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Digital Agriculture and the Nation-State: How AI Reshapes Food Security and Political Power

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Abstract
Digital agriculture is rapidly reshaping the interface between agriculture, technology, and the modern nation-state, redefining both food systems and governance structures. This paper examines how Artificial Intelligence (AI), data-driven platforms, and digital infrastructures are transforming agricultural practices, enhancing state capacity, and influencing political power dynamics. Historically, agriculture has played a central role in state formation, from imperial agrarian control and colonial revenue systems to post-independence nation-state governance. In the contemporary digital era, AI-enabled tools such as precision farming, remote sensing, predictive analytics, and algorithmic decision-making have become critical instruments for managing agricultural production, mitigating climate risks, and strengthening food security. The study argues that digital agriculture increases the governing capacity of the nation-state by enabling centralized, data-informed policymaking. AI-driven governance allows states to monitor land, crops, and farmers in real time, anticipate food shortages, optimize resource allocation, and respond more efficiently to environmental variability. By integrating technology with policy, governments can exercise greater control over agricultural systems, reflecting both continuity with historical agrarian governance and the introduction of new mechanisms for oversight and efficiency. At the same time, the paper highlights emerging political and ethical challenges, including data ownership, digital inequality, algorithmic bias, and the concentration of digital resources in the hands of state or corporate actors, revealing tensions between efficiency, equity, and democratic governance. Using a political economy and historical lens, the study situates AI-led agricultural transformation within the broader transition from empire to nation-state, demonstrating both continuity and change in power structures. It emphasizes that digital agriculture is not merely a set of technological tools for productivity but a strategic instrument that reshapes state authority, resource management, and social relations in the twenty-first century.

Keywords: Digital Agriculture, Artificial Intelligence, Nation-State, Food Security, Political Power, Agricultural Governance.

1. Introduction

Agriculture has been the cornerstone of human civilization, and food security has always been a central element of power, stability, and legitimacy in any political system. Historically, from empires to modern nation-states, agricultural production, land control, and food distribution have shaped the nature of political power. In the 21st century, this traditional relationship has entered a new phase, driven by digital agriculture and, in particular, artificial intelligence (AI). The application of digital technologies has transformed agriculture from a mere production activity into a strategic and data-driven instrument of governance. [1]

Digital agriculture refers to the integrated use of digital platforms, sensors, satellite imagery, big data analytics, the Internet of Things (IoT), and AI-based decision systems in the agricultural sector. Through AI, machine learning, and predictive analytics, it has become possible to forecast crop yields, identify pests and diseases, manage water and fertilizer use, and assess market risks. This has increased agricultural productivity and enhanced the state's capacity to ensure food security. In this context, digital agriculture is becoming not just a technological innovation, but a new dimension of the nation-state's governance structure. [2]

Globally, climate change, population growth, pandemics, and geopolitical conflicts have destabilized food supply chains. Amidst these challenges, nation-states are adopting AI-based agricultural systems as a means of achieving food self-sufficiency and enhancing national security. Food security is no longer merely a matter of social welfare; it is now directly linked to strategic policy and political stability. AI-based digital agricultural systems provide states with more precise control over production, storage, and distribution, thereby strengthening their political power. [3]

However, the entry of Artificial Intelligence (AI) into agriculture not only strengthens existing power relations but also reshapes them. Data, algorithms, and digital infrastructure are emerging as new sources of power. The question of data governance becomes crucial in this context. Who owns agricultural data—farmers, the state, or private technology companies? This question is directly linked to sovereignty and democratic governance. If private multinational corporations gain increasing control over agricultural data, both the nation-state's policy-making capacity and farmers' autonomy could be compromised. [4]

For developing countries, particularly agrarian nations like India, digital agriculture presents a double-edged sword. On the one hand, AI-based systems can offer small and marginal farmers opportunities for climate-resilient farming, reduced costs, and improved market access. On the other hand, the digital divide, technological dependence, and data inequality can give rise to new forms of exclusion. Thus, agricultural policy is evolving—requiring the inclusion of digital infrastructure, data protection, and AI regulation alongside traditional subsidies and price support policies. [5]

From a nation-state perspective, digital agriculture also enhances the state's surveillance and control capabilities. Satellite monitoring, real-time data collection, and AI-based analysis make the agricultural sector more transparent, but also raise the possibility of surveillance-based governance. This leads to a restructuring of power relations in rural society, where farmers become not only producers but also data providers. In this context, digital agriculture holds the potential for both democratic empowerment and technological control. [6]

