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# Hybrid forestry practices in British colonial and postcolonial forestry networks

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## Abstract

This study first examines the process by which the forest management system was developed in the British Empire, focusing on colonial foresters' arguments concerning the question of indigenous land use. This study argues that by the early twentieth century, new forestry practices called the 'taungya' and 'village forest' had been devised to manage indigenous land use, such as shifting cultivation, in colonies. These 'hybrid' forestry practices, which evolved from encounters between European forestry models and indigenous land use in colonial regions, were incorporated into empire forestry networks.

This study's findings reveal how the hybrid colonial forestry practices were argued in multiple forestry networks after the Second World War. This was accomplished by considering the continuity and shifts in the postcolonial forestry networks, by examining the arguments for and against the taungya, from the late 1940s to the 1960s. The Empire/Commonwealth Forestry Conference and the World Forestry Congress were analysed primarily to explore how foresters of newly independent countries, former colonial British foresters, and other experts committed to international technical assistance, considered this issue.

Keywords: British Empire, forestry, network, colonial, postcolonial, hybrid

## Introduction

In the history of colonial forestry, many studies have investigated how state forestry developed in British India because the Indian Forest Service (hereafter IFS) was first established under the British Empire in 1864 and included the largest number of professional foresters in the empire. Some analyses are highly critical of forest management in colonial India. For example, Madhav Gadgil and Ramachandra Guha note that state forestry established regimes of regulation that profoundly

affected rural societies where ecological harmony existed in the pre-colonial period. They argue that state forestry triggered popular resistance, which sometimes fed into anti-colonial, nationalist movements in the twentieth century.<sup>1</sup>

More recent literature challenges simple arguments about the history of colonial rule and local resistance. K. Sivaramakrishnan and Arun Agrawal outline the varieties of colonial forestry practices in India and suggest that the forestry system was actually constrained by ecological and political conditions in each area and transformed into hybrid forestry practices through interactions with local ecologies, economics and politics.<sup>2</sup> Their studies have led to revisions of the debate surrounding forest management and colonialism in India.

Other studies have focused on the history of empire forestry, which deals with the intersection of professional scientific forestry and imperial agendas such as resource management, economic development and state formation. Gregory A. Barton and S. Ravi Rajan examine the process by which modern forestry was established and spread in the British Empire, and observe that Continental European forestry had an influential impact on the development of the forest management system in India and other colonies.<sup>3</sup>

Meanwhile, Peter Vandergeest and Nancy Lee Peluso take issue with the assumption that a single, dominant European forestry model spread worldwide through forestry networks. Their research on South East Asian countries reveals that European forestry models were transformed into hybrid forestry practices through interactions with local ecologies, economics and politics, and circulated in forestry networks.<sup>4</sup> Although their findings are insightful, to better understand the hybridity and dynamics of knowledge production in forestry networks in the empire, further empirical investigation is necessary into how local experiences in colonies were exchanged and how a new management system was produced and spread around the empire.

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1 Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (Delhi: Oxford University Press, 1989); Madhav Gadgil and Ramachandra Guha, *This Fissured Land: An Ecological History of India* (Delhi: Oxford University Press, 1992).

2 K. Sivaramakrishnan, *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India* (Stanford, CA: Stanford University Press, 1999), doi.org/10.1515/9781503617995; Arun Agrawal, *Environmentalities: Technologies of Government and the Making of Subjects* (Durham, NC: Duke University Press, 2005), doi.org/10.2307/1511132.

3 Gregory A. Barton, *Empire Forestry and the Origins of Environmentalism* (Cambridge: Cambridge University Press, 2002), doi.org/10.1017/CBO9780511493621; S. Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development, 1800–1950* (Oxford: Clarendon, 2006).

4 Peter Vandergeest and N. L. Peluso, 'Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 1, Part 2', *Environment and History* 12 (2006): 31–64, 359–93, doi.org/10.3197/096734006776026809.

Furthermore, much less work has assessed how colonial knowledge and practices on forests have been reinforced or transformed in the postcolonial period.<sup>5</sup> After India's independence in 1947, the IFS began to establish a new state forestry system, although it remained in the empire (later Commonwealth) forestry networks. Most British staff retired or moved to work for other British colonial forestry services, as well as universities, research institutes or timber companies in Britain or its colonies. Simultaneously, international organisations such as the Food and Agriculture Organization of the United Nations (FAO) began to integrate networks including newly independent countries (e.g. India). To fully understand the impact of colonial forestry, we need to investigate how colonial knowledge and practices were considered in these newly generated networks.

