



EMERGING PATTERNS IN POTATO PRODUCTION AND PRODUCTIVITY WITH REFERENCE TO HOOGHLY DISTRICT, WEST BENGAL

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Abstract:

The production of potatoes in the Hooghly district of West Bengal has seen considerable modification in recent decades. The district maintains a preeminent role in state potato production, accounting for the majority of overall output and serving as a central agricultural hub due to its fertile alluvial soils, advantageous agro-climatic conditions, and established irrigation infrastructure. Emerging trends demonstrate a consistent growth in cultivated area coupled with a significant rise in total production, especially in recent years due to advantageous winter conditions and enhanced inputs leading to increased yields. Technological developments, such as high-yielding cultivars, fertilisers, and cold storage facilities, have enhanced production; nonetheless, obstacles remain in achieving fair productivity growth across all regions. A significant development is the growing commercialisation of potato cultivation, along with enhanced market connections and storage facilities. Agricultural producers frequently encounter financial hardship due to variable market pricing, elevated input expenses, and supply chain inefficiencies, which diminish profitability despite substantial production volumes. The growing pattern in Hooghly illustrates a conundrum of significant output increase alongside inconsistent productivity and market volatility. In this article; emerging patterns in potato production and productivity with reference to Hooghly district, West Bengal has been discussed.

Keywords: Potato, Production, Productivity, Hooghly District, West Bengal.

INTRODUCTION:

Potato agriculture holds a crucial role in the agricultural economy of West Bengal, ranking as one of the most significant commercial food crops behind cereals. The state is acknowledged as the second-largest potato producer in India, significantly contributing to national output and playing a vital role in food security and farmers' lives. Historically, the Hooghly district has been the principal centre of potato growing in the state, frequently accounting for over 40 per cent of total state production, thereby solidifying its status as a prominent potato-producing area. Hooghly's supremacy in potato production is chiefly ascribed to its fertile alluvial soil, advantageous agro-climatic conditions, advanced irrigation infrastructure, and enduring agricultural heritage. The advent of high-yielding cultivars, superior agronomic methods, and technology interventions have markedly boosted production and productivity levels throughout time. Consequently, potato growing has evolved from a subsistence endeavour into an economically successful sector in the district. In recent years, potato production in West Bengal, particularly in Hooghly, has seen significant growth tendencies. The state has experienced a consistent rise in cultivated area and overall output, with production around 14-15 million tonnes in recent agricultural seasons. This rise has been propelled by advantageous climatic circumstances, enhanced seed varieties, and the extension of arable land. Nonetheless, concurrent with heightened output, novel patterns have surfaced that signify both opportunities and challenges. Despite enhancements in production across several sectors due to enhanced inputs and irrigation, notable intra-district discrepancies remain, signifying unequal growth. Furthermore, factors like price volatility, insufficient storage capacity, escalating input prices, and market inefficiencies have progressively impacted the viability of potato cultivation in Hooghly. The examination of rising trends in potato output and productivity in the Hooghly area is of considerable importance. It aids in comprehending regional and temporal variations, discerning the variables affecting growth and inequalities, and assessing the obstacles encountered by farmers. This analysis is crucial for developing effective agricultural policies, enhancing production, and securing the economic stability of potato farmers in the region.

TRENDS IN AREA UNDER POTATO CULTIVATION:

The trend of potato cultivation area in Hooghly District exhibits an initial concentration, followed by progressive expansion and current oscillations driven by market and environmental factors. Historically, Hooghly has been the principal area for potato cultivation in West Bengal, characterised

by extensive lands dedicated to the crop, owing to its fertile alluvial soil and excellent agro-climatic conditions. It continues to represent a substantial portion of the state's potato acreage and production. The total area dedicated to potato farming in the state has consistently increased, rising from approximately 4.6 lakh hectares in 2022–23 to over 5.1 lakh hectares in recent years, reflecting a general upward trend, with Hooghly as a primary contributor. In recent seasons, the district has encountered minor instability in cultivated areas due to variables such as price volatility, flooding, and waterlogging, prompting some farmers to marginally reduce acreage. The emerging pattern indicates long-term growth accompanied by short-term variations, influenced by economic incentives and climatic uncertainties (Mundhe, F., 2015).

