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Colonial Botany and Institution Building in India: William Roxburgh and the Foundations of the Botanical Survey of India

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Abstract

Botanical development in colonial India was intertwined with colonial expansion, explorations and institutionalisation. This paper looks at the contribution of the so called ‘Father of Indian Botany’ William Roxburgh who contributed to the formation of the botanical knowledge and institutional systems in India. Roxburgh's activities in plant economy, classification, documentation and research set the scene for systematic botanical research in the late 18th and early 19th centuries. His work had an impact on the later creation of scientific institutions like the Botanical Survey of India. The paper examines the role of botanical science in the service of empire, as a means to the extraction of resources, improvement of agriculture and control of administration. It also reminds the reader of the long-term effects of colonial botany on the scientific institutions of India. The study makes the point that botany was a key factor in combining science with imperial government and institutionalization.

Keywords: Colonial Botany, William Roxburgh, Botanical Survey Of India, Empire And Science, Economic Botany, Colonial India

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1. Introduction

Colonial expansion, scientific exploration and the institutionalization of knowledge under British rule are all deeply involved in the history of botanical science in India. The British East India Company began to realize the potential of the botanical wealth of India in the late 1700s and began to search out its trade.In the late 1700s, the British East India Company started to see the potential of the Indian botanical wealth and began searching out its trade. The scientific study of plants was not just an academic exercise; it was a part of colonial government, to help improve agriculture, exploit colonial lands, carry out medical research, and manage the environment. As such, a branch of science known as botany became one of the most significant scientific areas in which the colonial state tried to explain, categorize and exploit the natural wealth of the subcontinent.[1]

Colonial botany was intimately linked to other aspects of Enlightenment science and the growth of European imperialism. In the colonial world, the knowledge was used to classify nature, and to make local resources imperial property. Botanical investigations were encouraged in India by founding botanical gardens, herbaria, scientific societies and networks of plant collectors. These institutions produced much data on native plants and at the same time served the colonial State's economic aims.[2]

In this context, William Roxburgh (1751-1815) plays a pivotal role in the history of Indian botany. Roxburgh was regarded as the “Father of Indian Botany” and was the first to systematically study Indian flora. He himself was a Superintendent of the Calcutta Botanic Garden, where he conducted a large number of botanical surveys, and gathered thousands of specimens of Indian plants and drew detailed descriptions and illustrations. His scientific approach was empirical based on observation and classification, which helped shape the plant taxonomy in South Asia, and his monumental Flora Indica was one of the first comprehensive descriptions of Indian flora, and was a key reference for future generations of botanists.

Roxburgh's work was not limited to taxonomy and plant classification. He was very interested in economic botany and studied plants of commercial, medical and agricultural value. His work was in line with the general agenda of colonial science, which aimed to locate and use natural resources for the benefit of the coloniser. By documenting the "useful" plants, Roxburgh contributed to a knowledge base that enabled the policies of the British colonists, their trade and commerce, and their exploitation of the environment.

By the nineteenth century, botanical science had started to be institutionalized in India. The Botanical Survey of India (BSI) was created in 1890, but it grew out of the ideas and knowledge of earlier colonial botanists. The collections, taxonomic systems, and research methods devised by Roxburgh and his peers laid the foundation for the Survey's organization and expansion of botanical research activities throughout the subcontinent, and the Botanical Survey of India emerged as the central body for the documentation of Indian flora, the coordination of botanical research, and the promotion of colonial economic and administrative aspirations.[8]

There was thus a scientific and a political connection between botany and empire. Colonial administration through botanical expertise enabled the categorisation of landscapes, the control of resources and the connection of local ecosystems to broader imperial networks. Concurrently, botanical institutions served as hubs for the production of knowledge, where the interests of science, administration and the economy met. Colonial Botany is a case in point because it was a science of power which helped to expand and consolidate British rule in India.[8]