This paper first examines the process by which the forest management system was developed in the British Empire, focusing on colonial foresters' arguments on the question of indigenous land use. I demonstrate that, by the early twentieth century, new forestry practices called the 'taungya' and 'village forest' had been devised to manage indigenous land use such as shifting cultivation in colonial sites. I also explore how these 'hybrid' forestry practices, which were produced by the encounter between European forestry models and indigenous land use in colonial regions, were incorporated into empire forestry networks. The sharing of experiences throughout the colonies resulted in new management models, which, by the 1930s, could serve as compromises with the exclusive state forestry system.

The latter part of this paper demonstrates how the hybrid colonial forestry practices were argued in the empire/Commonwealth and international forestry networks after the Second World War. I consider the continuity and shift in the postcolonial forestry networks, examining the arguments both for and against the taungya from the late 1940s to the 1960s. In particular, this paper illuminates how, by the late 1960s, colonial hybrid forestry practices were revised in international forestry networks. I analyse the regional, Commonwealth and international forestry conferences to explore how Indian foresters, former IFS British foresters, and other experts committed to international technical assistance, considered this issue.

## The establishment of empire forestry

The IFS was the first forest service established in the British Empire, as mentioned above. A number of the IFS officers, employed to assist in organising forest administration in other British colonies, brought their techniques to develop forestry throughout the empire and exchanged observations. Before the First World War, forestry services were established in New Zealand, Australia, Canada, Mauritius,

5 Vandergeest and Peluso's work examines postcolonial forestry in South East Asia: *ibid.*

Cyprus, Ceylon, the Cape Colony, Nigeria, the Gold Coast, Sierra Leone, Kenya and the Federated Malay States. As the IFS played an important part in establishing forest services in these colonies, we can assume that there were forestry networks among the British colonies. However, before the First World War, forestry was not developed, except on a private basis, within Britain itself.<sup>6</sup>

Britain had relied mainly on timber imported from northern Europe, Canada and the United States. However, the outbreak of the First World War seriously affected timber imports from abroad, and during and immediately after the war, no fewer than 450,000 acres (c. 180,000 ha) of woodland were felled in Britain.<sup>7</sup> As a result, the British Government realised the need for an internal forest policy, and the Forestry Act was passed in 1919, marking a new era in the British forestry system. This Act aimed to establish a Forestry Commission to develop afforestation and timber production in Britain.

Simultaneously, anxiety about and obsession with timber shortages were widespread in the British Empire. Foresters and administrators both in the colonies and the central government began to recognise that deforestation could threaten the stability of the states and even the continuing rule of the empire. Thus, forestry topped the agenda of the British Empire, which sought to establish empire forestry for more sustainable forest management.

To this end, the Empire Forestry Conference was first held in London in 1920, while the second conference was held in Canada in 1922, the third in Australia and New Zealand in 1928, and the fourth in South Africa in 1935. The next conference was intended to be held in India in 1940, but it was cancelled due to the Second World War. These conferences made it possible to exchange ideas, discuss matters of technical interest for purposes of a common policy, and to correct errors and misconceptions throughout the empire. They also strengthened the professional identity of foresters, who were widely dispersed throughout the empire. Most conference participants were experts from forest departments or research institutes in various parts of the empire, as well as some delegates from the Colonial Office and other administrative authorities. The conference required all governments to consider the discussions of the conference to improve forest policy.

At the first British Empire Forestry Conference, the principle of empire forestry was set out as follows:

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6 Shoko Mizuno, *Igirisuteikokukaramiru Kankyoushi* [Environmental History of the British Empire] (Tokyo: Iwanami Shoten, 2006).

7 Forestry Commission, *Post-War Forest Policy*, Report by HM Forestry Commissioners, Cmd. 6447, 1943, in *A History of English Forestry*, ed. N. D. G. James (Oxford: Blackwell, 1981), 209.

In view of the great importance to the Empire as a whole, as well as to each of its component parts, of producing a sustained yield of all classes of timber, and of encouraging the most economical utilisation of timber and other forest products, and of maintaining and improving climatic conditions in the interests of agriculture and water supply, each of the Governments of the Empire should lay down a definite forest policy to be administered by a properly constituted and adequate forest service.<sup>8</sup>

There are two key points here. First, both the economic and protective effects of forests were of significant concern in empire forestry. Second, it was believed that the state should have responsibility for establishing forestry in the empire.

