

# **STUDY OF FOOD SECURITY IN INDIA: A STATE-WISE ANALYSIS**

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**STUDY OF FOOD SECURITY IN INDIA:  
A STATE-WISE ANALYSIS**

by

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Submitted

**in fulfillment of the requirements for the degree of Doctor of Philosophy**

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# CERTIFICATE

This is to certify that the thesis titled “**Study of Food Security in India: A State-wise Analysis**”, being submitted by **Ms. Aakanksha Bhatia** to the Indian Institute of Technology Delhi for the award of the degree of Doctor of Philosophy is a record of bonafide research work carried out by her. She has worked under my guidance and supervision and has fulfilled all the requirements for the submission of the thesis, which has attained the standard required for a Ph.D. degree of this institute. The results presented in the thesis have been submitted in part or full to any other university or institution for any degree or diploma.

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## **ABSTRACT**

Ensuring food security has been a continuous global issue and its successful measurement shall help in appropriately working towards achieving the aim of food for all. It also requires proper implementation of food security policies at the national level, along with effective planning and use of sound indicators that account for a nation's priorities. India plays a vital role in global food security as it is significant contributor of nutritional and helps in combating challenges in relation to sustainability of agriculture and environment. Being one of the most populous nations of the world and by far one of the fastest growing economies makes it important to capture the progress of India in the alleviation of its food insecurity.

A review of existing literature highlights a significant gap in studies focused on identifying food security indicators at the national or regional level in India. Furthermore, only a limited number of studies have conducted a comprehensive analysis of food security, covering all four dimensions outlined by the Food and Agriculture Organization (FAO): food availability, access, utilization, and stability. In addition, the vital role of state governments in implementing, monitoring, and achieving food policy objectives often remains overlooked and underappreciated.

We discover the following gaps in the existing literature – How can a comprehensive food security indicator set be structured for Indian states which can represent all four dimensions of food security appropriately? What is the level of data availability of global food security indicators at state level in India? Are the problems of household food management addressed in our growing economy? What factors are responsible for household food waste in India? What policy support and managerial actions are necessary to bolster food security policy in India, while simultaneously addressing concerns regarding food wastage?

This research aims to develop a transparent methodology for constructing a composite index to measure food security at the state level in India. The process includes identifying data gaps, using a context-specific approach to indicator selection, and applying methods such as normalization, weighting, and aggregation. The resulting food security index will facilitate the evaluation of state-level performance across various dimensions of food security and highlight key areas for improvement. Additionally, the study investigates the underlying factors contributing to household food waste in India. Data was collected through a survey of 372 households, and structural equation modeling was employed to analyze the findings.

The study's results suggest that the development of a thorough food security framework at the regional level is still in the process of evolution, not only within India but also on a global scale. The study observes that at regional level there are diverse social, economic, and ecological challenges, along with different solutions for achieving food security. The study identifies a key performance indicator set comprising of 49 indicators for food security of India, categorized into four dimensions, viz., affordability, availability, quality & safety, and sustainability & adaptation. In addition, we conduct a data gap and availability exercise to assess the condition of food security data across the states. Only 14.47% of the indicators from the Global Food Security Index (GFSI) could be effectively matched with available state-level data in India, highlighting critical gaps in sub-national data systems and the urgent need to enhance statistical capacity and survey frameworks at the state level.

The study finds interstate differences in food security are strongly associated with economic, environmental and policy factors. Punjab performed best in availability dimension which is linked

to its strong agricultural investment, irrigation infrastructure, market access and supply chain efficiency. Andhra Pradesh, had the highest score in sustainability and adaptation dimension, attributed to lower water risk, curtailed land degradation and better pest and disease management. In contrast, the lower rankings of states like Bihar, Assam and Jharkhand are associated with income related constraints and low public expenditure on research and development in agriculture. The findings reinforce the need to account for state-level variations when designing effective food security policies.

Focusing on household food waste in India, the study reveals that a significant portion of waste arises from overcooking and leftovers from previous meals, with the latter closely associated with rising urbanization. It highlights the critical role of food consumption management practices in influencing household food waste and examines the impact of the COVID-19 pandemic on the quantity of food discarded.

The study makes various suggestions to policymakers, implementation as well as monitoring agencies and social scientists. The key recommendations from the study are: (i) Food Security index should be made with robust and efficient methodology. (ii) while selecting food security indicators, local food security studies and efforts of state governments should be kept in mind, (iii) a regular review of statistical efficiency, economic resources, data availability and construction of prevailing surveys is advised, (iv) efforts should be made by food insecure states based on their performance taking examples from the benchmark state of their region, (v) their needs to proper scale for measurement of household food wastage based on social structure in India, (vi) their needs to be more awareness in the country on the lack of consciousness of food management practices at households due to rising urbanization and replicating western lifestyles.

- 1) The study offers various recommendations to policymakers, implementation and monitoring organizations, and policymakers. The study's main recommendations are: A robust and replicable methodology should be used to develop a food security index.