This article investigates the contribution of William Roxburgh in the growth of botanical science in colonial India and discusses its impact on the creation of institutional frameworks that led to the creation

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of the Botanical Survey of India. The study looks at the interactions of science, empire and institution building to show how botanical knowledge was a vital tool of colonial control and at the same time was a vital force in the formation of modern botanical studies in India.[9]

2. Expansion of the colonial power and development of botanical science in India

Botanical science in India is intimately linked with the spread of British colonialism and the increasing significance of scientific knowledge in the governance of the British. In the eighteenth century, European colonial powers came to see that natural resources were vital to their economic and political strength. Scientific fields like botany, zoology, geology and geography became important means of exploration, classification and managing the territories of the colonies. Botanical research in India took special importance due to the rich diversity of the flora, which had great value in agriculture, medicine, commerce and industry.[10]

BEC came into India as a commercial company but became the power of territory after the Battle of Plassey (1757) and Battle of Buxar (1764) and faced new administrative problems. Understanding of local environments and natural resources was necessary to govern large land areas. Authorities in the colonies began to realize that scientific data could help in their effective governance and in the generation of revenues. Thus, the process of introducing plants into the environment was part of a larger colonial state project of manufacturing knowledge and of managing territory.

The ideas of colonial botany were shaped by events in European scientific thinking, such as the development of a system of botanical classification based on the Linnaean taxonomy of Carl Linnaeus. Linnaean taxonomy enabled plant species to be identified and categorized, so that any botanist in the world could communicate and compare in a standardised way. British botanists in India did so and used them to the huge variety of flora found in the subcontinent.[12]

Botanical gardens were one of the most significant institutional changes of colonial botanical science. Botanical gardens served as plants collection sites, experimental stations, acclimatization stations, and as research institutions. The most important among these was the Calcutta Botanic Garden founded in 1787 under the direction of Colonel Robert Kyd. The garden was an important site for botanical study, and a hub for collecting and trading plant specimens from across India and the British Empire.[13]

Botanical gardens were not only scientific institutions; they also had a significant role in imperial economic policy. Colonial rulers considered plants a source of wealth and wanted to identify plants with the potential to help with commercial agriculture and trade with other countries. Experimental cultivation was tried for various crops such as tea, spices, timber, medicine and fibers, to evaluate the economic potential of those crops. In these activities, botanical science was intimately associated with the economic ends of empire.[14]

A vast network of explorers, surgeons, missionaries, and administrators assisted in the collection and classification of plants. Those people collected the samples from various ecological areas and sent them to botanical institutes for research. This led to the creation of extensive floras of the Indian flora by colonial scientists. The utility of such inventories was not only for science but also for the knowledge that they provided of resources that might be used in imperial economies.

One such aspect of colonial botany was its ties with medicine. A lot of plants had medicinal values that were utilized by the indigenous people for centuries. To gain insight into the plants and the possibilities of treatment, colonial scientists recorded and studied these plants. Botanical studies thus played a role in the advancement of colonial medicine as well as in the appropriation of indigenous knowledges.[16]

The new science of botany also mirrored wider changes in the ways in which science and state power were

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interconnected. The practical use of scientific knowledge was increasingly recognized by colonial governments, leading to an increased investment in scientific institutions. Botanical surveys, agricultural experiments and environmental studies yielded data which could be applied to improve agricultural productivity, forest management, land use control, and commercial operations. Science was now a part of the colonial administration.[17]

Colonial botany also had a great deal of asymmetries of power at the same time. Traditional knowledge was very important in the identification and understanding of plant species and their uses, but local knowledge was poorly represented in official scientific accounts. The knowledge of these plants was often taken from the local people and then translated into European scientific systems and applied to the imperial institutions without proper credit given to the indigenous people's knowledge. The process here demonstrates the role that scientific knowledge might have played in the colonial appropriation and control.[18]