At the conference, reports demonstrated that forests had been over-cut and exploited in almost every part of the empire. Therefore, undeveloped forests in tropical Africa were viewed as a potential source of timber supply. However, colonial foresters in these regions reported that the forest area was decreasing sharply, due to the extension of plantations, the development of mines, and shifting cultivation.<sup>9</sup>

## Empire forestry networks and local knowledge

### Shifting cultivation and the ‘taungya’ system

Shifting cultivation was defined as ‘a system of temporary cultivation under which areas of forest are felled and burned. The clearings are temporarily cultivated with agricultural crops for one year, or a few years, and then abandoned’.<sup>10</sup> This practice was prevalent in the tropical colonies. Many foresters insisted that this method led to the destruction of valuable forests and soil denudation. However, in the late 1850s, the ‘taungya’<sup>11</sup> system was attempted in Burma, with the intention of planting valuable trees as well as controlling the shifting cultivation practised by the Karen, an ethnic group in the forests of the Pegu hills. This system involved sowing teak seed along with field crops in the cleared and burned forestland and tending the teak crop after the field crop had been reaped. In other words, taungya allowed indigenous communities to practise agriculture in forests for several years on the condition that they provide labour for forest plantations.

8 See Resolution 1, in Empire Forestry Commission (EFC), *British Empire Forestry Conference, London, 1920: Proceedings, Resolutions and Summary of Statements* (London: HMSO, 1921), 239.

9 *Ibid.*, 167–79.

10 EFC, *Second British Empire Forestry Conference, Proceedings and Resolutions* (Ottawa: F.A. Acland, 1927), 407–8.

11 ‘Taungya’ was originally a compound Burmese word, from ‘taung’ meaning hill and ‘ya’ meaning cultivation, and denoted shifting cultivation as commonly practised in the hills. See R. S. Troup, *The Silviculture of Indian Trees*, vol. 2 (Oxford: Clarendon, 1921), 739–41; R. S. Troup, *Colonial Forest Administration* (Oxford: Oxford University Press, 1940), 174–5.

Colonial forest laws generally prohibited, within reserved forests, the burning of grass or undergrowth; therefore, shifting cultivation was usually prohibited and offenders were fined or jailed. Why, then, was the taungya system implemented in Burma as an exception? Recent research offers two explanations. First, it was an efficient and economical method of forming teak plantations and drawing the Karen into the system as participants because it was difficult to secure forest labour in remote places. Second, it was expected to restrain their resistance to forest policy. The Karen villagers who agreed to engage in taungya received payment per acre planted, exemption from the poll-tax, and a plot for their own use.<sup>12</sup>

Interestingly, in the early twentieth century, the taungya system began to be employed in other parts of British India such as Bengal, Assam and the United Provinces. This can be explained from an ecological perspective.<sup>13</sup> We can turn our attention to fire protection, one of the main concerns of foresters at the turn of the twentieth century. They attempted to protect valuable trees such as teak and sal from fire and imposed fire prevention programs on local communities. Subsequently, in the 1910s, they began to notice undesired ecological transformations of the forest induced by fire protection.<sup>14</sup> Some foresters reported that the regeneration of young sal and teak, which were both fire-resistant species, was retarded by the dominance of evergreen shrubs in the undergrowth. After years of controversy, in the 1920s, the role of fire in sal and teak regeneration was broadly realised.<sup>15</sup> This silvicultural discovery was another reason for the development of taungya in the empire.<sup>16</sup>

I next examine how the issue of shifting cultivation was discussed at the Empire Forestry Conferences. Although Rajan addresses this subject, he focuses solely on the session on shifting cultivation and the report of the committee on shifting cultivation at the second conference.<sup>17</sup> Therefore, I will discuss the development of the arguments at the subsequent conferences.

At the second conference in 1923, it was clear that few foresters recognised the use of fire for regeneration. At the session on forest fire protection, C. G. Trevor of the IFS cited the instances of Bengal and Burma and recommended controlled fires as an effective measure to regenerate certain fire-resistant species. However, no one referred to this point after his report.<sup>18</sup> At the session on shifting cultivation, foresters were divided into two groups. J. R. Ainslie, a forester in Nigeria, and R. M. White, a forester in Ceylon, sought a complete ban on shifting cultivation. Ainsley argued that the forest area annually destroyed in Nigeria by uncontrolled

12 Raymond L. Bryant, 'The Rise and Fall of *Taungya* Forestry: Social Forestry in Defence of the Empire', *The Ecologist* 24 (1994): 21–6.

