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ARTICLE

Agricultural experimental farms in nineteenth-century Bengal: Studying a colonial project

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Abstract
The history of science, technology, and medicine in South Asia has gained significant academic recognition in recent decades, with particular emphasis on India's contributions to global scientific discourse. Within this broader field, the history of agricultural science stands out as a crucial area of inquiry. Agriculture has traditionally been the backbone of the Indian economy, and from ancient times to the colonial period, it has held a central role in the country's socio-economic fabric. Recognizing its importance, the British colonial administration initiated systematic efforts to reform and modernize Indian agriculture in the early nineteenth century. Drawing on European models, particularly those in England and Germany, experimental farms were established as critical sites for implementing scientific agricultural practices in India. This article investigates the emergence and evolution of agricultural experimental farms in colonial India, with a specific focus on Bengal in the late nineteenth century. It explores the nature of experiments conducted on crops, farming techniques, and agricultural machinery, providing an overview of how these efforts shaped the trajectory of Indian agriculture. The study is grounded in both primary and secondary sources, including institutional and archival reports. Archival materials from the West Bengal State Archives have been systematically collected, historically interpreted, and scientifically analyzed to construct a foundational narrative. The article argues that these experimental farms served as crucial intersections of colonial policy, scientific inquiry, and agrarian transformation, thereby offering valuable insights into the process of agricultural modernization in colonial South Asia.

Keywords Indian agriculture · Experimental farms · Education · Agricultural science · Nineteenth century bengal · Crops · Manures

1 Introduction

Since antiquity, agriculture has remained the backbone of the Indian subcontinent's economy, with a substantial portion of national income deriving from agrarian activities. Beyond its economic centrality, agriculture has also held a pivotal place in Indian cultural life. This status persisted during the colonial period, when British administrative priorities began to align with the imperative of maximizing agricultural surplus for imperial extraction. By the early nineteenth century, the colonial government recognized the need to develop the Indian agricultural system to enhance productivity and ensure a steady supply of raw materials and food grains for British industries and consumption. As a result, agricultural science emerged as a focal point of colonial intervention.

In pursuit of this goal, the British administration adopted a three-pronged strategy to promote agricultural modernization, particularly in Bengal: organizing agricultural fairs and exhibitions to disseminate new ideas and techniques; incorporating theoretical instruction on agriculture within educational institutions; and most significantly, establishing experimental farms in various parts of the country to introduce and test scientific methods of cultivation. Globally, the establishment of experimental farms has been integral to agricultural education and innovation. As Professor Deepak Kumar observes, the role of experimental farms in agricultural science is analogous to that of laboratories in the natural sciences: they are essential for empirical observation, innovation, and applied learning (Kumar, 2006, p. 90).