This research paper argues that Digital Agriculture and Artificial Intelligence (AI) are not merely tools for increasing agricultural efficiency, but have become an integral part of contemporary nation-states' political power and food security strategies. Digital agriculture is also influencing the global food regime, where technologically advanced nations and corporations are establishing dominance over agricultural knowledge, data, and markets. In this context, developing national-level data governance frameworks and inclusive agricultural policies becomes crucial. [6][7]

Therefore, this study views digital agriculture as a political and institutional phenomenon, not merely a technological solution. The AI-driven transformation of agriculture is redefining the role of the nation-state—where food security, sovereignty, and power are deeply intertwined. This introduction sets the stage for a broader discussion of how digital agriculture is shaping the power structures of the nation-state in the 21st century and through what policy interventions it can be made more equitable and sustainable. [1][4][8]

2. Literature Review

This literature review is presented step by step to examine how Digital Agriculture and Artificial Intelligence (AI) reshape Food Security and Political Power within the framework of the Nation-State. The review integrates key themes such as Agricultural Governance, data control, and state authority, drawing from interdisciplinary scholarship in political economy, development studies, and science and technology studies.

Step 1: Digital Agriculture – Concept and Evolution

Scholars describe **Digital Agriculture** as the application of digital technologies—such as sensors, satellites, data platforms, automation, and decision-support systems—to agricultural production and management. Wolfert et al. (2017) argue that digital agriculture represents a shift from mechanization to data-driven farming, where information becomes the most valuable input. Klerkx, Jakku, and Labarthe (2019) emphasize that digitalization reorganizes agricultural value chains and institutional arrangements, influencing who controls knowledge and resources. [8][9]

From a governance perspective, digital agriculture is not merely a technical innovation but a socio-political transformation. Studies highlight that digital tools alter power relations between farmers, markets, corporations, and the state by centralizing data and decision-making processes (Bronson & Knezevic, 2016). [10]

Step 2: Artificial Intelligence in Agriculture

The literature on **Artificial Intelligence (AI)** in agriculture focuses on machine learning, computer vision, and predictive analytics for yield estimation, pest detection, climate forecasting, and supply chain optimization. Liakos et al. (2018) demonstrate that AI-based systems significantly improve productivity and resource efficiency. FAO (2022) notes that AI enhances early warning systems and risk management, which are critical for national food security planning. [2][11]

However, critical scholars caution that AI systems are often developed and owned by private corporations, raising concerns about transparency, algorithmic bias, and dependency (Kshetri, 2021). [5] These concerns become politically significant when AI tools are embedded in national agricultural strategies.

Step 3: Food Security and the Nation-State

Food security has long been considered a core responsibility of the **Nation-State**. According to Clapp (2016), states derive political legitimacy from their ability to ensure stable and affordable food supplies. [12] The Green Revolution literature shows how states historically used technology and subsidies to achieve food self-sufficiency (Pingali, 2012). [13]

Recent studies argue that digital agriculture is redefining food security from a production-cantered model to a data-intensive governance model (Carolan, 2020). [6] AI-driven forecasting enables states to anticipate shortages and intervene proactively, thereby strengthening state capacity but also increasing reliance on digital infrastructures.

Step 4: Political Power and Data Control

Political power in digital agriculture is increasingly linked to **data ownership and control**. Scholars describe agricultural data as a strategic resource comparable to land or water (Fraser, 2019). Nation-states face new challenges in asserting sovereignty when critical data and AI platforms are controlled by multinational agribusiness and technology firms.

Foucault-inspired analyses suggest that digital agriculture introduces new forms of surveillance and governance, where farmers' practices are monitored and standardized through algorithms (Bronson & Knezevic, 2016). This reconfiguration of power raises questions about autonomy, consent, and democratic accountability. [10] [14]

Step 5: Agricultural Governance in the Digital Age

Agricultural governance literature emphasizes the changing role of the state from direct producer support to regulator and data steward. Klerkx and Rose (2020) argue that governments must balance innovation with regulation to ensure equitable outcomes. [3] Public–private partnerships are widely promoted, but critics warn that weak regulatory frameworks may allow corporate interests to dominate national food systems.