13 For a detailed study of colonial Bengal, see K. Sivaramakrishnan, 'The Politics of Fire and Forest Regeneration in Colonial Bengal', *Environment and History* 2 (1996): 145–94, doi.org/10.3197/096734096779522338.

14 E. P. Stebbing, *The Forests of India*, vol. 3 (London: John Lane and the Bodley Head, 1926), 392–9.

15 *Ibid.*, 400–2, 409.

16 Sivaramakrishnan, 'The Politics of Fire and Forest Regeneration in Colonial Bengal'.

17 Rajan, *Modernizing Nature*, 171–9.

18 EFC, *Second British Empire Forestry Conference*, 175–7, 204–11.

shifting cultivation was more than 2,000 square miles (c. 500,000 ha), which caused enormous economic and ecological damage. White suggested that shifting cultivation in Ceylon had resulted in forest deterioration and loss of soil fertility.<sup>19</sup> In contrast, those in favour of shifting cultivation, such as R. S. Troup,<sup>20</sup> a professor of forestry at the University of Oxford, and E. Battiscombe, a forester from Kenya, insisted that controlled shifting cultivation was the best and cheapest method for mobilising resident labour to plant valuable species. Troup cited the example of Burma, where there were c. 55,000 acres (c. 22,000 ha) of flourishing teak plantations raised with the aid of shifting cultivation.<sup>21</sup> Ultimately, an ambiguous resolution was passed, which admitted that 'the practice of shifting cultivation, except when controlled as an integral part of forest management, is a serious menace to the future welfare of certain portions of the Empire', and therefore the conference 'urge[d] Governments concerned to take necessary measures to deal with the situation'. It also declared that 'shifting cultivation, if strictly controlled, may be made to serve a useful and even necessary purpose in the formation of plantations' and, for that reason, 'this Conference favours its encouragement under control'.<sup>22</sup>

At the third conference in 1928, W. R. Jacob of the IFS described the successful utilisation of fire in North Bengal and Assam to get rid of extensive evergreen weeds. He also suggested using controlled fires for eucalypt regeneration in Queensland, Australia. In response, V. Greening, a forester in Queensland, admitted that fire could be used with careful control.<sup>23</sup>

At the fourth conference in 1935, a new understanding of fire protection was demonstrated. It was noted that 'the strict exclusion of fire, in vegetation accustomed to fire, may actually do harm and that under certain conditions care has to be taken so that fire protection does not alter the ecology of the trees'.<sup>24</sup> There remained many arguments for and against the use of fire, but the ecological evidence for the regeneration of some species rejected the view of taungya as 'silviculturally unsound'.<sup>25</sup> Troup commented that 'shifting cultivation, as such, is an extremely destructive practice, but like fire, although it is a very bad master it can be turned into a very good servant'.<sup>26</sup> He reported that taungya plantations were 'a regular mode of artificial regeneration' and were widespread in places such as Burma, Bengal, Assam and the United Provinces in India, as well as Kenya, Tanganyika, Nigeria and Queensland, although the technique of taungya varied greatly in different places.<sup>27</sup>

19 Ibid., 325–9, 333–4.

20 Troup was a director of the Imperial Forestry Institute at Oxford from 1924 to 1935, and had formerly worked in the IFS.

21 Ibid., 330, 332.

22 Ibid., 386–8, 407–11.

23 EFC, *Third Empire Forestry Conference, Australia and New Zealand, 1928: Proceedings* (Canberra: Government Printer, 1928), 134–7.

24 Empire Forestry Association, 'Fourth British Empire Forestry Conference', *Empire Forestry Journal* 15 (1936): 47.

25 EFC, *Second British Empire Forestry Conference*, 329.

26 EFC, *Fourth Empire Forestry Conference, 1935, Proceedings* (Pretoria, 1936), 224.

27 Ibid., 223–4.

For example, in Burma, the total area of taungya plantations exceeded 130,000 acres (c. 53,000 ha) in 1936. A rather smaller area was seen in African colonies such as Kenya, in which the total area of taungya plantations was c. 51,000 acres (c. 21,000 ha) in 1937.<sup>28</sup> Thus, taungya, a kind of hybrid forestry produced through interaction with indigenous ecology and custom, was developed in the empire.<sup>29</sup>