PRODUCTION TRENDS AND GROWTH PATTERNS:

The production trends and growth patterns of potatoes in Hooghly district, West Bengal, indicate a dynamic and predominantly upward trajectory, influenced by both an increase in cultivated area and enhancements in yield, albeit with occasional oscillations. Hooghly has consistently been the foremost potato-producing district in the state, accounting for almost 40% of overall output, so underscoring its pre-eminent role in the area's agricultural economy. Potato output in the district has exhibited a notable increase tendency, especially in the past decade. This growth is propelled by the introduction of high-yielding varieties (such as Kufri Jyoti), the expansion of irrigated agriculture, and the augmented utilisation of fertilisers and technological inputs. At the state level, production has escalated from around 100 lakh tonnes in 2022–23 to an anticipated 140–150 lakh tonnes in the next session, signifying a significant increase, with Hooghly serving as a pivotal production centre in this growth. The growth pattern is cyclical rather than precisely linear, shaped by environmental circumstances, market prices, and state actions. Prolonged favourable winter conditions and ideal temperatures during tuber development have resulted in abundant harvests and elevated productivity (often surpassing 30 tonnes per hectare in certain regions), whilst adverse weather phenomena such as flooding or waterlogging have intermittently diminished acreage and yield. A significant characteristic is the growth of production volatility associated with market dynamics. Excessive output frequently causes oversupply, resulting in price declines and forced sales by farmers, thus deterring expansion in the subsequent season. This cyclical interplay between production and price engenders alternating episodes of expansion and stagnation in output levels. The production trend in the Hooghly district has a long-term upward trajectory with short-term variations, influenced by technological progress, climatic sensitivity, and market-driven modifications. This signifies a shift from conventional

subsistence farming to a more commercialised and intensive agricultural framework; however, issues of price volatility and storage infrastructure persistently affect sustainable development (Haque, S., 2015).

PRODUCTIVITY PATTERNS AND YIELD VARIATIONS:

The implementation of micro irrigation devices and the provision of timely weather-based advisories via digital platforms have enhanced water usage and agricultural decision-making. behaviours about returns, affecting farmers production decisions, investment behaviours in behaviours utilising scientific techniques such as soil analysis, balanced fertilisation. The productivity patterns of potato production in the Hooghly region of West Bengal demonstrate a complex interaction between technological adoption, input intensity, and agro-climatic variables, resulting in significant yield discrepancies within blocks. Over time, the district has witnessed a steady rise in average yield per hectare, mostly attributed to the dissemination of high-yielding varieties, enhanced irrigation systems, and the application of chemical fertilisers and pesticides. Nonetheless, geographical discrepancies endure, as blocks with superior access to cold storage, market facilities, and extension services demonstrate more production than places with limited resources. Seasonal variations, erratic precipitation, pest invasions, and soil health deterioration further exacerbate interannual yield variability. Additionally, small and marginal farmers frequently have obstacles in obtaining excellent seeds and contemporary inputs, thus constraining their output potential. Consequently, although the general trend suggests an increase in potato output in Hooghly, the pattern is inconsistent, influenced by environmental conditions and socio-economic disparities among farming groups (Verma, A.R. & Rajput, A.M., 2000).

TECHNOLOGICAL INTERVENTIONS AND AGRICULTURAL PRACTICES:

The Hooghly district has experienced notable trends in potato production and productivity due to the use of new technology advancements and enhanced farming methods. The implementation of high-yielding and disease-resistant seed types, the growth of cold storage facilities, and the augmented utilisation of mechanisation, including power tillers and irrigation pumps, have improved yield and cropping intensity. Agriculturalists are favouring utilising scientific techniques such as soil analysis, balanced fertilisation, and integrated pest management, which diminish crop loss and enhance quality. The implementation of micro-irrigation devices and the provision of timely weather-based advisories

via digital platforms have enhanced water utilisation and agricultural decision-making. Moreover, institutional backing via government initiatives, agricultural cooperatives, and access to credit has enabled the dissemination of inventions, such as improved seed varieties and innovative farming practices, which are crucial for adapting to climate variability and enhancing productivity. marketing system's organisation These advances collectively signify a transition from conventional subsistence farming to more market-orientated, technology-driven potato growing, enhancing productivity and economic sustainability in the district.