By the early 19th century, botanical science had become an integral aspect of colonial rule in colonial India. During this time, institutions, collections and research networks were established which influenced the development of future botanical research. In this intellectual and institutional setting, William Roxburgh became one of the most important botanists in India's history. His work would greatly broaden the knowledge of botany and help advance the goals of colonial science and empire.[19]

3. William Roxburgh and the Making of Indian Botany

William Roxburgh (1751 – 1815) was one of the most important botanists in colonial India. Roxburgh is considered the ‘Father of Indian Botany' and made a significant contribution in turning the study of plants from a largely descriptive to a systematic scientific approach by observation, classification and documentation. His wide-ranging botanical studies helped in the development of Indian botany and provided framework to future generations of botanists and helped in the development of the institution of botanical science in India.[22]

Roxburgh was born in Scotland in 1751, and trained as a surgeon before serving the British East India Company. Like other Company surgeons of the time, he became fascinated with the study of natural history and botany. His medical training led him to delve into the medicinal characteristics of plants and his role in the colonial administration enabled him to develop an interest in the wide range of flora found in the Indian sub-continen[21]

Roxburgh started his botanical studies in the Madras Presidency where he did extensive research on native plants and climate. He gained a reputation during this time for his scientific rigour and attention to detail. His research was not confined to plant collecting but also involved investigations of plant physiology and agricultural practices, as well as meteorological and environmental effects on vegetation. The interdisciplinary interests were typical of natural history interests of the eighteenth century.

Roxburgh's most significant career milestone was when he became Superintendent of the Calcutta Botanic Garden in 1793. The garden was established in 1787 and was becoming an important focal point for botanical research in the British Empire. Roxburgh's direction led it to be one of the most important botanical institutions in Asia. He enlarged its collections, began to scientifically organize them and made it a great center for plant experimentation and documentation.[23]

One of Roxburgh's most lasting achievements was his meticulous compilation and categorisation of Indian flora. During the course of many years he collected thousands of specimens from various ecological regions of the subcontinent. The specimens collected were part of an unprecedented documentation of the botanical diversity of India and these were valuable reference specimens for future scientific study. His

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attention to detail allowed botanists to accurately identify and compare plant species for the first time.[24]

The Linnaean system of taxonomy was of special importance to Roxburgh, as it provided a standard classification system for plants. But he was not content with merely using European classifications for Indian plants. Instead he did his best to make the taxonomical approach local, using many field observations and empirical evidence in his work. This was a blend of international scientific standards and a local investigation which played an important role in shaping the modern botanical methodology in India.[25]

One of Roxburgh's most characteristic aspects of his scientific practice was his preference for visual documentation that was accurate. He also realized that the limitations of written descriptions alone could not be overcome so he ordered and personally supervised the creation of thousands of botanical illustrations that show plant morphology in more amazing detail. Many of the drawings produced by Indian artists working under his guidance were illustrations of Indian plants, one of the most extensive visual records of Indian flora during the colonial period. They remain good historical and scientific sources.[26]

Roxburgh's work ultimately resulted in his monumental publication Flora Indica which was one of the cornerstones of Indian botany. The work was published after his death, but was a compilation of decades of botanical observations, and included detailed descriptions of hundreds of plant species. Flora Indica laid the scientific basis to the study of Indian vegetation and continued to be a reference source for the nineteenth century botanists. It was not only in India but also in the world that it made an impact, enriching the world's knowledge of plants and the ties that bound colonial science with its European counterparts.[27]

Roxburgh also contributed to economic botany, as well as taxonomy. Roxburgh was actively involved in the search for plants of commercial value, and the colonial authorities became more interested in the process. He studied species appropriate for cultivation, forestry, use for medication, textiles, dyes and industry. His research aimed at understanding the value of botanical resources for the economic growth and imperial trade. The emphasis on the use of a practical approach was characteristic of colonial science more generally, whose production of knowledge often coincided with economic exploitation.[28]