## State forestry and the development of a village forest system

Another example of new forest management is the allocation of village forests. At the fourth conference, it was reported that the village forest scheme had begun in Nyasaland in 1926. The basis of the scheme was to protect indigenous forests on hill slopes or catchment areas to prevent erosion and run-off as well as to supply poles and fuel for local use. These forest areas were put under the control of the village headman and exempted from the operation of the general forest laws relating to reserved forests. Therefore, this system was expected to give local people a very direct interest in and facilitate their control of forests.<sup>30</sup> In other words, it was devised to educate people to 'appreciate that it is quite a wise thing to do, to get areas on which they can protect themselves, and look upon as the source of their supplies in the future'.<sup>31</sup> By the end of 1929, only 97 acres (39 ha) had been designated as village forest, but by 1936, this area had increased to nearly 180,000 acres (73,000 ha), approximately 7 per cent of the total forest area in Nyasaland.<sup>32</sup> Among the conference participants, R. D. Furse of the Colonial Office was particularly interested in how foresters in Nyasaland succeeded in inducing native chiefs to take 'such a very unusual attitude towards the forestry policy'.<sup>33</sup> In answering his question, J. B. Clements of the Nyasaland Forest Department described the success as mainly due to the close co-operation of the administrative officers, forest officers and native officers. He also attached great importance to the propaganda by native foresters directed at local societies.<sup>34</sup>

Troup also indicated that the scheme was facilitated to some extent by an old family custom known as *chire*, under which areas were protected from bush fires on behalf of the chief to provide a refuge for game, which was afterwards driven out by

28 Troup, *Colonial Forest Administration*, 174.

29 The acceptance of taungya as a means to control shifting cultivation did not mean that criticism of shifting cultivation itself weakened. It was condemned as a major cause of soil erosion and was recognised as an urgent problem in the empire after the mid-1930s. I discussed this point in Shoko Mizuno, 'Forest Management System and Indigenous Land Use in the British Empire, 1920–1947', paper presented at the Second Biennial Conference of East Asian Environmental History (EAEH, 2013).

30 EFC, *Fourth Empire Forestry Conference, 1935, Proceedings* (Pretoria, 1936), 215.

31 *Ibid.*, 230.

32 Troup, *Colonial Forest Administration*, 355–7.

33 EFC, *Fourth Empire Forestry Conference*, 227.

34 *Ibid.*, 216, 229–31.

hunters. The idea of protecting areas of bush was not, therefore, entirely foreign to the villagers. He recommended this village forest scheme to other colonies because it helped develop an appreciation of forest property amongst its inhabitants.<sup>35</sup> The success of Nyasaland's village forest scheme helped to bring about the introduction of communal forest management systems in Tanganyika, Uganda, Kenya, Northern Rhodesia and Nigeria in the second half of the 1930s. However, the management patterns and degree of local peoples' co-operation varied.<sup>36</sup>

On the other hand, in the 1920s and 1930s, the forest departments began to hand over less-valuable forests to the revenue departments in parts of India, such as Kumaon in the United Provinces, Punjab and Madras, to create communal forests.<sup>37</sup> These areas were put under the control of *panchayats* or village-level councils and supplied village communities with fodder and firewood. These village forest systems were considered a compromise among the conflicting interests and they changed relationships between local communities and the state.<sup>38</sup>

In general, colonial state forestry had prevented local people from exercising their customary rights in the reserved forests, but it was practically impossible for the small numbers of colonial foresters to control the reserved forests in Nyasaland and elsewhere in other African colonies.<sup>39</sup> Therefore, they realised the necessity of involving native forest officers and village headmen as collaborators in forest governance. Meanwhile, in post-First World War India, colonial foresters had to be more cautious in dealing with local resistance, such as incendiarism, which was often related to the rise of nationalism at that time.

Therefore, information about communal forestry practices in different local contexts was exchanged across the empire, and the new system for involving village communities in forest management was elaborated as a complementary type of forestry. Troup concluded that:

It may be said that forests required for the benefit of the country as a whole—where for purpose of protection or of production—should be retained under the direct administration and management of Government, whereas those maintained solely for the local supply of produce to native communities might be handed over to Native Authorities, but with adequate safeguards. Generally speaking, the latter would be forests of comparatively small area and no great timber value.<sup>40</sup>

35 Troup, *Colonial Forest Administration*, 355.

36 *Ibid.*, 225–8.

37 Agrawal, *Environmentality*, 112–15.

38 *Ibid.*, 113.