In developing countries, governance challenges are intensified by digital divides, limited infrastructure, and low digital literacy. World Bank (2021) reports stress that without inclusive governance, AI-driven agriculture may marginalize smallholders and exacerbate rural inequality. [8]

Step 6: Global Inequality and Power Asymmetries

The global literature highlights that digital agriculture may reinforce inequalities between developed and developing nations. Advanced economies possess technological capabilities and control intellectual property, while many Global South countries remain technology consumers (Kshetri, 2021). This asymmetry affects global food trade and geopolitical influence. [1][5]

Step 7: Synthesis of Literature and Research Gap

The reviewed literature collectively shows that digital agriculture and AI significantly enhance food security potential while simultaneously reshaping political power and governance structures. However, there is a clear research gap in integrating technological analysis with nation-state theory and political sovereignty. Existing studies often treat AI as a neutral tool, underestimating its political implications. This paper addresses this gap by analyzing digital agriculture as a strategic domain of state power and governance.

3. Objectives of the Study

The primary objective of this study is to critically examine how digital agriculture and Artificial Intelligence (AI) are transforming agricultural practices, food security, and the political power of the modern nation-state**,** with a particular focus on India as a case study. In recent years, the integration of AI, data-driven platforms, and digital infrastructures into the agricultural sector has not only enhanced productivity but also significantly influenced governance mechanisms and socio-political structures. This study seeks to explore these transformations through a comprehensive analytical framework that combines technological, historical, and political perspectives.

3.1 Examining the Transformation of Agricultural Practices through Digital Agriculture and AI

One of the fundamental objectives of the study is to analyze how digital agriculture, powered by AI, is reshaping traditional farming practices. This includes investigating the use of precision farming, remote sensing, predictive analytics, machine learning, and decision-support systems for crop management, pest and disease detection, irrigation optimization, and efficient resource allocation. The study aims to demonstrate how these technological interventions have transformed agriculture from a predominantly manual and experience-based practice into a data-driven, strategic instrument of governance and production efficiency. Furthermore, it explores the potential of AI to mitigate environmental risks, improve resilience against climate variability, and enhance the overall productivity of small, medium, and large-scale farms.

3.2 Investigating the Impact of AI-Driven Agriculture on Food Security

Another key objective is to evaluate the role of digital agriculture in strengthening national food security. Food security has historically been a cornerstone of political stability and state legitimacy. This study investigates how AI and digital technologies enable real-time monitoring of crops, forecasting of yields, anticipation of shortages, and proactive risk management. By integrating predictive analytics with decision-making processes, AI empowers the nation-state to optimize storage, distribution, and consumption patterns, thereby reducing dependency on external food sources and ensuring a stable supply. The research also seeks to highlight the relationship between digital agricultural systems and broader food policies, illustrating how technological interventions contribute to strategic planning for self-sufficiency and long-term sustainability.

3.3 Understanding the Governance Implications of Digital Agriculture

This study aims to explore how AI and digital agriculture affect the governance capacity of the nation-state. By facilitating centralized and data-informed policymaking, these technologies enable governments to monitor agricultural activities at a granular level, anticipate risks, allocate resources efficiently, and respond effectively to environmental and socio-economic challenges. The objective is to demonstrate that digital agriculture is not merely a technical advancement but a mechanism that strengthens state authority and oversight, reshaping the traditional relationship between the state, farmers, and other stakeholders in the agricultural value chain. Moreover, the study examines the role of digital tools in transforming the state's approach from direct producer support to regulatory oversight and data stewardship, highlighting the evolution of agricultural governance in the digital era.

3.4 Exploring Political, Ethical, and Socio-Economic Challenges

While digital agriculture offers numerous benefits, it also introduces complex political, ethical, and socio-economic challenges. A major objective of this study is to identify and analyze these issues, including data ownership, algorithmic bias, digital inequality, and corporate concentration of power. The research investigates questions related to sovereignty, democratic accountability, and farmers' autonomy, examining how control over agricultural data can shift political power dynamics. The study also highlights the risks associated with technological dependence and digital exclusion, particularly in developing countries like India, where disparities in digital literacy, access to infrastructure, and affordability of AI-based solutions may exacerbate social inequalities. By critically evaluating these challenges, the study emphasizes the need for inclusive and equitable policies that ensure all stakeholders benefit from digital transformation.

