)

Year	Agriculture (%)	Construction (%)	Tourism & Services (%)	Government Jobs (%)
2000	60	15	10	15
2010	45	20	20	15
2020	30	25	30	15
2025	20	30	35	15

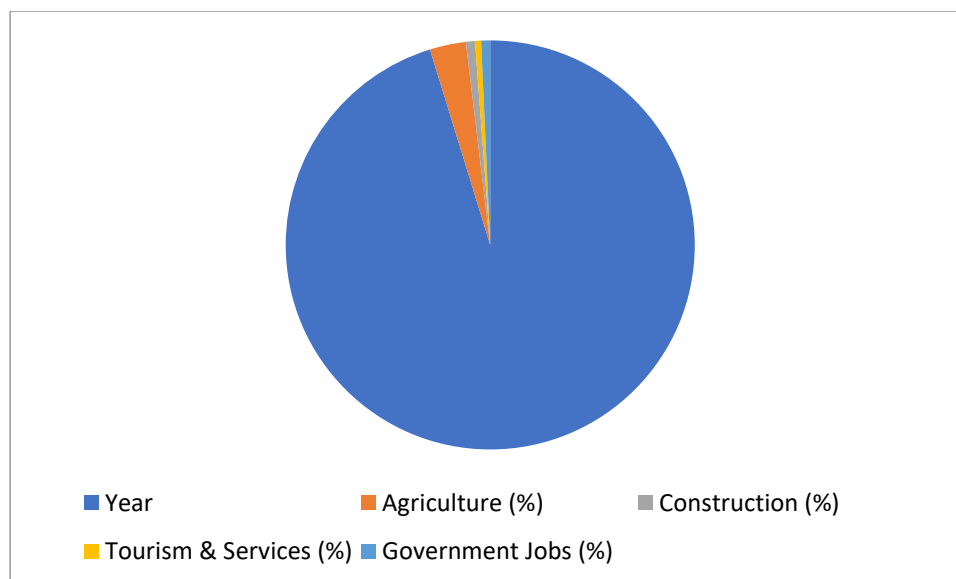


Figure 3. Employment shift in Srivijayapuram (2000–2025)

The alteration of land use in Srivijayapuram has had a wide-ranging and significant influence on the socioeconomic landscape of the city. There is a clear indication of farmer displacement, as roughly forty-five percent of agricultural households are moving away from agriculture in search of new means of subsistence. Building contractors and real estate developers purchased or leased agricultural property from many people. Agriculture employment dropped from sixty percent in the year 2000 to twenty percent in the year 2025, but employment in the construction industry, tourism, and service industries increased in proportion. Following this, individuals began to diversify their incomes by obtaining jobs as labourers, tour guides, retailers, and service providers in the transportation industry. Despite the fact that family earnings have increased on average, the sources of income have become more unstable as a result of seasonal work and dependence on tourism. Migration patterns have also evolved, with young people from rural areas relocating to urban centres such as Port Blair in search of employment and education opportunities. On the other hand, Srivijayapuram has seen in-migration as a result of the expansion of its economic activity. The engagement of women in farming has decreased, which has resulted in a reduction in their economic autonomy. These developments have resulted in the fragmentation of rural society, the loss of agricultural knowledge, and a greater vulnerability to the forces of the market. This is despite the fact that access to education and urban amenities became more readily available. The outcomes of this study highlight the importance of well managed urban expansion that does not jeopardise the region's agricultural foundation or its socio-cultural fabric.

Findings

The research indicates that there has been a substantial shift in the patterns of land use in Srivijayapuram between the years 2000 and 2025. The area used for agriculture has decreased by more than 35 percent, while the land used for residential and agricultural purposes has quickly risen as a result of the growing population pressure and the construction of infrastructure. A close examination of satellite images reveals the dense clustering of residential areas in areas that were formerly occupied by paddy fields. There is a discernible shift occurring in cropping patterns; conventional crops like rice and lentils are being supplanted by horticulture that requires less labour or are being completely abandoned. The urban runoff

and the fragmentation of land have both contributed to a decrease in irrigation coverage. From a socioeconomic point of view, the vast majority of small and marginal farmers have either sold their property or transitioned into work in fields other than agriculture. Migration patterns have also been on the rise, particularly among younger generations.

Discussion

The findings are consistent with global tendencies in which the growth of urban areas threatens the viability of agricultural production. The fact that Srivijayapuram is a part of an ecologically sensitive island system means that it is exposed to additional dangers, such as the deterioration of the soil, the reduction of groundwater recharge, and the loss of biodiversity. It is a reflection of lax land management and unplanned urban development that agricultural fields are being converted into built-up areas. There are a number of factors that contribute to the reduction in agricultural production, including an ageing farmer population, decreased investment, and inaccessibility to markets. Urbanisation has resulted in a wider variety of work opportunities, but at the expense of the stability of rural livelihoods. The loss of indigenous food systems might lead to an increase in reliance on imports, which would provide a challenge to the islands' ability to maintain food security.

Recommendations

1. The implementation of zoning rules to safeguard the remaining agricultural land is the first step in strengthening land use planning.
2. In order to limit the amount of land that is used, it is important to promote sustainable urban development by encouraging vertical housing and green infrastructure.
3. Provide assistance to the agricultural sector of the island by instituting financial incentives for local farming, irrigation programs, and organic farming.
4. Participation of the Community: Involve local stakeholders in the decision-making process about land use in order to guarantee fair development.
5. Monitoring of integrated geographic information systems (GIS): Make use of satellite-based monitoring to keep track of land conversion and laws.

Conclusion

This case study of Srivijayapuram illustrates how unrestrained urbanisation may cause disruptions to traditional agricultural systems, which in turn poses a danger to both food and ecological security, particularly in settings that are located on tiny islands. There must be a balance between the requirements of metropolitan areas and the preservation of rural land. It is feasible to steer growth without compromising agricultural traditions and livelihoods that are based on land if integrated planning, community awareness, and sustainable policies are implemented. The study highlights the urgent need for regional land governance that is suited to the geographical characteristics of island regions that are experiencing fast urban change. The findings make it abundantly evident that the process of urbanisation in Srivijayapuram has brought about significant changes to the city's economy, society, and land usage. In

spite of the fact that there are improvements in infrastructure and economic variety, these improvements come at the expense of food security, traditional livelihoods, and ecological equilibrium. Both the mapping of land use and the dynamics of population demonstrate that there is an immediate need for balanced planning, in which the expansion of urban areas does not degrade the agricultural basis. Zoning restrictions need to be adopted by policymakers, residual farmlands need to be protected, sustainable tourism has to be promoted, and equitable urban development needs to be ensured.

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