39 The number of senior foresters in most African colonies did not exceed 10. See 'Professional Members', *Appendix to Empire Forestry Journal* 3 (1923).

40 Troup, *Colonial Forest Administration*, 226–8.

Thus, the new state forestry system, which was compatible with communal forest management, was proposed as an efficient method, suggesting that the state–community relationships in managing forests were partly transformed under the empire.

## Reconfiguration of forestry networks after the Second World War

Before India's independence in 1947, the IFS had already begun to reorganise its structure. In 1923, the Government of India began to reform employment in all public services, including the IFS, so that more Indians were employed (so-called 'Indianisation'). In 1934, the IFS staff comprised 189 Europeans, 92 Indians, and one Burmese. In 1943, there were 85 Europeans and 76 Indians. By 1947, most British staff had retired.<sup>41</sup> Some of the former IFS British foresters now worked for other British colonial forestry services. Others found posts at universities, research institutes or timber companies in Britain or its colonies, whereas some British foresters remained employed in independent India and Burma. For example, C. W. D. Kermode, who had worked for the IFS since 1924, became the first head of the department of forestry at the University of Rangoon in 1952. C. E. Hewetson, Conservator of Forests of Madhya Pradesh, had worked at the IFS for 30 years. R. M. Gorrie, who was known as a soil conservation expert within the IFS, was employed by the Damodar Valley Corporation as a forestry advisor.

Indian foresters maintained a close relationship with the former British IFS foresters. For example, H. G. Champion, professor of forestry at Oxford University, was invited to major national forestry conferences in India throughout the 1950s and 1960s. Current and former IFS members remained active participants in the empire forestry networks and, ultimately, those of the Commonwealth. The Empire Forestry Conference changed its name to the Commonwealth Forestry Conference at the sixth conference in Canada in 1952.<sup>42</sup>

On the other hand, newly founded international organisations such as the FAO began to integrate forestry networks, including those in newly independent countries. This organisation helped to (re)establish state forestry in developing countries and to develop forest research and education through technical assistance programs.<sup>43</sup> In 1948, the FAO established a Regional Office for Asia and the Pacific in Bangkok. In 1949, a Forestry and Timber Utilization Conference for Asia and

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41 Harry Champion and F. C. Osmaston, eds, *The Forests of India*, vol. 4 (London: Oxford University Press, 1962), 11.

42 The Commonwealth Forestry Conference is still held periodically.

43 For example, the FAO organised a seminar for the training of forest research workers at Dehra Dun in 1955 as part of its Technical Assistance Programme.

the Pacific was convened at Mysore, India, sponsored by the FAO. This conference led to the establishment of the Asia and the Pacific Forestry Commission, which has held meetings almost every two years to bring together forestry experts and decision makers from the region. Thus, the FAO established postcolonial forestry networks during the 1950s in Asia, including in previous British colonial territories. In fact, a considerable number of colonial foresters were recruited by the FAO in the 1950s and 1960s, and they influenced state forestry in developing countries.<sup>44</sup>

The FAO also supported the World Forestry Congress after the war, which provided a forum for bringing the ideas and techniques of experts to develop forestry in each part of the world, as well as opportunities to exchange their opinions or observations. In the multiple post-war forestry networks mentioned above, how were colonial knowledge and practices discussed? In the next section, I examine the arguments about taungya and shifting cultivation at the empire (later Commonwealth) and international forestry conferences.

## Shifting views on taungya in the postcolonial forestry networks

### Continuity in the postcolonial forestry networks

The Fifth Empire Forestry Conference was held in London in 1947 and, as before, various measures against shifting cultivation were proposed. H. F. Mooney of the IFS reported that, in 1939, a scheme had commenced for the removal from the steeper hills of tribes who had practised shifting cultivation, and their settlement on lower slopes in India's Eastern States. This experiment had proved so successful that the methods began to be applied over a wider area and amongst other tribes, to whom medical aid and educational facilities were provided.<sup>45</sup> W. J. Eggeling, a forester from Uganda, insisted that forests on catchments must be preserved to maintain water supply by evicting the shifting population.<sup>46</sup> A forester from Nigeria, F. S. Collier, suggested altering the shifting cultivation system, as increasing population accompanied the expansion of the area under that system, leading to encroachment upon forest reserves.<sup>47</sup>

44 Jennifer Gold, 'The Reconfiguration of Scientific Career Networks in the Late Colonial Period: The Case of the Food and Agriculture Organization and the British Colonial Forestry Service', in *Science and Empire: Knowledge and Networks of Science across the British Empire, 1800–1970*, ed. B. M. Bennett and J. M. Hodge (New York: Palgrave Macmillan, 2011), 297–320, doi.org/10.1057/9780230320826\_14; Vandergeest and Peluso, 'Empires of Forestry, Part 2'.