Some of the crops that caught Roxburgh's interest included cotton, indigo, spices, timbers species, and some medicinal plants. He tried cultivation methods, tested the environmental suitability, and recorded the production methods. The work of such research led to the introduction and development of commercially important crops as part of a colonial economy. Roxburgh produced information on the plants of economic value, which paved the way for the scientific foundation of resource management and agricultural expansion.[29]

It is important to note that, concurrently, Roxburgh's work was largely dependent on community engagement and traditional knowledge systems. Information was obtained from farmers, healers, artisans and plant collectors on uses of plants, cultivation methods and ecological conditions. Indigenous knowledge played an important role in the success of botanical research despite the emphasis placed on the expertise of Europeans in colonial publications. In colonial science, recent scholarship has revealed a collaborative process in the production of knowledge, with botanical discoveries often the result of interaction between European scientists and local informants.30

Roxburgh's contribution is not limited to the present, but endured beyond his days. His collections, publications and illustrations, together with his scientific methods, were to influence botanical research in the nineteenth century, long after his death in 1815. Later botanists, including Nathaniel Wallich, Joseph Dalton Hooker, George King and David Prain, continued on the work laid down by Roxburgh. His work

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was an intellectual bridge between the early colonial period of botanical exploration and the later establishment of botanical science in the form of the Botanical Survey of India.[32]

Roxburgh's career is emblematic of the history of science and empire. His botanical studies were important to the scientific community, as well as colonial administration and economic goals. Botanical science was used to understand, document and experiment with colonial environments through classification and documentation of resources, and agricultural experimentation. Roxburgh's work thus stands at a crucial turning point, both in the history of botany and in the history of the colonial production of knowledge and colonial rule in South Asia.

4. Botany, Empire, and Economic Exploitation in Colonial India

The development of botanical science in colonial India cannot be separated from the economic and political objectives of the British Empire. While botany was presented as a scientific enterprise devoted to the study of plant life, it simultaneously functioned as an instrument of imperial expansion, resource extraction, and administrative control. The systematic investigation of India’s flora enabled colonial authorities to identify, classify, and exploit economically valuable plants, thereby transforming natural resources into components of imperial wealth. Botanical knowledge thus became a crucial element of colonial governance and economic development.[33]

During the eighteenth and nineteenth centuries, European empires increasingly viewed tropical colonies as repositories of valuable natural resources. Scientific exploration was encouraged because it promised new opportunities for commercial agriculture, industrial production, and international trade. In India, the British East India Company invested heavily in botanical research with the expectation that scientific knowledge would contribute to increased revenue and economic efficiency. Botanical gardens, experimental farms, and scientific surveys were established to support these objectives.[34]

The concept of economic botany emerged as a central feature of colonial scientific practice. Economic botany focused on identifying plants with commercial, medicinal, agricultural, or industrial value. Colonial botanists investigated plant species not merely to understand their biological characteristics but also to determine their potential usefulness within imperial economic systems. Through this process, botanical science became directly connected to the extraction and commercialization of natural resources.[35]

William Roxburgh played an important role in advancing economic botany in India. His studies extended beyond taxonomy and classification to include investigations of crops, medicinal plants, timber resources, fibers, dyes, and spices. Roxburgh’s research sought to identify species that could contribute to agricultural productivity and commercial profitability. His observations provided colonial administrators with valuable information regarding cultivation methods, environmental conditions, and economic applications of various plants.[36]

Among the most significant colonial crops were indigo, cotton, tea, coffee, sugarcane, and opium. Scientific research facilitated the expansion of these commodities by improving cultivation techniques, identifying suitable growing regions, and introducing new plant varieties. Botanical knowledge therefore played a direct role in transforming Indian agriculture from a predominantly subsistence-oriented system into one increasingly integrated with global markets.[37]

