The foregoing study gives an account of the colonial endeavours to introduce and institutionalise science in agriculture in India, in general, and Madras Presidency, in particular during the period 1835 to 1928. The British made some efforts to introduce scientific methods and devices in agriculture. But these scientific endeavours of the government were instituted with expectation of metropolitan interests. In the nineteenth century, the British objective was to consolidate the empire and exploit agricultural resources. Science was employed as an instrument for this project. The British promotion of scientific improvements in the field of agriculture was expected to supply commodities required for exports as agriculture commodities became important in commerce.

The study of agricultural science in colonial India more particularly in Madras Presidency shows the three distinct but sequential phases in institutionalization process. The first phase of the process was characterised by encouragement of the institutions like agricultural and horticultural societies. This phase includes the period of mid-nineteenth century when the East India Company consolidated political power to the Famine Commission’s recommendations in 1880. This phase was dominated by the importation of exotic varieties and implements for the purpose of experimentation. In this phase, science of agriculture itself was still in a stage of infant development. Experiments were largely conducted on trial and error basis, partly they were scientific but were largely empirical.

The second phase maps gradual establishment of scientific investigation and agricultural education. This phase comprises the period of two decades from 1870 to 1890 when the memorandums and discussions were made on framing up of a definite policy for agriculture improvement. The attitude of the government towards scientific agriculture both at imperial and provincial level
was shaped up into a concrete expression during the period 1870 to 1890. In contrast to the first phase of lending indirect support to promotion of the agricultural science, in the second phase the improvement of agriculture became a direct responsibility of the government at imperial as well as provincial levels. The third and final phase of institutionalisation was characterised with the institution of trained expert staff in different branches of agriculture science and building up research institutions. Dr. Leather and Collins were appointed to the imperial agricultural department in 1890. In Madras Presidency, Benson was promoted to the post of Deputy Director and C.K. Subba Rao was appointed as assistant Director. More important development of this period was the creation of an imperial institution of research at Pusa. The period also shows expansion of research and institution building. Agricultural research obtained a systematic basis in colonial India from the reorganisation of the Department of agriculture in 1905. This phase also shows developing improved varieties of crops that increased yields per acre, improved quality of the commodity or increased pest resistance. In addition to the yielding changes, there were also changes in quality of several commodities due to plant breeding. The most important quality change was in cotton; scientists were able to develop long lint varieties like Cambodia cotton with sufficiently high yields to make them competitive with the local mixtures.

Colonial government had encouraged the promotion of science in agriculture but the size and expansion of science was subjected to a restricted growth. The process of institutionalisation of science in agriculture was not designed for the development of the colony; it was structured carefully for the realization of their agenda of maintaining political control and also to help an efficient extraction of resources from the colony. Agriculture science occupied importance due to its scope to produce export products and improvement of

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revenue sources. Unlike their interest in cash crops, involvement in the improvement of food crops was done under the pressure coming mainly from famines. Though food was a necessity, it did not receive any particular attention. Cash crops were commodities to be traded, which could show profit and brought the British-Indian state additional income at several levels. World market conditions and a land tax acted like catalysts and transformed south Indian agriculture. Institutionalisation process of science was originally conceived not in the colony but in the metropolitan centres of science as the creation of the field laboratories to perform the functions of testing the experiment in field, supplying scientific data and propagation of scientific changes to the colony. Among the scientific institutions built in the colony were botanical gardens, agricultural and horticultural societies and agricultural research stations and agricultural colleges. Though the institutionalisation of botanical and agricultural scientific activities had its own motives of the colonial government, but they were not without of scientific importance, in fact it was a milestone in both the history of science and the history of imperialism. These institutions not only imported knowledge but they imparted and also to some extent, generated knowledge. But could they disseminate new knowledge and what was the level of dissemination of knowledge?

These changes in agriculture development had important consequences both from the point of view of the British Empire and Indian people. In a broader perspective it clearly reveals three main aspects concerning technoscientific developments in the Indian agriculture. Firstly, the scientific developments were determined by the constraints of colonial rule. Secondly, the British in India did not formulate a systematic policy to develop agriculture by making adequate scientific and technical explorations and innovations. Finally, the response of Indian people towards the new scientific changes in the field of agriculture was primarily influenced by their own existing conditions.
As a matter of fact they did not arbitrarily reject any innovation, which they found useful from the economic point of view.