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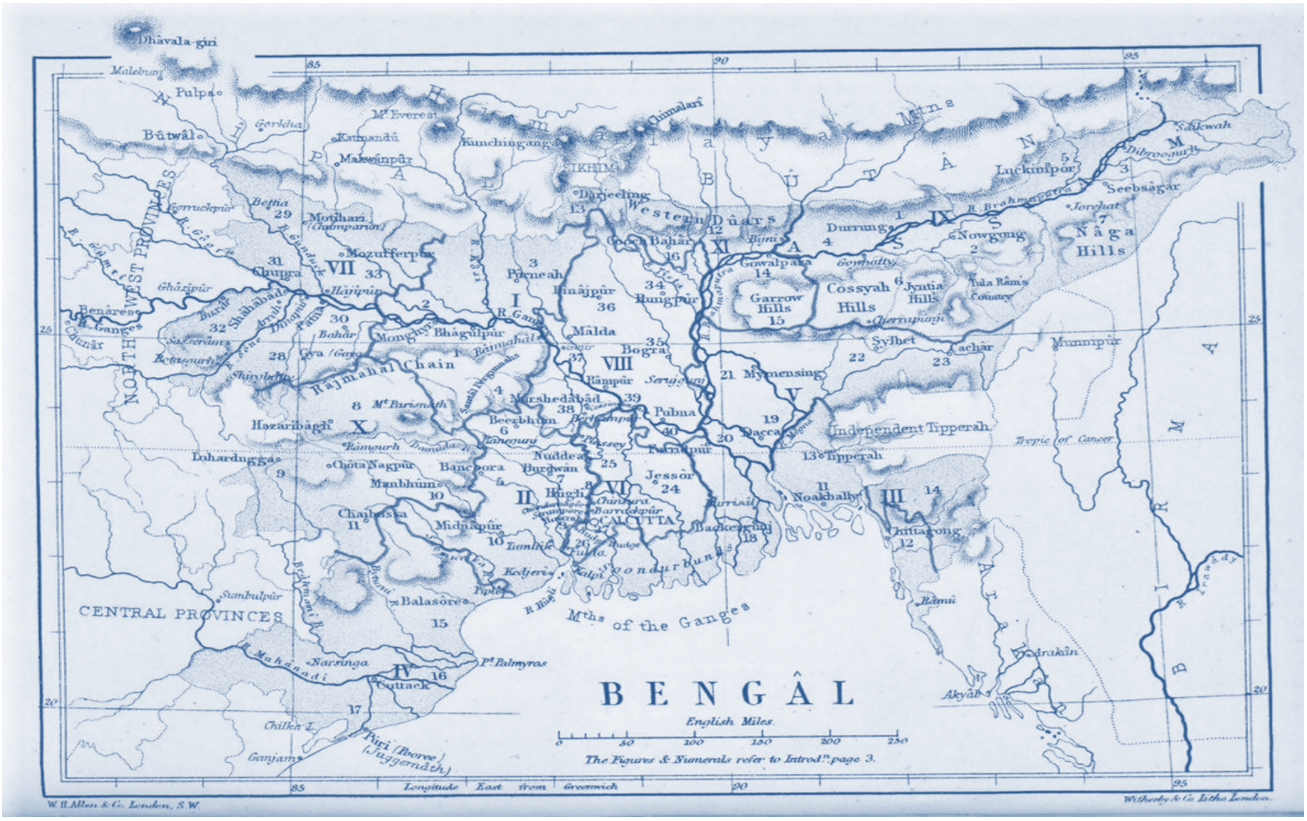


Fig. 1 Map of Bengal in 1880 CE (Pope, 1880, p. 574)

Before delving into the Indian context, it is necessary to define the concept of an experimental farm. Such a farm typically refers to a designated tract of land, developed through governmental, private, or collaborative efforts, supervised by trained agronomists, and established to test and adapt agricultural implements, evaluate the efficacy of manures, experiment with cropping techniques and rotations, and impart practical agricultural education to farmers. These farms served as sites for introducing new crop varieties, promoting modern farming equipment suited to Indian soil and climate, and encouraging local cultivators to adopt scientific knowledge (Kumar, 2006, pp. 90–91).

Current research either incorporates these farms into larger institutional narratives or examines agrarian knowledge through cultural, intellectual, or plantation-oriented lenses. This article aims to fill this gap by providing a preliminary historical account of the inception, development, and evolution of agricultural experimental farms in colonial Bengal. Utilizing archival records, official reports, and contemporary narratives, it reconstructs the origins, objectives, and development of these institutions, contextualizing them within the broader framework of colonial agrarian science and governance (Fig. 1).

2 Colonial agricultural policy and the emergence of experimental farms in India

The British government's agricultural policy in India can be divided into three stages. The first phase, from 1757 to 1820 CE, was a period during which the company sought to change the administrative structure by introducing various land revenue settlements to raise more revenue from agriculture. At that time, Lord Wellesley was the first to advocate for improving agriculture by applying scientific methods and establishing experimental farms to test new agricultural knowledge. He said that in order to increase the production of land and reduce the cost of production, it is necessary to cultivate in a modern progressive system, as a result of which new crops can be grown on the land, the productivity of the land can be increased, and the welfare of the natives can be enhanced. At the Governor General's request, an initiative was taken to establish an experimental farm at Barrackpore to improve Indian agriculture. Although Wellesley's application was rejected by higher authorities, the farm-building process was halted.[1]

[1] *Asiatic Annual Register*, Vol-ix, Minutes of the Governor General, Miscellany Appendix, Calcutta, 1809, p. 114.