IMPACT OF CLIMATE VARIABILITY ON PRODUCTIVITY:

The evolving trends in potato output and productivity in Hooghly district, West Bengal, indicate a significant correlation between agricultural outcomes and escalating climate variability. Despite Hooghly being a prominent potato-producing region, its productivity has exhibited a variable and unstable pattern throughout time, resulting in only minimal long-term yield growth despite an increase in cultivated area. Climate variability—specifically increasing temperatures, unpredictable precipitation, and altered seasonal patterns—has become a significant element affecting this instability. Research demonstrates that even a modest increase in temperature can markedly diminish potato yields, given the crop's acute sensitivity to heat stress during tuber development; anticipated warming scenarios predict yield reductions of approximately 6% in the short term and exceeding 10% in the long term, even when considering the effects of CO₂ fertilisation. Regional climate projections for areas such as Hooghly indicate increases in temperature and rainfall variability, potentially resulting in a significant decline in potato productivity—estimated at 23–32% by mid-century due to combined climatic stresses and heightened disease incidence, including late blight. Unseasonal precipitation and altered winter conditions interfere with planting timelines, diminish crop duration, and impact soil moisture levels, thus decreasing yield stability. The emerging pattern indicates that although technological inputs and irrigation have facilitated production growth, climate variability is progressively limiting productivity, requiring adaptive strategies such as climate-resilient varieties, modified sowing dates, and enhanced agro-management practices to maintain potato cultivation in Hooghly (Ghosh, N.P.G & Siddique, G., 2017).

MARKET DYNAMICS AND PRICE FLUCTUATIONS:

Market dynamics and price changes significantly influence the evolving trends of potato production and productivity in Hooghly district, West Bengal. The potato market in this region is extremely

volatile, principally influenced by variations in production, seasonal supply surpluses, storage limitations, and the pricing behaviour and organisation of the marketing system. Research demonstrates that potato prices in Hooghly display significant temporal fluctuations, mostly driven by variations in output rather than consistent demand conditions, resulting in fundamentally unstable Farmers are forced to sell promptly post-harvest when storage facilities reach full capacity or become prohibitively expensive, inundating the market and suppressing prices. price behaviour. An essential growing trend is the inverse correlation between production and prices. In years of abundant harvests—typically attributed to excellent weather and increased acreage—markets in Hooghly and other regions see substantial arrivals, resulting in oversupply and significant price declines. Recent trends indicate that farm-gate prices have plummeted to alarming levels, occasionally sinking beyond production costs due to surplus supply and constrained absorption capacity. This cyclical surplus dissuades farmers from investing in the subsequent season, ultimately affecting productivity trends over time. A significant factor is the insufficient cold storage infrastructure and elevated storage expenses, which exacerbate price volatility. Despite West Bengal's extensive cold storage infrastructure, it frequently falls short in relation to total production. When storage facilities attain full capacity or become prohibitively expensive, farmers are necessitated to sell promptly post-harvest, inundating the market and suppressing prices. This establishes a seasonal pricing pattern—lower prices during harvest and comparatively higher prices thereafter, favouring the government frequently postpones or inconsistently applies initiatives such as minimum support price (MSP), procurement, and stock limitations, which diminishes their efficacy in stabilising prices. traders over producers. The influence of intermediaries and market inefficiencies additionally affects price dynamics. A substantial disparity exists between farm-gate and retail prices, resulting in farmers receiving minimal returns while urban customers incur elevated costs. This imbalance results from various tiers of traders, the farmers diminished bargaining power, and restricted direct marketing avenues. These inefficiencies diminish farmers' economic security and dissuade investments that enhance production. Furthermore, policy interventions and market rules exhibit a varied impact. Government initiatives, including minimum support price (MSP), procurement, and stock limitations, are frequently postponed or used inconsistently, diminishing their efficacy in price stabilisation. Consequently, farmers in Hooghly are vulnerable to market uncertainties, impacting their planting decisions and long-term productivity patterns. The market dynamics of Hooghly's potato sector exhibit significant price volatility, seasonal supply discrepancies, storage constraints, and structural inefficiencies in marketing channels. These factors collectively create uncertainty in the rate of uncertainty in the use of mechanisation in returns,

affecting farmers' production decisions, investment behaviours, and ultimately the productivity trajectory of potato agriculture in the district (Shaw, M., & Topno, S., 2022).

STORAGE INFRASTRUCTURE AND POST-HARVEST MANAGEMENT:

The Hooghly district of West Bengal has become a prominent centre for potato production, with significant enhancements in yield and cropping intensity through the implementation of high-yielding varieties, mechanisation, and improved irrigation techniques. The sustainability of this expansion is intricately linked to the advancement of storage facilities and effective post-harvest management. The extensive development of cold storage facilities has diminished urgent distress sales and allowed farmers to strategically time the market, thus improving revenue stability. Nonetheless, obstacles remain regarding inequitable access to storage, elevated storage expenses, and energy limitations, which disproportionately impact small and marginal farmers. Post-harvest losses resulting from insufficient grading, packaging, and transportation systems persist in constraining total productivity improvements. Thus, emerging trends suggest that although production has markedly increased, future advancements in Hooghly's potato economy will rely on enhancing decentralised cold storage systems, optimising supply chain integration, and implementing scientific post-harvest techniques to reduce losses and achieve improved price realisation (Ray, K.S. & Datta, D., 2020).