However, these efforts of the colonial state were pre-determined by the economic and political conditions that prevailed during this period. So, improvement in agriculture through new scientific innovations and technology had limitations that restrained extensive qualitative progress in the field. It was only after 1905 that with the reorganisation of the agriculture department, agriculture research was organised on more systematic lines. A breakthrough in this sphere was made with the establishment of Pusa Institute and provincial colleges at Coimbatore in Madras Presidency and other provinces. The third phase shows development of improved varieties of crops that increased yields per acre, improved the quality of the commodity or increased the capacity of the pest resistance. Agricultural experimental stations were started in the most important agricultural tracts. Therefore, it is important to note that agricultural science that developed during the period under study helped in the creation of colonial strongholds, and at the same time strengthened and legitimised the British hegemony. In this light, science and the Raj both were projected an example of superhuman. Yet, science and technology did not find their forceful application in agricultural production, because it worked through metropolitan and administrative pushes and pulls.

The scientific changes brought by the colonial rule in India derooted the specific peculiarities of Indian rural structure. While strengthening British hegemony, these radiated the western scientific knowledge. In the nineteenth century ‘India as a laboratory’ for the European science remained the same, but the focus of scientific and technical experiments changed. Under the Company rule, colonial science was a healthy discourse between ‘core’ and ‘periphery’, and the scientists enjoyed freedom and flexibility to work. During this period, agricultural science was imparted or partially generated in the country to supply the metropolis economy with the Indian agrarian products. To fulfil
these requirements scientific and technical tentacles broke down the pre-colonial rural structure and pushed it into the radius of commercialisation. The British land revenue system, the establishment of railways and the development of market phenomenon created thoughtful scientific ripples in the rural economy. At this stage, Indian structure required not merely ripples but a flood of techno-scientific ideas. The British political hegemony, the Indian social and religious taboos and the rural economic self-sufficiency did not allow the ‘germs’ of science and technology to mature on the western trends. All this created modulations in the rural structure. The agrarian social strata were stirred up by the advent of science and technology, but actual socio-economic churning could not take place. The British government looked upon this social and economic sluggishness as a result of Indian poverty, inferiority, and the degradation of economy. In fact, it was government’s own creation to avoid social upheavals, which endangered the basis of the British imperialism. Therefore, agricultural science emerged as dependent science which derived strength from imported knowledge. It worked to transform India from a “primary producing country with her economy controlled and directed from outside.”

As Indian agrarian potentialities were recognised, the British economic ranges in the rural economy were extended through science and technology. As Peter Harnetty observes: “in both the formal and informal dependencies in the mid-Victorian period, there was much effort to open continental interiors, expand British influence in land from the ports, and develop the hinterlands. The general strategy of this development was to convert these areas into complementary satellite economies providing raw materials and food for Great Britain, and also providing widening markets for her manufacturers.”

David Fieldhouse considered these efforts as the development of backward regions of

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3 Peter Harnetty, Imperialism and Free Trade: Lancashire and India in the Mid-Nineteenth Century, pp. 2-3
a colony to fulfil the needs of British industry. Thus, agrarian science and technology helped the government in turning feudal backwardness to colonial backwardness. At the same time, Indian agriculture was dissimilar to those in Britain, as they were approached halfway and half-heartedly in the Indian colony.

The exploitation from the Indian agriculture was shaped up by the needs of the metropolis, international trade balance and the land revenue of the government. These were made more exploitative with the aid of science and technology. While catering to the above-mentioned requirements, government tried to follow a scientific policy. Although policy evolution lacked continuity, but variations in scientific and technical means accommodated the end. The four fold objectives of agrarian science were: firstly, to make maximum exploitation from the rural economy in the form of revenues and raw materials; secondly, to make effective scientific and technological developments to improve agrarian commercial produce and to invest least on unremunerative projects; thirdly, to create agrarian colonialism not only for economic exploitations, but also to extend political tentacles in the hinterland; and finally, to make imperial impressions upon Indian minds residing in the villages.