The cultivation of indigo illustrates the relationship between botany and imperial economics. Indigo became one of the most profitable export commodities of the colonial period, generating substantial revenue for British commercial interests. Botanical investigations helped improve production methods and increase yields. However, the expansion of indigo cultivation often imposed severe burdens upon Indian peasants, who were compelled to devote agricultural land to cash crops rather than food production. Thus,

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scientific advances frequently served imperial economic interests while contributing to social and economic inequalities.[38]

Similarly, botanical research played a crucial role in the development of tea plantations in northeastern India. Colonial authorities sought alternatives to Chinese tea imports and invested heavily in identifying suitable tea varieties and cultivation techniques. Botanical surveys, experimental gardens, and scientific studies contributed to the establishment of a thriving tea industry that became one of the most important sectors of the colonial economy. By the late nineteenth century, Indian tea had become a major export commodity within global trade networks.[39]

The transfer of plants across different parts of the British Empire constituted another important dimension of colonial botany. Historians have described this process as biological imperialism, whereby plants, animals, and agricultural practices were moved between colonies to support imperial economic objectives. Botanical gardens functioned as centers for the acclimatization and distribution of economically valuable species. Through these networks, crops such as cinchona, rubber, and tea were introduced into new regions and integrated into colonial production systems.[40] Botanical science also contributed to the exploitation of forest resources. Colonial authorities relied upon scientific surveys to identify commercially valuable timber species required for railway construction, shipbuilding, military infrastructure, and urban development. Forest management policies increasingly emphasized economic productivity, leading to the expansion of state control over forested landscapes. Botanical research thus supported the transformation of forests into regulated sources of imperial revenue.[41]

The economic applications of botany extended into the field of medicine. Many indigenous plants possessed medicinal properties that attracted the attention of colonial scientists. Botanical investigations sought to identify pharmaceutical compounds that could be incorporated into Western medical practice. In numerous cases, indigenous knowledge regarding medicinal plants provided the foundation for scientific research. However, colonial institutions frequently appropriated such knowledge without adequately recognizing local intellectual contributions.[42]

The relationship between botany and empire also had significant environmental consequences. The expansion of commercial agriculture encouraged monoculture cultivation, which reduced biodiversity and altered ecological systems. Large-scale plantation agriculture transformed landscapes, affected soil conditions, and disrupted traditional patterns of land use. Forest exploitation contributed to deforestation and ecological degradation in several regions. These developments demonstrate that colonial botanical science was not merely a process of knowledge acquisition but also a force reshaping environments on a vast scale.[43]

Furthermore, the emphasis on commercially valuable species often marginalized indigenous agricultural practices and local ecological knowledge. Colonial scientists tended to prioritize plants that could generate revenue within imperial markets, while traditional systems of cultivation and resource management received comparatively little attention. This selective approach reflected broader patterns of colonial governance, in which scientific knowledge was directed toward economic and administrative objectives rather than local needs.[44]

Recent scholarship has emphasized that colonial botany should be understood as a form of environmental governance. By classifying plants, mapping resources, and regulating landscapes, colonial authorities sought to create systems of knowledge that facilitated control over nature and society. Botanical science became a mechanism through which imperial power was exercised and legitimized. The production of scientific knowledge was therefore inseparable from the broader structures of colonial rule.[45]

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However, colonial botany left behind also a lasting legacy in science. The many collections, herbarium specimens, botanical drawings and publications made during this time remain valuable to current research. Colonial botanists like William Roxburgh have left their indelible legacy in many aspects of modern taxonomy, biodiversity studies and ecological investigations undertaken in India. However, these scientific accomplishments need to be considered in the context of the economic and environmental impact of colonial exploitation.[46]

This is thus a complicated history of science and empire in colonial India. Botanical information grew scientific understanding – and also promoted commercial development, resource extraction, and also government oversight. Roxburgh and fellow scientists such as him illustrateted the possibilities of scientific research for the intellectual purpose and the imperial goal. Through the study of these linkages, historians have a better understanding of how colonial science affected Indian economic development, environmental change, and institutional development.[47]