The second phase was between the 1820s and 1860s; during that time, the government did not promote agricultural science on its own initiative but patronized various societies, such as the "Agri and Horticultural Society (1820), and they took various initiatives in the development of agriculture. Some initiatives were taken by the Agri-horticultural Society and the government in the second half of the nineteenth century. Fred J. Mouyet, the President of the Educational Council of the Bengal Public Instruction Department, visited Cuttack in 1851–1852 to inspect the school's infrastructure. He was fascinated by agricultural education there and realized its need in schools in Bengal. Then Mouyet recommended teaching agronomy and establishing an agricultural farm at Barasat District School. Mouyet said that the farm would be cultivated in an improved manner without changing the soil, and that the crop would be grown by testing different types of fertilizer. He also said that if it were possible to grow improved crops in this way by experimenting in schools, it would attract farmers from surrounding areas and thus improve agriculture in Bengal as a whole. Mouyet proposed engaging more boys from farming families on the farm for agricultural education and experimental farming.[2] In the wake of Fred Mouyet's proposal, three gardeners were initially appointed at Barasat district school in September 1852, at the initiative of the Public Instruction Department.[3] In November of the same year, a separate agricultural section was instituted as an integral part of the district school. At the same time, an experimental farm was set up on the school premises to impart practical education alongside theoretical knowledge of agriculture.[4] Agricultural education classes and farm work at Barasat District School began with 50 students. Students were given theoretical lessons on a variety of topics, including Humphry Davy's agricultural lectures, Lindsay's horticultural theory, and Leibniz's agricultural chemistry. Babu Peary Charan Sarkar taught them agriculture; he was also the school's headmaster. We learned that, in addition to gaining theoretical knowledge about agriculture, students had to work on the farm for 1 h/ 3 days a week in the afternoon. The farm products were sold in the market, and the proceeds were used to buy the necessary agricultural equipment, as advised by the experts.[5] But in 1860 CE, agricultural education was stopped in this school.

The third phase began in the 1860's, during which time the excavation of the Suez Canal increased the importance of Indian agricultural products in the British context. In the socio-political context, the East India Company's position in India began to change from the beginning of the eighteenth century; it lost its trading monopoly, and a new class of industrialists emerged following the Industrial Revolution. In terms of world politics, Asia became more important as the Napoleonic Wars reduced England's imports of food and industrial raw materials from America. To please the new industrialists, the company began importing cotton from India, but neither the quality nor the quantity met their standards. They discussed the idea of cultivating cotton by establishing new experimental agricultural farms. In 1834, 'The East India and Colonial Magazine', an influential English newspaper, demanded that the government invest some of its surplus funds in India to encourage the cultivation of cash crops and food grains. Meanwhile, after the Great Mutiny of 1857, company rule in India came to an end in 1858, and India came directly under the British Raj through the 'Government of India Act'. Since 1864, some agricultural fairs have been held in different parts of India. The establishment of the Department of Agriculture of the Government of India at the initiative of Lord Mayo & A.O. Hume (1871), and the Provincial Department of Agriculture, established on the recommendation of the Famine Commission, gave a new impetus to agricultural development. In this context, in 1865 CE, in response to the appeals of the Land Holders' Association and the British Indian Association, the Madras Government established India's first Agricultural Experimental Farm in Saidapet, Madras (Kumar, 2006, p. 125). It marked a milestone in the history of agricultural science, education, and research in India, opening a new horizon in Indian agricultural research.

3 Glimpses of nineteenth-century agricultural experimental farms in India: With special reference to Bengal

During the 1880s, the Provincial Departments of Agriculture, often in collaboration with influential zamindar (landowner) classes, undertook initiatives to establish experimental farms across various provinces of British India. These farms were intended to promote scientific agriculture through localized experimentation and demonstration of improved techniques. By the close of the nineteenth century, nearly every province had witnessed the establishment of two or three such farms, reflecting a broader institutional push toward agrarian modernization.[6] Table 1 shows the major experimental farms established between 1865 and 1905, a critical phase in the evolution of agricultural science

[2] *General Report On Public Instruction in the Lower Province of Bengal Presidency*, Calcutta, 1850–51, p. 179.

[3] Ibid*,* 1852-53, p. 168.

[4] Ibid, 1853–54, pp. 169–170.

[5] Ibid, 1855-56, p. 114.

[6] Revenue Department, Agriculture Branch, Proceedings No.29, January 1887, WBSA(West Bengal State Archives), p. 1.