The British policy remained throughout segmented because it was regulated by the financial stringency of the government and the pressures from the British and Indian Chambers of Commerce and Traders associations. The Indian Empire was often called upon to make sacrifice for the larger imperial interests. Discontinuous and indefinite policy was generally geared to maintain a balance between financial viability and preserved the reputation for good faith. But usually, financial elements absorbed and remove all the other


elements. In spite of stringent policy, government focussed its attention on the introduction and institutionalisation of science because it was a method of creating a colonial culture in the rural India. It was further enhanced by the introduction of agricultural education, which as a matter of fact was prompted to create an official class of natives that helped in the systematic and maximum extraction of revenues. As a result of this a new type of class of yeomen in rural India came into existence. But since the scope of agricultural education was limited, culture of scientific agriculture was not established in the country. The education imparted was of low form, which was not even aided by extensive and systematic researches. It did not create real knowledgeable ryots but created professional class. In fact, agricultural education did not reach the mass as students came from the nonfarming backgrounds who aspired for government jobs. It remained a fascination for the natives and a facility for the British government.

In order to fulfil the needs of the metropolis, scientific experiments were conducted in different regions. Different methods of experiments were adopted to increase the qualitative and quantitative production of various commercial crops like cotton, tobacco, sugarcane and spices. But on an average, improvements and experiments were traced without making a thorough enquiry of the topographical conditions of different regions, generally, these experiments lacked continuity and systematic efforts. Agri-horticultural societies, private associations and societies, encouraged experimental improvements by distributing exotic seeds, implements and knowledge, but did not indulge in actual systematic experiments. Scientific experiments were remaining confined to government experimental farms. The success and failure of experiments depended upon the role of official scientists recruited on the farms and their scientific knowledge and interests. On several occasions official scientists had to sacrifice their scientific attitude at the altar of

\[6\] Ibid., p. XLIII.
administrative benefits and hence actual experiments and researches were ignored during the period under study. Demonstrations of successful experiments and dissemination of scientific knowledge were made at the 'Model' or Demonstrations Farms, through exhibitions, farm reports and journals. It is indeed true that the demonstration of agrarian products attracted the cultivators, but due to lack of finances and actual incentives, they were ignored frequently. Exhibitions were unsystematic and did not present the actual reality. Ryots sometimes regarded them as mere 'tamasha.' Various reports and journals circulated among officials and rich landlords, supplied extracted information to the government agencies but these did not reach the actual cultivators.

In India there had been a prolonged continuity in the rural technology which was broken up by western technique and knowledge. As a result space was created in the rural structure for technological changes. Various technological changes were introduced mainly in manuring, irrigation and tillage, which were experimented and demonstrated in isolation. Like scientific experiments, technological experiments too lacked continuity and coordination in different regions. But one thing was implicit that in the rural structure there was ample room for technological changes. Through various indigenous and exotic techniques were improved upon, but for a deeper percolation, a positive relation between the Indian rural economic structure and the techniques introduced was required, and this was not provided by the British imperialist policies.

Veterinary science, a new branch of science, was introduced into the Indian rural society, which indirectly helped in the improvement of Indian agriculture. Initially, the colonial government did not find much economic benefit in its introduction other than the treatment of horse and pony breeding as well as treatment of diseases intended for military purpose. Gradually, to justify the expenditure incurred upon the veterinary from the agricultural purse,
it began to work for the benefit of cattle in general. It tried to improve upon indigenous breeds not merely on statistical level but scientific too. It established co-ordination between the breeding and feeding of cattle and provided a logical understanding of and interest in veterinary diseases and their treatment. Tropical cattle diseases and their treatment perhaps attracted the attention of European veterinary scientists too. However, not much evidence is available on this aspect; yet probably a two-way process of core and periphery relation was reflected in veterinary sciences also.

Response of the Ryots

The response of the Indian social strata towards agricultural science and technology was not consistent; it was neither always positive nor always negative. It was shaped up by the rural social relations and economic realities. British, in general, while working at the experimental farms in the rural pockets, regarded the Indian disinterestedness towards science and technology as resistance to innovations. On the contrary, Dr. Voelcker found that ‘the native though he may be slow in taking up an improvement would not hesitate to adopt it if he is convinced that it constitutes a better plan, and one to his advantage.’ In a similar context, A. J. Qaisar’s observation which was made about the precolonial conditions is relevant for the nineteenth century also. He says “as long as there was an alternative or appropriated indigenous technology which could serve the needs of Indians to a reasonable degree, the European counterpart was understandably passed over.”