In recent years, scholarship has focused on colonial botany as an environmental governmentality. Colonial authorities sought to establish a knowledge system of classification, mapping and regulation of landscape that would enable control of nature and society. Botanical science was used as a tool for the exercise and justification of imperial power. The process of scientific knowledge, then, was intimately bound up with the wider processes of colonial rule.[45]

5. Institutionalization of Botanical Science and Emergence of the Botanical Survey of India

A major change in the nature and administration of botanical research took place in 19th century India. The activity of individual naturalists, surgeons, and plant collectors morphed into a "system of organized scientific institutions which were backed by the colonial state. This institutionalization was part of a larger evolution in colonial government which increasingly valued scientific knowledge for resource management, economic planning and administrative control. These developments culminated in the establishment of the Botanical Survey of India (BSI) in 1890 and a significant milestone in the history of botanical science in India.

Institutional Botany in India has its roots in the late 18th Century, when botanical gardens and scientific societies were established. A physical and intellectual environment where plants could be collected, grown, sorted and learned was created in institutions like the Calcutta Botanic Garden. The garden, led by William Roxburgh and later by his successors, developed into one of the premier sites for botanical research, and was firmly linked to international scientific networks.[49]

In the nineteenth century, botanical research grew greatly as the British administrators realized the utility of science. With the increasing development of commercial agriculture, forestry and industry, there was a need for coordinated information on plant resources. Scientific surveys were increasingly tasked to colonial authorities to identify species with economic value, to optimize agriculture and to aid resource extraction. As a result, botanical studies became more institutionalized and administrative in importance.[50]

Herbarium collections have been an important part of this. Various parts of India were visited to collect plant specimens that were preserved, catalogued and classified by scientific classification. It was from these collections that taxonomic studies were made and that the comparison of species from various ecological regions was possible. Herbaria were also used as archives of scientific information, and they contained botanical data for future generations of scientists.[51]

The growth of institutional botany in the nineteenth century was aided by several major botanists. Plant collections and classification continued under Roxburgh with the work of other collectors including Nathaniel Wallich, Joseph Dalton Hooker, George King and David Prain. As a result of their publications,

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surveys and scientific networks, their work greatly contributed to the knowledge of Indian flora. Meanwhile, they called for the development of a more integrated system of botanical research to span the enormous geographic area of the sub-continent.

Colonial administration realised by the late 1800s that there was a need for a central body to coordinate botanical research throughout India. In response, the Government of India, under the leadership of George King, the then Superintendent of the Royal Botanic Garden, Calcutta, set up the Botanical Survey of India in 1890.[52] The Survey was founded not only for scientific purposes but also for administrative convenience. It aimed to give a detailed account of the plant resources of India, and uphold the economic and political goals of colonialism.[53]

The main goal of the Botanical Survey of India was to explore the flora of the Indian subcontinent systematically, identify and document the flora. For this purpose, the country was subdivided into a number of botanical regions, which were carefully examined. Field trips were organized, specimens were collected, herbarium records were prepared and ecological conditions were recorded. The activities resulted in a lot of information on the distribution, diversity and economic value of Indian flora.[54]

The Botanical Survey of India also contributed significantly to enhancing scientific communication. The results of research were published in reports, journals, monographs and floristic publications. These publications enabled the exchange of ideas, experiences and expertise between the botanists of various regions of India and helped to establish a national program framework for botanical research. The Survey thus became an important institution for the production and circulation of scientific knowledge.[55]

Economics continued to play a major role in the activities of the Survey. The colonial authorities thought botanical studies would be useful in improving agriculture, forestry and commerce. Botanists surveyed plants that might have an economic value such as medicinal plants, trees, fibers, and agricultural crops. They used their conclusions to guide government planning in the areas of land use, management of resources, and land expansion for agriculture.[56]