Table 1 Major experimental farms established in nineteenth-century India

	Name of the farm	Place	Year of establishment
1	Saidapet	Madras	1865
2	Vadgaon	Bombay	1873
3	Pune	Bombay	1873
4	Kanpur	North-West Provinces	1874
5	Nadiad	Gujarat	1878
6	Nagpur	Central Provinces	1883
7	Madurai	Madras	1883
8	Dumrao	Bengal	1885
9	Burdwan	Bengal	1885
10	Sibpur	Bengal	1887

in colonial India. Several of these farms will be discussed in detail in the following sections.

These farms not only served as centers for agricultural experimentation and training but also played a pivotal role in disseminating scientific knowledge among cultivators and policymakers alike.

The Saidapet Experimental Farm, established in 1865 in the Madras Province, holds the distinction of being the first agricultural experimental farm in India. Its foundation marked a significant milestone in the history of Indian agricultural science. It was largely the outcome of persistent advocacy by the Landholders' Association and the British Indian Association, who, since the 1860s, had urged the colonial administration to prioritize scientific approaches to agriculture. Responding to these appeals, the Madras government allocated 300 acres of land in Saidapet for the establishment of an experimental farm. According to official reports, the farm was intended to facilitate experiments in crop rotation, test new agricultural implements suited to the agro-climatic conditions of South India, examine the application of lime and other mineral manures, increase crop yields, introduce new crop varieties, and conduct research on cattle breeding (Benson, 1885, p.2). Under the supervision of W. R. Robertson, the farm undertook a wide range of agricultural experiments, including the use of iron ploughs, the production of manure from cattle dung, and the breeding of improved varieties of cows and goats. It played a pioneering role in demonstrating the benefits of scientific agriculture to both government authorities and the rural population. One notable innovation was the promotion of the "box" system of cattle keeping, where livestock were housed on litter to produce higher-quality manure with minimal waste. The farm also made significant efforts to popularise iron ploughs, particularly among large landholders, although smaller farmers were more reluctant to adopt such innovations. In 1876, the Saidapet Farm expanded its scope by establishing an agricultural college to provide formal training in agricultural science. Despite its initial success and ambition, the farm faced a steady decline beginning in the 1880s, primarily due to its unsuitable location—the land being sandy and infertile—and the inadequate financial support from the Madras government. When J. A. Voelcker, the renowned agricultural chemist, visited the site in 1892, he found that the farm had deteriorated significantly, having been reduced to only 60 acres. Voelcker attributed the decline to poor site selection and governmental neglect, underscoring the need for a more thoughtful and sustained investment in agricultural research infrastructure in colonial India.

The Kanpur Experimental Farm, established in 1874, emerged as the largest and one of the most significant agricultural research institutions in the North-Western Provinces during the late nineteenth century. Spanning a total area of 107 acres, the farm dedicated 65 acres to experimental activities and 42 acres to orchards. In its initial phase, the farm was supervised by Mir Muhammad Hussain, under whose guidance it developed into a model center for agrarian scientific experimentation. A distinguishing feature of the Kanpur Farm was a specialized workshop for manufacturing agricultural implements, coupled with a distribution centre that facilitated the sale of these tools at subsidized rates. A separate display area was also maintained to showcase the latest equipment. Furthermore, the farm included seed centers for distributing quality seeds to cultivators. Experimental trials at the farm focused on key crops such as wheat, maize, sugarcane, cotton, and fodder, incorporating American agricultural techniques. One of its central objectives was to evaluate the effectiveness of various fertilizing agents, including green manure, cow dung, horse dung, gypsum, and bone meal, in enhancing crop productivity. In addition to agronomic experiments, the farm conducted trials with sugar mills, water pumps, and different types of ploughs, and undertook cattle-breeding initiatives. Its fertile soil and accessible location encouraged periodic visits from local farmers, thereby facilitating the transfer of knowledge and practical demonstrations of scientific agriculture. The Kanpur Farm earned particular praise from J.A. Voelcker, the renowned agricultural chemist, who noted that it conducted the most systematic and successful experiments on manures among all the experimental farms in India during the period. Its combination of practical innovation, infrastructural support, and regional accessibility made it one of the leading centres for agricultural experimentation in nineteenth-century India (Voelcker, 1893, pp. 359–360).