ECONOMIC VIABILITY AND FARMER CHALLENGES:

The potato economy of Hooghly district, a prominent potato-producing area in West Bengal, presents a conundrum in which heightened production and productivity have not resulted in enhanced economic sustainability for farmers. In recent years, advantageous meteorological conditions, increased farmed land, and the adoption of high-yielding cultivars like Jyoti and Pokhraj have markedly enhanced production, frequently leading to abundant harvests. This increase in production has resulted in persistent oversupply in the market, leading to a significant decrease in farm-gate pricing, often dropping below cultivation costs. Farmers in Hooghly frequently face elevated input costs—spanning costly seeds, fertilisers, irrigation, and manpower (about ₹30,000–33,000 per bigha)—yet are obligated to sell at distress rates due to insufficient price support mechanisms and ineffective procurement processes. A significant difficulty impacting economic viability is the discrepancy between production and market absorption capacity. The state's cold storage infrastructure, while reasonably advanced, is inadequate and expensive, compelling small and marginal farmers to sell

promptly post-harvest. Increasing storage fees, electricity expenses, and previous instances of missed payments further dissuade storage, resulting in distress sales during peak arrival times. The involvement of numerous intermediaries in the supply chain exacerbates the disparity between farm-gate and retail prices, denying farmers equitable returns despite elevated consumer costs. Agricultural producers encounter structural and institutional obstacles, including insufficient enforcement of minimum support price (MSP), restricted access to formal financing, and reliance on private traders or microfinance institutions that impose elevated interest rates. Market volatility, disorganised marketing channels, and insufficient connections with processing sectors exacerbate the dilemma. Occurrences of substandard or irregular production, frequently attributable to seed problems, diminish marketability and revenue. The growing trend in Hooghly reveals a crisis characterised by "high production but low profitability", where economic sustainability is compromised by price volatility, infrastructural deficiencies, and regulatory inefficacies. Mitigating these issues necessitates the enhancement of procurement procedures, the expansion of cold storage and processing facilities, the improvement of market linkages, and the assurance of higher price realisation to safeguard farmers' livelihoods (Mondal, T. K & Mitra, C., 2005).

REGIONAL DISPARITIES WITHIN HOOGHLY DISTRICT:

Regional inequalities in potato output and productivity within Hooghly district illustrate variability in agro-ecological conditions, irrigation availability, soil fertility, and infrastructural development among several blocks. Regions like Arambagh and Tarakeswar demonstrate enhanced production owing to superior irrigation systems, fertile alluvial soils, and increased utilisation of high-yielding varieties and contemporary agricultural practices. Conversely, blocks like Balagarh and Pandua frequently underperform due to relatively inadequate irrigation coverage, fragmented landholdings, and restricted access to institutional loans and storage facilities. The intra-district disparities are exacerbated by variations in market connectivity and the availability of cold storage facilities, which substantially affect farmers' ability to keep goods and prevent distress sales. Thus, although Hooghly is a prominent potato-producing district in West Bengal, its internal regional disparities present obstacles to equitable agricultural development and necessitate focused, location-specific policy measures.

EMERGING PATTERNS AND RECENT DEVELOPMENTS:

The evolving trends and recent advancements in potato production and productivity in the Hooghly district of West Bengal indicate a shift towards high-yield, market-focused agriculture, propelled by advantageous agro-climatic conditions, technical innovations, and increased cultivation. Hooghly remains the preeminent force in the state's potato economy, accounting for a significant portion of overall production, with enhanced yields in various blocks attributed to superior seed varieties, irrigation, and modern agricultural methods. In recent years, production has significantly increased. Farmers face economic viability and challenges with West Bengal anticipated to achieve a record 140–150 lakh tonnes in upcoming session aided by excellent winter conditions and some expansion of planted land, especially in key producing districts like Hooghly. Simultaneously, growing trends reveal structural concerns, including regional productivity differences, variable acreage resulting from price volatility, and heightened susceptibility to climatic events such as flooding and atypical rainfall. A significant recent trend is the increasing disparity between production and market realisation—abundant harvests frequently result in oversupply, insufficient cold storage capacity, and distress sales, which negatively impact farmer income despite elevated productivity. The district demonstrates a twofold pattern of technological progress and increased productivity, constrained by market, infrastructural, and policy-related factors, which influence the current dynamics of potato agriculture (Ghosh, N.P.G & Siddique, G., 2016).