The rural middle class, known as money lending or trading class, lacked experimental spirit. They financed the cultivators and encouraged them to produce for the market, but only to strive for short-term profits. They did not

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8 A. J. Qaisar, The Indian Response to European technology and Culture 1496-1707, p. 139.
work for the long-term process of scientific and technical encouragement of the British type.

Indian ryots, who belonged to the base of the rural social pyramid, were enquiring, appreciative and rational. They had an age-old experience but lacked capital. In fact they were not averse to novel scientific and technical changes, and intelligently appreciated some innovations, adopted a few and rejected those which were costly or did not suit their conditions. Besides this, scientific experts were not available everywhere to guide them on matters of agricultural science and technology. High cost and technical complications hindered them to adopt new science and techniques. They also feared that they might eventually place them in the strong clutches of the moneylenders or landlords.

The ryots viewed the action of the government on agricultural improvement with suspicion and indifference not because they did not believe in experiments and on the results of the experiments as colonial officials interpreted it, but because their experience with the colonial officials’ constant attempt of revisions for higher land revenue created a feeling of fear of imposition of additional revenue levy on the produce additionally improved on.  

The term unchanging East was trotted out at every turn whenever no better reason could be given for the failure of new idea or technique propagated. It has been often stated that the ryot in the village was the most irresponsive to a new idea and he lives the same life and adopts the same methods his forefathers lived and adopted generations back. But the ryot originally was not devoid of rationality. Infact south Indian ryot adhered to the principle of rationality. The ryot of south India was not a very rich man who could afford to loose in speculations. Like all practical men with scanty purses,

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he obviously was slow to turn to the risk of losing the little he has. But within his means and occasionally even beyond these he did speculate. When the ryot was convinced that there was a tolerably good chance of improving his position by cultivating a new crop or adopting a new method, he went for it.

But actual reason of the sluggishness in the progress of science was within the nature of construction of science itself. As for the saw-gins, for example, their initial failures were mainly due to total in-experience of the servants of the East India Company regarding the ginning machine. Although this difficulty was overcome with the employment of American planters. The major defect with the Whitney’s saw-gin was that it did not suit the short staple cotton of India. When the gin wheels were adjusted very close to the grating to separate the seed, the staple of Indian cotton was spoiled. The lack of skilled workers for servicing the gin was another problem.

The main objection of British technicians to the Indian wooden plough was that its wooden share did not invert the soil and went to a depth of only 3 or 4 inches. They misassumed as they only thought that reploughing and cross-ploughing by the Indian plough as proof of its inability to go deep enough and to invert the soil once for all. The response of Indian cultivators to the exotic seeds brought by the British was also affected by the local conditions. The British introduced some improved varieties of cash crops like cotton, spices, sugarcane and indigo, etc. They also acquired the services of American experts to instruct the Indian farmers. But these experiments failed to yield encouraging results. Once again the factors responsible for the failure of such experiments were other than ‘indolent’ character of the Indians.

The positive attitude of the cultivators is evident from the extraordinary rapidity with which they opted for new technology in the form of Thomson and Mylne sugarcane mill. The new iron mill exhibited superiority over the work of the wooden mill as it increased amount crushing of efficiency. Juice extracted by it was far cleaner and the yield of sugar higher by nearly 25
percent. This invention did not take long to become popular with cultivators. Indian ryots response to the introduction of scientific agriculture did not comprise a uniform action but reflected the concern and suitability to the ryots own conditions. Western science introductions were not debared if they promised him advantageous over his own. For example, the advantages of Messers Thomson and Mylne sugarcane mill was universally appreciated by the ryot. But at the same time, ryot’s decision to reject some other technological innovations were rational in the then conditions. In the case of so called iron ploughs also experience indicates the prudent nature of Indian ryots. Even in the case of heavy iron ploughs, attitude of the ryots towards its adoption was not the expression of an outright discard. They were rather to adopt only of those of improved implements that had promised certain usefulness. The Swedish heavy iron plough gained attention of the Bellary ryots as they effectively removed the haryali nut grass in the black soil of this area. The higher cost of the implement was not viewed always as a barrier, but most often higher price of the implements did not ensure a better function. In the case of heavy ploughs, the advisability of deep ploughing had to be proved first. In both cases the capacity of the available cattle and the difficulty of replacing broken spare parts and of carrying out repairs were serious obstacles to the introduction of foreign machinery.