Meanwhile the Survey also made many important contributions to the advancement of scientific knowledge. Its collections and publications gave precise details on the extraordinary botanical diversity in India.[57] Research under the auspices of the Survey resulted in the identification, classification and description of many species. The scientific works of these men did not serve the administrative requirements of the colonies and have continued to shape the work of modern botanists.[58]

The institutionalization of botanical science also helped in professionalizing the science. The Survey set standards for the collection, classification, preservation, and documentation of plants. It promoted specialization and promoted scientific careers in colonial institutions. This led, over time, to botany becoming a professional scientific discipline, rather than an activity largely pursued by amateur naturalists, with the development of formal institutions and methods.[59]

The work of the Botanical Survey of India continues beyond the time of the British. After India's independence in 1947, it was reorganized and reoriented towards concerns of the Nation such as conservation of biodiversity, protection of environment, ecological studies, and sustainable development. The Survey continues to be one of India's most significant scientific organizations today, with its continued documentation and preservation of the botanical heritage of India.[60]

The establishment of the Botanical Survey of India, therefore, is a turning point in the institutional evolution of science in South Asia. It illustrated the shift from botanical exploration to scientific, institutional administration, and the increasing significance of institutional structures in the production of knowledge. The Survey was rooted in colonial structures, but also helped to establish modern botanical

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research and conservation efforts in India.[61]

6. Legacy and Long-Term Impact

The colonial legacy in Indian botany is rich and complex. Botanical science helped to advance science and build lasting research institutions but also served as a tool of imperial control and resource extraction. William Roxburgh and later the colonial botanists have left a lasting legacy in Indian flora, scientific research and natural resource management. This heritage must be considered in terms of its scientific success but also its wider social, economic and environmental impact.[62]

The most significant developments of colonial botany were the establishment of a systematic knowledge of the plant diversity of India. Before the end of the eighteenth century, the knowledge of Indian flora was mostly confined to the folk traditions, traditional medicine systems, agricultural practices and local ecological knowledge of India. Standardized collection, classification and documentation of plants by colonial botanists resulted in comprehensive plant inventories of plant species throughout the subcontinent. These efforts contributed greatly to the scientific knowledge on biodiversity of India and paved the way for contemporary botanical studies.[63]

William Roxburgh had a notable impact in this area. His precise detailed accounts of the species, his botanical illustrations and his compilation of Flora Indica gave a scientific and unprecedented record of Indian vegetation. Subsequent botanists, such as Nathaniel Wallich, Joseph Dalton Hooker, George King and David Prain, added to this work, and developed more advanced studies of Indian flora. Botanical work continued to be influenced by Roxburgh long into the 20th century as botanical research passed from one generation to the next.[64]

The colonial heritage of the institution of botany is also deserving of attention. The Botanical Survey of India (BSI), founded in 1890, set up a lasting organization for botanical research and preservation. These institutions served as a source of herbarium specimens, as a means for the publication of floristic studies, and as a training ground for professional botanists. Some of the scientific institutions established during the colonial period were retained after Independence and converted to meet national needs. Consequently, the collections, methods, and infrastructure created in the colonial era continue to be useful in present day botanical research in India.[65]

Colonial botany helped to develop environmental and ecological sciences also. The detailed records of plant species and vegetation types were important as background data for current research on biodiversity, climate change, habitat modification and conservation biology. Historical botanical data are commonly used by contemporary researchers to examine long-term changes in the flora and to understand the effects of human activities on natural ecosystems. Colonial botanical archives are thus significant scientific resources in this respect.