POLICY SUPPORT AND GOVERNMENT INTERVENTIONS:

Government policy support and institutional initiatives have been instrumental in influencing the evolving trends of potato output and productivity in Hooghly district. The Government of West Bengal has implemented price stabilisation measures, including the establishment of a minimum support price for potatoes, to avert distress sales during periods of surplus production, thus guaranteeing a minimum return for farmers. Furthermore, direct procurement initiatives—such as state-sponsored purchases via programs like Sufal Bangla—have diminished the influence of intermediaries and allowed farmers to secure reliable markets at equitable prices. Infrastructure support has been substantial, notably the allocation of approximately 30% of cold storage capacity for small and marginal farmers, enabling them to retain their produce and sell it later at more favourable prices. The dissemination of high-yielding and indigenous seed types, coupled with agricultural research initiatives such as the AICRP on Potato, has augmented productivity via increased cultivation methodologies. Moreover,

governmental initiatives to include potatoes in public distribution systems and welfare programmes, facilitate interstate commerce, and enhance marketing connections have collectively aided in stabilising production trends and enhancing farm-level results in Hooghly (Roy, A., 2019).

CHALLENGES AND FUTURE PROSPECTS:

The Hooghly district has become a prominent potato-producing area in West Bengal, indicating substantial alterations in production and productivity trends in recent decades. The rising utilisation of high-yielding varieties, the enhancement of irrigation systems, and enhanced availability of cold storage facilities have led to increased production and cropping intensity. Agricultural producers are progressively transitioning to market-orientated farming, facilitated by enhanced connection and integration with agro-processing entities. Nevertheless, other obstacles endure, including volatile market pricing, escalating input costs, diminutive and fragmented landholdings, insufficient storage capacity during peak seasons, and susceptibility to climatic variability such as atypical rainfall and temperature swings. Furthermore, challenges associated with pest infestations and excessive reliance on chemical inputs undermine sustainability. Future prospects involve fortifying farmer cooperatives, advancing sustainable agricultural practices, improving cold chain logistics, fostering value addition via processing industries, and enacting supportive governmental policies to stabilise prices and secure farmers' income in the region (Behera, B., 2015).

CONCLUSION:

The examination of potato output and productivity in Hooghly district indicates a dynamic and evolving agricultural environment marked by considerable growth and ongoing structural problems. Hooghly persists in its pre-eminence as the foremost potato-producing district in West Bengal, providing a significant portion—frequently exceeding 40%—to the state's overall yield, bolstered by fertile alluvial soil, advantageous agro-climatic conditions, and a longstanding legacy of intensive cultivation. A notable developing trend is the consistent rise in production and yield, propelled by the use of high-yielding varieties, enhanced irrigation systems, and superior agronomic methods. In recent years, excellent meteorological circumstances and a modest increase in cultivated area have significantly augmented output, with yields in certain regions surpassing 30 tonnes per hectare, signifying improved productivity levels. Nonetheless, inter-block discrepancies endure, with locations like Pursurah demonstrating significantly higher yield, but others such as Khanakul-II fall short due to variations in soil fertility, irrigation availability, and technological implementation. A notable trend

is the growing commercialisation and market focus of potato cultivation. Farmers in Hooghly are deeply integrated into regional and inter-state markets, indicating a transition from subsistence to market-orientated agriculture. This commercialisation is accompanied by price instability and economic susceptibility, as abundant production frequently results in oversupply, leading to distress sales and diminished farm-gate pricing. A significant increasing issue is the disparity between output growth and post-harvest infrastructure, especially regarding cold storage capacity. Despite significant production expansion, storage and marketing infrastructure have lagged, resulting in waste, compelled sales, and revenue volatility for farmers. Moreover, escalating input expenses, such as seeds and fertilisers, exacerbate profitability challenges despite increased yields. Environmental and climatic conditions also influence emerging trends. Favourable winters can markedly improve output, yet erratic rainfall, flooding, or waterlogging may diminish cultivation area and impact yields, underscoring the increasing need for climate resilience in potato agriculture. In conclusion, potato production in the Hooghly area exhibits a trend of significant productivity development alongside structural imbalances. The district's future viability relies on diminishing regional inequalities, enhancing storage and selling infrastructure, guaranteeing profitable prices, and fostering climate-resilient and technology-orientated agricultural methods. Failure to confront these difficulties may render increased production insufficient for enhancing farmers' livelihoods.

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