The conclusion to be drawn from these examples is that from time to time and when it was appropriate, cultivators were ready to take up new varieties of crop if they had access to the seed. For the big landlords and well-to-do ryots, the governmental farms proved useful sources of supply. The farms assumed the role of benevolent landlord. The improvement of indigenous agriculture system was discouraged by the British not because it was incapable of improvement but for two main other colonial reasons, agrarian transformation set by Indian system had its own speed of progress and the changes occurred in European manufacturing technology, therefore they
demanded such related changes in the supply of inputs. Secondly colonial raj was established primarily on projection and dissemination of modernisation. On the other hand, continuation of the already existing methods and techniques were perceived as a barrier and insufficient to cater the modern requirements of Europe. Whereas, modern science was expected by colonialism to serve their own objectives better.

The colonial promotion of science in agriculture may be put in simplified form as an example of an extractive science or 'exploitative science' than development science. This interpretation of colonial science may appear quite opposite to the perception of colonial historians. Of course colonised ryot was not completely deprived of the advantages of scientific progress. The development of science for the advantages of the coloniser also extended certain inevitable scientific benefits to the colonised. But was that the kind of science the colonised desired to develop? Why the scientific projects of the coloniser were resisted? Raj did not believe nor wanted its political establishment on physical strength alone. Raj preferred to establish a substantially different empire from the structure of precolonial powers. It trusted more to sophisticated, inexpensive tools of cultural ideology, and science which were not developed, as tools of rule in the pre-British period now became an exceptionally important tool.

11 Drayton, Richard, Natures’s Government argues colonial modernisation of the colonised world.
Plate-1.

Agricultural College, Saidapet.

Agricultural College, Coimbatore.
Plate 9. Principals.

W.R. Robertson

W. Keess

C.J.W. Shepperson

S.L. D'Silva
Plate-10. Principals.

H.C. Sampson, C.I.E.

W. McRae

R.C. Breedfoot

R.C. Wood

R.V. Norris

F.R. Parnell

C.R. Hilson
Plate—


Dewan Bahadur L. C. Swamkanna Hill, C.I.E., I.S.O.

The Madras Agricultural Students' Union Hall.

G. A. D. Stuart, C.I.E.

C. A. Barber, C.I.E.  R. D. Anstend, C.I.E.

Dewan Bahadur K. Rameshwaran
Plate—5. Patrons.

Sir. A.P. Patro, Kt.

Sir. C.P. Rameswamy Iyer, K.C.I.E.

M. Sambanda Mudaliar

Rao Bahadur, T.A. Ramalinga Chettiar

Rao Bahadur, C.S. Patnaikapathy Mudaliar

C. V. Venkataramana Iyengar
Plate-6. Patrons.

Rajah of Parhakimedi

Kumaro Zemindar of Uttukuli

Rajah of Kollengode

Rajah of Rumnad

Veerarayan Thirumalpad (Nilambur)

V. Mudhooram Rajah
Plate 7. Patrons.

Raja of Bubbli
Vengurle Krishnar Nayyar
N.R. Muliyandy Chettiur
R. Jeevan Das

Khan Bahadar Haji
Aftab Ali Haji Kasim Sahib
Zaminder of Vithavuni
Thodlepangunnur

Moopil Nayar of
Kovalespara
Plate -12

Rao Bahadur J. Chelvaranga Raju  D. Ananda Rao

Rao, Saheb M. R. Ramaswamy Sivan  C. Tadulinga Mudaliar

Lt. E. Buckley, I.C.S.  Sir Gordon Fraser  M.E. Couchman, C.S.I.

Sir Fairless Burber  Sir P. Thengaroyen Chettiar  N. Mierschuel, M.A.; I.C.S.