But colonial botany was a science whose accomplishments are inextricably bound up in the support of imperial economic goals. Much botanical research was focused on the identification and utilization of commercially useful plants.[66] The cultivation of crops like tea, indigo, cotton, cinchona, coffee and rubber took center stage in the economic strategies of the colonists. Scientific research helped them to be cultivated and to be woven into global trade networks, where they made significant profits for the British Empire. These changes helped to drive the development of the economy, but also altered the traditional agricultural framework and increased the reliance on export agriculture.[67]

Colonial botanic policies had significant environmental impacts. Many areas became monocultures and lost ecological diversity with the spread of plantation cultivation. Managing forest ecosystems for commercial uses increased the rate of deforestation and habitat destruction. Botanical science has helped to

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facilitate these changes often with technical knowledge needed for resource extraction and environmental control. By extension, colonial botany helped to transform landscapes and ecological systems throughout India.[68]

A further important legacy of colonial botany has to do with the way indigenous knowledge was treated. The local people had a wealth of knowledge regarding the properties, medicinal uses, planting & cultivation information, and interactions of plants. It was this knowledge that was often used by colonial botanists for collecting specimens and recording plant usage. However, the voices of the indigenous people were silenced in the official scientific narratives, with emphasis on the experiences and institutions of Europeans. Recent scholarship has attempted to reclaim these underwritten contributions and reveal the co-productive aspect of knowledge making in colonial science.[69]

The legacy of colonial botany has not only been in the form of scientific findings. It brought about wider trends of environmental governance and resource management that continued into the post-colonial period. The involvement of the colonial governments in forestry, conservation, agricultural improvement and documentation of biodiversity practices has influenced administrative practices thereafter. Many of these policies were changed in response to new political and environmental priorities, but their historical roots can often be attributed to the colonial scientific institutions and practices.[70]

There were changes in the institutional landscape such as Botanical Survey of India in the decades following independence. They went beyond the role of defending the interests of the Imperial Empire to the cause of conserving biodiversity, sustainability and science for the nation. Conservation planning, environmental education, ecological assessment, and threatened species surveys came to play a key role in their activities. The transformations of institutions that have been created in a colonial context are indicative of the changes of purpose for these institutions created for new social and environmental goals.[71]

Current discussions on biodiversity conservation, TEK, IP and environmental sustainability are intertwined with colonial issues. The importance of the study of colonial botany for modern environmental issues is becoming more and more appreciated by scholars. The history demonstrates the interplay between scientific knowledge and political power and economic interest in creating ecological systems and research institutions. These ideas help to develop more critical and inclusive environmental policy and scientific practice.[72]

As a whole, these are the historical dynamics that William Roxburgh illustrates. He was a pioneer botanist and his work on Indian flora was invaluable and helped lay the foundation of modern botanical research. While working in this context, he was also going against the grain of a colonial world where science often had an imperial purpose. The assessment of his legacy is only possible if one takes into account his science and the political and economic system in which it was created.[73]

From the above discussion it is clear that in the Indian context, the history of colonial botany is a history of knowledge, which could not have been developed without the involvement of wider social and political parameters. Botanical science both advanced the mind and the creation of institutions, enhanced awareness of the environment, and enabled the economic exploitation and imperial control. Science, empire and society are intertwined in the lasting legacy of colonial botanical practices. An intelligent and critical treatment of this history not only helps to understand the development of modern scientific institutions but also their importance in the present-day India.

7. Conclusion

William Roxburgh has a special significance in the history of botanical science in India. He was the founder of plant taxonomy, botanical illustration and economic botany, laying the scientific groundwork

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for future generations of botanists. By leading the Calcutta Botanic Garden and through his monumental Flora Indica, Roxburgh revolutionised the study of Indian flora into a scientific systematic approach. During this period, his work also paralleled the overall goals of British colonialism, which involved scientific knowledge as a central aspect associated with resource extraction, agricultural expansion, and administrative control. The introduction of the Botanical Survey of India later gave voice to many of the practices and methodologies initiated by Roxburgh, and set up a framework for botanical research in the subcontinent that continues to stand to this day. Colonial botany played a crucial role in institutionalizing and in advancing science, but it also enabled environmental change and economic exploitation. The history of Roxburgh and colonial botany thus reveals the interplay of science, empire and institution building in India and the successes and paradoxes of colonial scientific knowledge.

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