The principal experimental farm of the Central Provinces was established at Nagpur and evolved from an earlier model farm spanning 400 acres. Of this, approximately 85 acres were designated for experimental use, with 65 acres specifically allocated for scientific crop trials. Modelled after the Kanpur Experimental Farm, the Nagpur facility

aimed to replicate its organizational and methodological framework. At its inception, the farm was overseen by J.B. Fuller, who supervised it and made it a significant site for agrarian experimentation in the region. The Nagpur farm conducted a range of experiments on staple crops such as cotton, sorghum, sugarcane, and wheat, applying both natural and chemical fertilizers to assess their relative efficacy. One notable innovation was the use of hemp as green manure in cotton cultivation, marking a significant departure from traditional practices. The farm also conducted experiments using sulphuric acid to extract cotton from its seeds, an attempt to replace indigenous methods that used cow dung and water. Although this chemical approach failed in its initial application, it proved successful during the 1889–1890 agricultural season. In addition to soil and crop experimentation, the farm manufactured agricultural implements, such as sugar mills and threshing machines, indicating a broader interest in mechanization (Mukerji, 1915, p. 133). The farm's geographical and environmental conditions were largely favourable—its flat terrain and well-proportioned plots enabled systematic experimentation. However, a critical limitation noted by contemporary observers was the land's unusually high fertility. In standard agronomic research, medium-fertility soil is preferred for testing fertilizers to obtain measurable contrasts in productivity. Despite this drawback, agricultural chemist J.A. Voelcker commended the farm's scientific undertakings and acknowledged the Central Provinces government's evident enthusiasm for its development and continued improvement (Voelcker, 1893, pp. 364–365).

In the Bombay Province, two notable experimental farms were established during the late nineteenth century: the Vadgaon Experimental Farm near Khandesh and the one situated at Pune. The Vadgaon Farm covered an extensive area of 650 acres, of which 65 acres were designated for systematic experimental cultivation, while the remaining land was utilized primarily for cattle grazing. Upon its establishment, the farm was managed by P. R. Mehta and became a key site for agricultural experimentation and education in the region. The farm's primary activities included scientific cattle breeding and the improvement of sugar milling techniques. It also served as a site for experimenting with a wide range of crops. Among the notable experiments were trials with different cotton varieties, such as Bani and Jairi, as well as the cultivation of arrowroot, mangoes, and guavas. The farm adopted innovative manure management practices, collecting cow dung in containers, processing it into organic fertilizer, and applying it to cultivated plots to assess its impact on crop yield. In addition to its research functions, the Vadgaon Farm also played a significant role in agricultural education. Students enrolled at the College of Agriculture in Pune were required to undertake practical training at the farm, thereby integrating hands-on experience

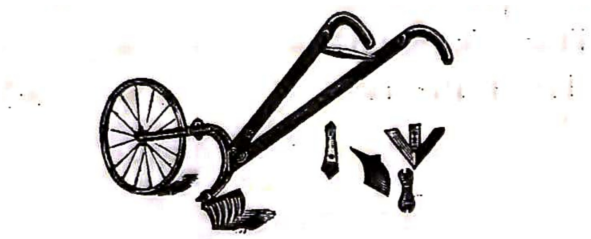


Fig. 2 The American Hand Hoe, used in Dumraon and Shibpur Farm (Mukerji, 1915, p. 131)

with their theoretical studies (Voelcker, 1893, pp. 366–368). Despite its broad scope and educational value, the farm faced several logistical challenges. J.A. Voelcker, in his official agricultural review, noted that the Vadgaon Farm was excessively large for effective management and situated at a considerable distance from urban centers, making access difficult for regular visitors and students. These limitations hindered its efficiency and outreach potential, though the farm nonetheless remained an important institution in the colonial agricultural landscape of western India.

During the late nineteenth century, three experimental farms were established in the Bengal Province— at Dumrao, Burdwan, and Sibpur. Of these, the Dumrao and Burdwan farms were set up in 1885 through a collaborative initiative between the Department of Land Records and Agriculture and local zamindars, with the latter bearing the majority of the financial burden.[7] In contrast, the Sibpur farm, established in 1887, was funded and managed solely by the Department of Land Records and Agriculture.