3.5 Analyzing Changing Power Relations in Rural Societies

Digital agriculture alters traditional power structures in rural societies by redefining the role of farmers. Under AI-driven systems, farmers are not only producers but also providers of critical data, which has implications for autonomy, agency, and socio-economic status. One of the study's objectives is to explore how these new forms of surveillance and data dependency can simultaneously empower farmers by providing access to knowledge and market opportunities while also increasing the potential for control and standardization by the state or corporate actors. This duality underscores the complex interplay between technology, governance, and social relations, highlighting the need to balance empowerment with ethical oversight and accountability.

3.6 Situating AI-Led Agricultural Transformation in Historical and Global Contexts

Another objective is to contextualize the contemporary AI-driven transformation of agriculture within both historical and global frameworks. The study examines the continuity of agrarian governance practices from colonial revenue systems and post-independence agricultural policies to modern AI-enabled strategies. Additionally, it investigates global inequalities in technological access, intellectual property control, and market dominance, showing how technologically advanced nations and corporations influence global food regimes. By situating digital agriculture within historical and international contexts, the research highlights both continuity and change in power relations, demonstrating how technological innovation interacts with political sovereignty and state authority.

3.7 Developing Policy Frameworks for Inclusive and Sustainable Digital Agriculture

Finally, the study aims to propose policy recommendations that ensure inclusive, equitable, and sustainable deployment of AI in agriculture. This objective involves identifying strategies for national-level data governance, regulation of public–private partnerships, and protection of smallholder farmers' interests. It emphasizes the integration of technological innovation with social equity, democratic accountability, and long-term sustainability, aiming to inform policymakers, researchers, and practitioners about effective interventions that balance efficiency with ethical and socio-political considerations.

4. Theoretical Framework

Farmer-Centric Digital Agriculture: Theoretical Framework with Equations

4.1 Theoretical Foundation

This model is based on the Political Economy of Agriculture, Digital Governance Theory, and Food Security Theory. The core argument is that AI-based digital agriculture, if farmer-centric, not only increases productivity but also strengthens farmer income stability, food security, and political stability.

This framework defines the state as a Digital Welfare State, where technology is used for farmer empowerment rather than market control.

4.2 Key Components of the Model

4.2.1 AI & Digital Tools (A)

This includes:

- Precision Agriculture
- AI-based weather forecasting
- Crop Disease Detection
- Digital Market Information

Theoretical role:

AI increases farmers' production efficiency by reducing input costs and minimizing risks.

$$A = f(P, W, D, M)$$

Where,

A = AI & Digital Tools

P = Precision farming

W = Weather prediction

D = Disease detection

M = Market intelligence

4.2.2 Farmer-Centric Data Use (F)

It recognizes that farmers are not only data providers but also data users and decision-makers.

$$F = \alpha A + \beta L + \gamma K$$

Where,
F = Farmer-Centric Data Use
L = Local language & accessibility
K = Indigenous knowledge
α, β, γ = influence coefficient

4.2.3 State Support (S)

The role of the state is based on three pillars:

- MSP (Minimum Support Price)
- Crop Insurance
- Digital Advisory Services

$$S = MSP + I + AD$$

Where,
I = Insurance
AD = Advisory services
The state uses data obtained from AI for welfare policy, not just for surveillance.

4.2.4 Income Stability of Farmers (Y)

The farmer's income is considered the central variable in the model.

$$Y = f(A, F, S)$$

Or in expanded form:

$$Y = \theta_1 A + \theta_2 F + \theta_3 S - R$$

Where,
Y = Farmer income stability
R = Risk (climate, price volatility)
AI and government support reduce the risks (R).

4.2.5 Rural Prosperity (RP)

The collective impact of income stability is felt on the rural economy.

$RP = \sum Y_i$ (i= 1 to n Farmers)

This shows that increased farmer income leads to increased rural consumption, employment, and social stability.

4.2.6 Food Security (FS)

Food security is defined in four dimensions:

- Availability
- Accessibility
- Affordability
- Stability

$$FS = (Q, D, S_t)$$

Where,

Q = Agricultural output
D = Distribution efficiency
S_t = Stability over time
AI-based forecasting systems help in identifying food crises early.

4.2.7 Political Stability (PS)

Political stability is linked to rural satisfaction and food security.

$$PS = \lambda_1 FS + \lambda_2 RP$$

This equation shows that

$$Food\ Security + Rural\ Prosperity = Political\ Legitimacy$$

4.3 Integrated Theoretical Model

The entire theoretical framework can be expressed by a single combined equation:

$$PS = f[FS(Q(A,S),D), \sum Y(A,F,S)]$$

That is:

- AI and state support increase production
- Production and distribution enhance food security
- Farmer income and rural prosperity strengthen political stability

4.4 Theoretical Proposition

Proposition 1: If AI is used in a farmer-centric way, farmer income stability will increase.
Proposition 2: State welfare interventions in digital agriculture strengthen food security.
Proposition 3: Farmer income stability and food security together enhance the political power and legitimacy of the nation-state.