*Rationale: A rigorous methodological framework ensures reliability, comparability, and policy relevance of food security measurement across states.*

- 2) States experiencing food insecurity ought to implement focused policies influenced by regional benchmark states.

*Rationale: Differential state performance suggests that localized policy learning can improve programme effectiveness and resource utilization.*

- 3) It is necessary to develop a standardized and context-appropriate scale to measure food waste in households in India, which is a rising concern globally.

*Rationale: Household food waste behaviors were found to be influenced by socio-economic and demographic factors specific to the Indian context.*

The outcomes and conclusions of this study will be useful to scholars and governments (national as well as state) in India and other developing countries in redesigning and investigating their national food security implementation strategies to improve their reach and effectiveness.

## सार

खाद्य सुरक्षा तक पहुँचना एक वैश्विक समस्या रही है और खाद्य सुरक्षा के सफल माप से लक्ष्य को उचित रूप से प्राप्त करने में मदद मिलेगी, खासकर विकासशील देशों के लिए। इसके लिए राष्ट्रीय स्तर पर खाद्य सुरक्षा नीतियों के उचित कार्यान्वयन के साथ-साथ प्रभावी योजना और देश की प्राथमिकताओं को ध्यान में रखने वाले अच्छे संकेतकों के उपयोग की आवश्यकता है। भारत वैश्विक खाद्य सुरक्षा में एक महत्वपूर्ण योगदानकर्ता है क्योंकि यह न केवल पोषण की मात्रा में योगदान देता है बल्कि कृषि और पर्यावरण की स्थिरता के संबंध में चुनौतियों से निपटने में भी महत्वपूर्ण योगदान देता है। दुनिया के सबसे अधिक आबादी वाले देशों में से एक और अब तक की सबसे तेजी से बढ़ती अर्थव्यवस्थाओं में से एक होने के नाते भारत की खाद्य असुरक्षा को कम करने में प्रगति पर ध्यान देना महत्वपूर्ण है।

रिग्रेस साहित्य समीक्षा भारत में राष्ट्रीय या क्षेत्रीय स्तर पर खाद्य सुरक्षा संकेतक पहचान पर दुर्लभ अध्ययन प्रदर्शित करती है। बहुत सीमित अध्ययनों ने खाद्य सुरक्षा के सभी चार आयामों से खाद्य सुरक्षा माप का विश्लेषण किया है। खाद्य नीति कार्यान्वयन, निगरानी और उपलब्धि में उपराष्ट्रीय सरकारों की महत्वपूर्ण भूमिका के बावजूद, उनके प्रयासों को मान्यता नहीं दी जाती है।

साहित्य की समीक्षा के माध्यम से, हम मौजूदा कार्य में कुछ कमियों का पता लगाते हैं - क्या खाद्य सुरक्षा नीतियां खाद्य सुरक्षा के सभी आयामों को पकड़ने के लिए पर्याप्त और उपयुक्त हैं? एक व्यापक खाद्य सुरक्षा संकेतक सेट कैसे विकसित किया जा सकता है? देश में खाद्य सुरक्षा डेटा उपलब्धता का स्तर क्या है? देश में खाद्य असुरक्षा को कम करने में क्षेत्रीय/राज्य सरकारों की क्या भूमिका है? क्या हमारी बढ़ती अर्थव्यवस्था में घरेलू खाद्य प्रबंधन की समस्याओं का समाधान हो गया है? भारत में घरेलू खाद्य प्रबंधन के लिए कौन से कारक

जिम्मेदार हैं? भारत में खाद्य सुरक्षा नीति को बढ़ाने के लिए किस नीति समर्थन और प्रबंधकीय कार्रवाई की आवश्यकता है, जिसमें खाद्य अपव्यय संबंधी चिंताएं भी शामिल हैं?

प्रासंगिक उत्तर प्रदान करने के लिए अध्ययन 22 प्रमुख राज्यों पर ध्यान केंद्रित करते हुए भारत में राज्य स्तर पर खाद्य सुरक्षा के माप की बाधाओं को दूर करने के लिए एक सरल लेकिन मजबूत दृष्टिकोण प्रदान करने का प्रयास करता है। यह डेटा अंतराल की पहचान करके और खाद्य सुरक्षा के लिए उपयुक्त संकेतकों के चयन में एक अनुकूलित दृष्टिकोण प्रदान करके, उपराष्ट्रीय स्तर पर खाद्य सुरक्षा सूचकांक विकसित करके किया जाता है। यह सूचकांक खाद्य सुरक्षा में राज्यों के प्रदर्शन और इसके आयामों और ध्यान केंद्रित करने वाले क्षेत्रों का आकलन करने में मदद करता है। इसके अलावा, अध्ययन भारत में घरेलू खाद्य अपशिष्ट को मापने का एक पायलट प्रयास भी करता है।