The impetus for the Dumrao experimental farm can be traced to the famine of 1873–74, which prompted local aristocratic interest in agricultural improvement. This farm conducted a series of experimental cultivations of staple crops, including paddy, wheat, sugarcane, potatoes, maize, and various pulses.[8] The primary objectives of these experiments were to compare newly introduced crop varieties with indigenous ones, assess the effectiveness of green and artificial manures, and evaluate the relative merits of deep versus shallow tillage. In the case of sugarcane, the ratooning cultivation method, in which the rootstock is retained for successive crops, was introduced and tested.[9] In addition to crop

[7] Revenue Department, Agriculture Branch, Proceedings No. 29, January 1887, WBSA, p. 24.

[8] Ibid, Proceedings No. 60–62, File No.7R/19, December 1891, WBSA, p. 23.

[9] In the case of sugarcane, the farm experimented with the *ratooning* method of cultivation—an agricultural practice involving the harvesting of a monocot crop by cutting most of the above-ground portion while retaining the roots and growing shoot apices. This technique allows the plant to regenerate and produce a subsequent crop

trials, the Dumrao farm functioned as a site for mechanization experiments (Fig. 2). The implements tested included the hand hoe, Shibpur plough, Messrs. Thompson's threshing machine, the English hay-cutting machine, and the Behia roller sugarcane mill. However, the practical success of these implements was limited. In his detailed report, agricultural expert J.A. Voelcker critically examined the administration of the Dumraon farm, highlighting inefficiencies and pointing to the general negligence of the overseeing department. Despite these shortcomings, the Dumrao zamindar family remained deeply invested in the project. Following Voelcker's recommendations, the farm was eventually relocated to enhance its effectiveness.

Notwithstanding early challenges, the Dumrao farm achieved several successes. Notable among these were the productive cultivation of paddy, wheat, green manure crops, Nainital potatoes, and soybeans.[10] Moreover, the decision to distribute improved seeds and tested machinery to local cultivators represented a meaningful step toward agricultural dissemination. This facilitated the transfer of experimental knowledge and practice to the rural farming community, contributing modestly yet significantly to the spread of scientific agriculture in Bengal.

During this period, the experimental farm at Burdwan emerged as one of the most important experimental farms in the Bengal region. Before its establishment, the Zamindar of Burdwan committed to contributing an annual sum of one thousand rupees to support the farm's activities. The farm was established at Palla, situated on the banks of the Eden Canal near the Burdwan railway station (Peterson, 1910, p. 98). The primary objectives of the farm included the comparative cultivation of various crops, particularly paddy, potatoes, and sugarcane, as well as the application of different fertilizers and cultivation techniques.

A notable experiment involved the comparative cultivation of ten rice varieties, through which Basmati, Diamond Harbour, and the locally available Paramanasal varieties were found to be particularly well-suited to the agro-climatic conditions of Burdwan. In the case of potatoes, experimental cultivation included varieties such as Nainital, Darjeeling, and Cherrapunji. These trials were designed to assess whether English potato varieties, typically grown in hilly regions, could adapt to and thrive in the plains. The results demonstrated that these hill-grown varieties could indeed be successfully cultivated in the Burdwan plains, indicating a potential for broader diffusion among local farmers.[11] Sugarcane cultivation at the Burdwan farm was undertaken using both the Mauritian method of planting and the ratooning method. Over ten consecutive years, the Mauritian method consistently produced yields superior to those of indigenous practices.

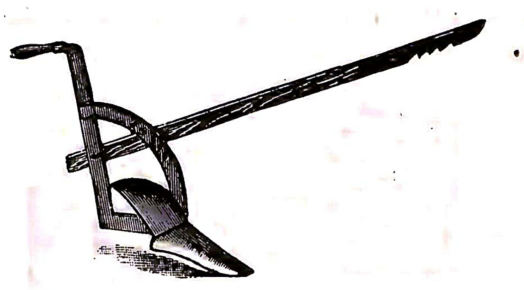


Fig. 3 The Sibpur Plough made at Sibpur Agricultural Experimental Farm (Mukerji, 1915, p. 131)

In addition to experimentation, the farm played an important role in the dissemination of agricultural knowledge. Successful crop varieties and fertilizers were distributed to local cultivators, and arrangements were made for farmers to observe farm operations throughout the year, thereby facilitating the transfer of practical knowledge about new crops and technologies.[12] However, after 1897, the farm encountered significant challenges. Due to its distance from Calcutta, foreign agricultural experts were unable to visit regularly, limiting its access to contemporary scientific inputs. Despite this, the provincial agriculture department continued to provide support by deploying experts, allowing farm operations to proceed, though at a slower pace, towards the end of the period.