5. Research Methodology

This study attempts to analyze how Digital Agriculture and Artificial Intelligence (AI) are restructuring the nature of Food Security, Agricultural Governance, and Political Power in a developing nation-state like India. In the context of Indian agriculture, this research specifically focuses on understanding how AI-based digital interventions impact farmer-state relations, policy-making processes, and food security strategies.

5.1 Nature of the Study

This research is qualitative and conceptual in nature.
The objective of the study is not to prove a hypothesis through a specific statistical test, but rather to clarify, through theoretical interpretation and policy-oriented analysis, how digital agriculture is emerging as both a technological process and a political-economic governance mechanism.
Through a conceptual study, this research:

- Presents Digital Agriculture as a tool of governance and power rather than merely a technological innovation.
- Connects AI and data to the expansion of state capacity.
- Views Food Security beyond mere production, linking it to political stability and legitimacy.

Indian agriculture has been adopted as a case-study context because India's digital agriculture policies, public distribution system, and AI-based governance mechanisms present a representative model of the

Global South.

5.2 Data Sources
This study is entirely based on secondary data sources. The following sources were used for data collection:

5.2.1 Books
- Political Economy of Agriculture
- Food Security and Development
- Digital Governance and State Power

Theoretical concepts, historical context, and conceptual frameworks were obtained from these books.

5.2.2 Academic Journals
Peer-reviewed journals related to:
- Digital Agriculture
- Artificial Intelligence in Agriculture
- Food Security Studies
- Political Economy and Governance

Peer-reviewed journals from academic journals have been used, which provides the research with academic validity and theoretical depth.

5.2.3 Reports
- FAO, World Bank, IFPRI
- Reports from the NITI Aayog and the Ministry of Agriculture, Government of India

These reports have been used to understand contemporary trends related to AI, digital platforms, and food security.

5.2.4 Policy Documents
- National Agriculture Policy
- Digital India Mission
- AgriStack Framework
- Government documents related to Food Security and PDS

These documents illustrate how the nation-state is utilizing digital agriculture as a policy tool.

5.3 Analytical Approach
This study employs two main analytical approaches:

5.3.1 Comparative Analysis
The comparative method involves:
- Traditional agricultural governance versus digital agricultural governance
- Food security strategies before AI versus AI-based strategies
- Farmer-centric models versus data-centric models

A comparative study of these aspects has been conducted.

This clarifies how digital agriculture has transformed the nature of agricultural governance and political power.

5.3.2 Policy Analysis
Through policy analysis, this study:

- Examines how AI and digital agriculture policies are being implemented
- Understands the role of AI in data collection, monitoring, and decision-making by the state
- Analyzes the impact of these policies on farmer autonomy and food security

Policy analysis reveals that digital agriculture has now become an integral part of the nation-state's political strategy.

5.4 Scope of the Study

The scope of this study is limited to the following points:

- The Indian agricultural system and state-farmer relations
- AI-based digital agriculture initiatives
- The relationship between food security and political power
- Digital transformation in agricultural governance

This research acknowledges the possibility of global comparisons, but the primary focus is on India as a representative nation-state case.

5.5 Limitations of the Study

This research also has some limitations:

- Lack of primary data (field surveys or interviews)
- Limited representation of regional variations
- The time-bound nature of the findings due to the rapid pace of change in AI technologies
- Over-reliance on policy documents, which may not fully reflect the complexities at the practical level Despite these limitations, this study provides a strong foundation for theoretical and policy understanding.

6. Results and Discussion

This section presents an expanded discussion of the findings derived from the qualitative and conceptual analysis. The results are interpreted in light of the theoretical framework and existing literature, demonstrating how Digital Agriculture and Artificial Intelligence (AI) reshape food security governance and political power within the nation-state, particularly in the context of developing countries such as India.