अध्ययन के निष्कर्षों से पता चलता है कि क्षेत्रीय स्तर पर एक व्यापक खाद्य सुरक्षा ढांचा अभी भी न केवल भारत में बल्कि दुनिया भर में विकसित हो रहा है। अध्ययन में पाया गया है कि क्षेत्रीय स्तर पर राज्य स्तर पर खाद्य सुरक्षा प्राप्त करने के लिए विभिन्न समाधानों के साथ-साथ विविध सामाजिक, आर्थिक और पारिस्थितिक चुनौतियों का सामना करना पड़ता है। अध्ययन में भारत के लिए 50 संकेतकों वाले सबसे अधिक प्रतिनिधि संकेतक सेट की पहचान की गई है, जिसमें खाद्य सुरक्षा, सामर्थ्य, उपलब्धता, गुणवत्ता और सुरक्षा और स्थिरता और अनुकूलन के सभी चार आयाम शामिल हैं। इसके साथ ही, हम राज्यों में खाद्य सुरक्षा डेटा की स्थिति का विश्लेषण करने के लिए डेटा गैप और उपलब्धता अभ्यास भी करते हैं। यह पाया गया कि राज्य स्तर पर खाद्य सुरक्षा संकेतकों का वैश्विक संकेतकों के साथ सटीक मिलान केवल 14.47% था, जो देश में सांख्यिकीय क्षमताओं को बढ़ाने और सर्वेक्षण अभ्यासों में सुधार की तत्काल आवश्यकता को दर्शाता है।

अध्ययन में केरल, पंजाब और हरियाणा में उच्च खाद्य सुरक्षा प्रदर्शन पाया गया। सभी आयामों में केरल के उच्च प्रदर्शन का श्रेय उच्च खाद्य सुरक्षा, कम गरीबी, कम भ्रष्टाचार, कम भूमि क्षरण, जल संसाधनों का उचित उपयोग और उच्च आपदा प्रतिरोध को जाता है। पंजाब और हरियाणा का अच्छा प्रदर्शन विशेष रूप से अच्छे पोषण सेवन और सूक्ष्म पोषक तत्वों की उपलब्धता के साथ गुणवत्ता और सुरक्षा आयाम में प्रदर्शन के कारण है।

उद्देश्य तीन में, अध्ययन से पता चलता है कि घर में बर्बाद होने वाला अधिकांश भोजन अधिक पकाने के कारण होता है या पिछले भोजन से बचा हुआ होता है। घरेलू भोजन की बर्बादी का एक प्रमुख घटक होने के कारण बचा हुआ खाना बढ़ते श्रमिक वर्ग और शहरीकरण से जुड़ा हो सकता है। यह भी देखा गया कि खाद्य उपभोग प्रबंधन गतिविधियाँ घरों में बर्बाद होने वाले भोजन की मात्रा निर्धारित करने में महत्वपूर्ण भूमिका निभाती हैं। अध्ययन में घरेलू भोजन की बर्बादी की मात्रा पर COVID-19 महामारी के प्रभाव को भी पकड़ने का प्रयास किया गया है।

अध्ययन नीति निर्माताओं, कार्यान्वयन के साथ-साथ निगरानी एजेंसियों और सामाजिक वैज्ञानिकों को विभिन्न सुझाव देता है। अध्ययन की मुख्य सिफारिशों में से एक हैं: (i) खाद्य सुरक्षा सूचकांक मजबूत और कुशल पद्धति के साथ बनाया जाना चाहिए। (ii) खाद्य सुरक्षा संकेतकों का चयन करते समय, स्थानीय खाद्य सुरक्षा अध्ययन और राज्य सरकारों के प्रयासों को ध्यान में रखा जाना चाहिए, (iii) सांख्यिकीय दक्षता, आर्थिक संसाधनों, डेटा उपलब्धता और प्रचलित सर्वेक्षणों के निर्माण की नियमित समीक्षा की सलाह दी जाती है, (iv) खाद्य असुरक्षा वाले राज्यों द्वारा अपने क्षेत्र के बेंचमार्क राज्य से उदाहरण लेते हुए उनके प्रदर्शन के आधार पर प्रयास किए जाने चाहिए, (v) भारत में सामाजिक संरचना के आधार पर घरेलू भोजन की बर्बादी को मापने के लिए उचित पैमाने की उनकी आवश्यकताएं, (vi) उनकी आवश्यकताएं बढ़ते शहरीकरण और पश्चिमी

जीवनशैली की नकल के कारण घरों में खाद्य प्रबंधन प्रथाओं की जागरूकता की कमी पर देश में अधिक जागरूकता।

इस अध्ययन के परिणाम और निष्कर्ष भारत और अन्य विकासशील देशों में विद्वानों और सरकारों (राष्ट्रीय और साथ ही राज्य) के लिए उनकी पहुंच और प्रभावशीलता में सुधार के लिए उनकी राष्ट्रीय खाद्य सुरक्षा कार्यान्वयन रणनीतियों को फिर से डिजाइन करने और जांच करने में उपयोगी होंगे।

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