The Sibpur Experimental Farm was established in 1887 in the vicinity of the Sibpur Engineering College. From its inception until 1897, the farm remained under the direct administration of the Department of Land Records and Agriculture. In 1897, control of the farm was transferred to the Sibpur Engineering College, effectively shifting its focus from experimental agricultural research to a practical training ground for agricultural students.[13]

During its operational years as an experimental facility, the farm undertook trials involving a variety of crops, including paddy, jute, sugarcane, tobacco, and cotton. However, it

Footnote 9 (continued)
in the following season, thereby reducing cultivation costs and time between harvests.

[10] Revenue Department, Agriculture Branch, Proceedings No. 16–17, File No. 7R/15, January 1894,WBSA, p. 18.

[11] Revenue Department, Agriculture Branch, Proceedings No. 16, File No. 7R/15, January 1894, WBSA, pp. 14–15.

[12] Ibid, Proceedings No. 137–140, File No. 7R/18, November 1898, WBSA, p. 16.

[13] Ibid, Proceedings No. 1–4, File No. 7R/18, October 1896, WBSA, p. 8.

gained national recognition primarily due to Ambikacharan Sen's invention of the rod iron plough, which came to be known as the 'Sibpur Plough (Fig. 3).' This implement was widely distributed for testing and demonstration across various experimental farms throughout India. Notably, in 1892, the plough—priced at four rupees—became a significant source of revenue for the Sibpur Farm.[14] Despite these innovations, the farm faced a structural challenge: its exceptionally fertile land rendered it less than ideal for controlled agricultural experimentation. Nevertheless, activities continued at the site until 1905. The relocation of agricultural classes and related equipment to the newly established agricultural institute at Pusa after 1905 marked the functional decline of Sibpur Farm, bringing an end to both its experimental role and its contributions to agricultural education.

4 Conclusion

The Bengal Agricultural Department had started work by establishing experimental farms—one at Burdwan and another at Dumraon and by instituting agricultural enquiries and collecting agricultural statistics. An agricultural class and farm were eventually opened and attached to the Shibpore Engineering College.... It would be natural to expect that, under the circumstances mentioned above, a great advance had been made within the last 20 years towards the solution of the problem of the improvement of Indian Agriculture. But unfortunately, this is not the case (Roy, 1906, p.5).

This critical observation by Dwijendralal Roy aptly reflects the limitations and unrealized expectations surrounding the early British agricultural initiatives introduced in the second half of the nineteenth century. During this period, the colonial administration sought to modernize India's traditional agricultural system by establishing experimental farms, motivated primarily by two objectives: preventing famine through increased food grain production and promoting the cultivation of commercial crops. Although various debates among British officials occurred regarding the structure, location, and methodology of these farms, several were established across India with considerable initial enthusiasm. These farms initially developed positive relations with local cultivators, encouraging them to adopt new crops, innovative techniques, and agricultural machinery. However, as Roy noted, despite the infrastructural setup and institutional efforts, real progress was limited. Within a couple of decades, the momentum diminished. In Bengal, early experimental farms failed to produce the expected results, primarily due to two factors: first, the British lacked adequate knowledge of Indian soils, climate, and agrarian practices, which led to inappropriate site selection and a poor understanding of farmers' challenges; second, there was a significant shortage of trained personnel in modern agricultural science and a persistent lack of financial resources. Gradually, in the early twentieth century, efforts were made to address these shortcomings. A new institutional framework was conceived, resulting in the establishment of the Agricultural Research Centre at Pusa in Bihar in 1905, initiated by Lord Curzon with support from Henry Phipps (Kumar, 2006, pp. 90–91). While many of the early ventures fell short, they laid the groundwork for important debates and institutional reforms in agricultural science. These discussions ultimately contributed to the advancement of agricultural education and research in India. By the first half of the twentieth century, experimental farms had been established in almost every district of Bengal, supported by both the colonial government and private initiatives, most notably the Surul Agricultural Experimental Farm at Santiniketan, founded by Rabindranath Tagore in 1922 (Elmhirst, 1975, pp. 13–14).

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[14] Ibid, Proceedings No. 16–17, File No. 7R/15, January 1894,WBSA, p. 22.