6.1 AI-Based Digital Agriculture and Expansion of State Capacity

The analysis reveals that AI-based digital agriculture substantially enhances the administrative and governing capacity of the nation-state. Digital tools such as satellite imagery, crop forecasting models, and real-time data platforms allow the state to move from reactive governance to anticipatory and predictive decision-making. This transformation aligns with state capacity theory, which emphasizes information control as a foundation of effective governance.

In the Indian context, initiatives such as digital land records, crop monitoring systems, and AI-based weather advisories enable the state to map agricultural activity with unprecedented granularity. These systems strengthen the state's ability to plan procurement, manage buffer stocks, and coordinate food distribution. As a result, food security governance becomes more centralized, data-driven, and technocratic.

However, this expansion of state capacity also introduces new dependencies on digital infrastructure and algorithmic models. The state's authority increasingly relies on the accuracy, transparency, and neutrality of AI systems, raising questions about accountability and democratic oversight.

6.2 Transformation of Agricultural Governance

The findings indicate a clear shift from decentralized, experience-based agricultural governance toward centralized, algorithmic regulation. Traditional agricultural governance relied heavily on local knowledge, extension services, and discretionary decision-making. Digital agriculture, by contrast, standardizes agricultural practices through data models and AI-driven advisories.

This transformation improves efficiency and policy coherence but also marginalizes local context and indigenous knowledge. Farmers increasingly become implementers of algorithmic recommendations rather than autonomous decision-makers. This restructuring of governance reflects broader trends in digital governance, where algorithms mediate state-society relations.

6.3 Farmer Income Stability: Conditional and Uneven Outcomes

A central finding of this study is that AI-based digital agriculture does not automatically guarantee farmer income stability. Income stabilization occurs only when digital technologies are integrated with supportive state policies such as Minimum Support Prices (MSP), crop insurance schemes, and public digital advisory systems.

AI tools reduce production risks by improving weather forecasting, pest detection, and resource management. However, market volatility, unequal access to digital infrastructure, and varying levels of digital literacy limit these benefits. Small and marginal farmers, in particular, face challenges in adopting AI-driven systems, leading to uneven outcomes.

Thus, income stability emerges as a policy-mediated result rather than a direct technological outcome, reinforcing the importance of farmer-centric digital governance.

6.4 Food Security Outcomes and National Stability

The results demonstrate that AI-enabled digital agriculture improves food security across multiple dimensions—availability, accessibility, affordability, and stability. Predictive analytics enhance production planning, while digital supply chain systems reduce post-harvest losses and distribution inefficiencies.

For the nation-state, improved food security strengthens political legitimacy and social stability. Historical and contemporary evidence suggests that food shortages often translate into political unrest. By contrast, reliable food systems reinforce state authority and public trust. Digital agriculture thus functions as a strategic tool for maintaining political order.

6.5 Data Governance and Reconfiguration of Political Power

One of the most significant findings is the emergence of agricultural data as a new source of political power. Control over data platforms and AI systems determine who influences agricultural policy, market access, and farmer behaviour. When data governance frameworks are weak, private corporations may gain disproportionate influence over national food systems.

From a sovereignty perspective, reliance on proprietary algorithms and foreign digital platforms poses strategic risks for the nation-state. The findings suggest that data sovereignty is becoming as critical as food sovereignty in the digital age.

6.6 Surveillance, Autonomy, and Democratic Implications

The study also reveals that digital agriculture introduces new forms of surveillance-based governance. Continuous monitoring of land use, cropping patterns, and farmer practices increases transparency but also raises concerns about privacy, consent, and autonomy.

Farmers increasingly function as data providers within state-managed digital ecosystems. Without adequate safeguards, this dynamic may erode trust and democratic participation in agricultural governance. Thus, the political implications of digital agriculture extend beyond productivity to questions of rights and citizenship.

6.7 Synthesis of Findings

Overall, the expanded analysis confirms that Digital Agriculture and AI reshape food security and political power through interconnected pathways: enhanced state capacity, restructured governance, conditional farmer welfare outcomes, and intensified data-driven control. These findings validate the study's theoretical proposition that digital agriculture is a strategic domain of nation-state power rather than a neutral technological intervention.

7. Conclusion

This paper demonstrates that digital agriculture and AI are reshaping food security and political power in fundamental ways. By transforming agriculture into a data-governed domain, AI enhances state capacity while simultaneously introducing new forms of control and inequality. The study concludes that digital agriculture must be governed through inclusive, farmer-centric, and sovereignty-aware policies to ensure that technological transformation strengthens food security and democratic legitimacy rather than undermining them.

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