45 EFC, *Fifth British Empire Forestry Conference, Great Britain 1947, Proceedings* (London: HMSO, 1948), 98.

46 *Ibid.*, 83.

47 *Ibid.*, 100–1.

However, D. J. Atkinson of the Burma Forest Department regarded taungya as a system of cheap and successful establishment of plantations based on shifting cultivation. He disagreed with Mooney and declared: 'There can be no doubt that it [taungya] was acting beneficially for the species for which we are most concerned, that is, teak. Shifting cultivation is not by any means always a menace.'<sup>48</sup> Some foresters demonstrated ambiguous attitudes towards shifting cultivation. G. N. Sale, a forester from Trinidad, stated that taungya was used in the establishment of teak plantations and was good if strictly controlled, although he realised that it was a long, slow process to improve the methods of the peasants who practised shifting cultivation on hills and steep slopes.<sup>49</sup> A forester from the Gold Coast, A. Foggie, noted the conditional effects of shifting cultivation, stating that:

Within the centre of the forest area, where the forest tends to be of the wet type, shifting cultivation tends to bring in the valuable species as opposed to the very hard-wooded evergreen trees; while, on the edges, it immediately causes degrading from closed forest to savannah woodland.<sup>50</sup>

In summary, at the fifth conference, taungya remained a controversial theme. Although some foresters insisted on the eradication of shifting cultivation, their ideas were seldom put into practice due to the cost and expected resistance of local societies. Taungya was recognised as a practical method of controlling shifting cultivation as well as the artificial regeneration of teak and sal.

In 1949, the United Nations Scientific Conference on the Conservation and Utilization of Resources (hereafter UNSCCUR) was held at Lake Success, New York. This was the first occasion on which the UN brought together more than 700 experts from 52 countries to discuss the application of advanced scientific technologies to resource management worldwide.<sup>51</sup> The program for the conference was divided into six major sections: mineral resources, forest resources, fuel and energy resources, water resources, land resources, and fish and wildlife resources. The forest resources section had seven sessions. In the Forest Management session, Indian and Burmese foresters introduced the advantages of taungya. For example, C. R. Ranganathan, director of the Indian Forest Research Institute at Dehra Dun, stated that:

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48 Ibid., 100.

49 Ibid., 101.

50 Ibid., 107.

51 Concerning the UNSCCUR, see Shoko Mizuno, 'Global Governance of Natural Resources and the British Empire: A Study on the United Nations Scientific Conference on the Conservation and Utilization of Resources, 1949', in *Environmental History in the Making*, vol. 2: *Acting*, ed. C. Joanaz de Melo et al. (Chur, Switzerland: Springer, 2017), doi.org/10.1007/978-3-319-41139-2\_16.

The application of rigid fire protection has produced unexpected results in many cases by inhibiting the regeneration of valuable species. We now have a better understanding of the role of controlled fire in tropical forestry and do not hesitate to use it in our regeneration techniques.<sup>52</sup>

U Aung Din, Deputy Conservator of Forests, Burma, reported that taungya was also the most common and extensively used system in Burma.<sup>53</sup> Their papers contain two points. First, Indian and Burmese foresters suggested that taungya could be adapted to the social and ecological conditions in British India. Second, they inherited the taungya system in the postcolonial period and presented it as their own.

To summarise this session, S. B. Show, acting director of the FAO, Forest Division, stated that he was impressed by the papers on tropical forests. He recognised that attempts to transplant European methods had failed and suggested that the papers should be treated as an impressive record of the progress made by tropical countries in developing their own techniques, as well as being of vital interest to countries about to commence tropical forestry management.<sup>54</sup>

In 1954, the Government of India hosted the Fourth World Forestry Congress at Dehra Dun under the auspices of the FAO. This was the first international forestry conference to be held in a non-European, developing country, reflecting the FAO's great interest in India as a centre of tropical forestry. A majority of the 358 delegates to the Congress came from tropical countries. India alone sent 208 participants. The Congress had five sections, including 'tropical forestry'. In this section, British foresters working in Burma and India argued that taungya facilitated the regeneration of teak and sal. For example, Kermodé stated that 'detailed scientific studies have not been carried out but there is a good deal of evidence as to the effect of taungya cultivation on the teak-bearing forests'.<sup>55</sup> Hewetson suggested using fire for the regeneration of sal in a more careful manner:

In wet areas the sal forest may be able to maintain itself only when frequent fires restrain the evergreen species which would otherwise occupy the site. In dry areas exclusion of fire is necessary to reduce the dryness and to permit sal to survive. Burning is a very important factor and the effect is cumulative. The effects vary widely with type and it is difficult to decide in any one place whether the interests of the sal forest are better served by complete protection or allowing some fires to occur.<sup>56</sup>

52 United Nations, *Proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Resources, 17 August–6 September 1949, Lake Success, New York*, vol. 5: *Forest Resources* ([New York]: United Nations, 1951), 97.

53 *Ibid.*, 117.

54 *Ibid.*, 139.

55 World Forestry Congress, *Proceedings: 4th World Forestry Congress, 1954, Dehra Dun*, vol. 3 (Delhi: Government of India, 1957), 278.

56 *Ibid.*, 480.

Meanwhile, Indian foresters demonstrated more varied attitudes towards taungya. For example, N. Pal, Conservator General of Forests for West Bengal, introduced the information that taungya was the standard and ideal method of raising plantations in North Bengal.<sup>57</sup> K. Kadambi's<sup>58</sup> conclusion was similar to Hewetson's. He stated that fire was beneficial to the establishment of natural reproduction in the moister types of deciduous forests, but harmful in dryer ones. He also noted the difficulties of finding the necessary conditions for using fire for regeneration:

There is, however, still some doubt as to whether the dividing line has to be drawn between the stage where fire is a useful servant and where it is a bad master; for example, [in] Madhya Pradesh, once natural regeneration is established, fire protection, grazing protection and removal of canopy will provide the necessary conditions for its progress; but, for obtaining seedling recruitment, light burning is considered advantageous and the canopy has to be opened out [but] not so much as to allow rank grass and weeds to appear.<sup>59</sup>

In contrast, foresters such as G. C. Takle and R. B. Mujumdar from Madhya Pradesh had more negative views regarding the use of fire for artificial regeneration, particularly in the early stage of plantations. As they suggested, there were conflicting opinions on the utility of fire and further research was required.<sup>60</sup>

The measures against shifting cultivation were also discussed. Although the desirability of changing to a permanent form of cultivation by resettling people was argued, the Congress participants understood that such a compulsory policy would face certain difficulties and might be costly. After all, taungya was still recognised in the mid-1950s as a useful method of artificial regeneration as well as controlling shifting cultivation.<sup>61</sup> The arguments for and against taungya from the mid-1950s to the early 1960s continued.

Interestingly, by the early 1960s, Indian and Burmese foresters had stopped referring to taungya in the Commonwealth and at international forestry conferences. At the Sixth Commonwealth Forestry Conference in Canada in 1952, J. Banerji, Deputy Inspector General of Forests for India, stated that taungya had been sufficiently standardised, mainly in West Bengal, Uttar Pradesh and Assam, and was working relatively well, with suitable local modifications.<sup>62</sup> However, at the seventh conference in Australia and New Zealand in 1957, taungya was never discussed.<sup>63</sup>

57 N. Pal, 'Techniques of Artificial Regeneration and Formation of Plantations in West Bengal', in *ibid.*, 543.

58 Kadambi was working at the Forest Research Institute at Dehra Dun and as an honorary editor of *The Indian Forester*.

59 K. Kadambi, 'Natural Reproduction of Teak', in *Proceedings: 4th World Forestry Congress, 1954, Dehra Dun*, 3:297.

60 G. C. Takle and R. B. Mujumdar, 'Increasing Growth and Natural Regeneration of Teak', *ibid.*, 343–56.

61 *Ibid.*, 69–70.

62 British Commonwealth Forestry Conference, *Sixth British Commonwealth Forestry Conference, Canada, 1952, Proceedings* (Ottawa: Queen's Printer and Controller of Stationery, 1953), 210–11.

63 British Commonwealth Forestry Conference, *Proceedings of the Seventh British Commonwealth Forestry Conference* (Canberra: Commonwealth Government Printer, 1958).

At the eighth conference in East Africa in 1962, G. A. E. Ogbe, Conservator of Forests for Nigeria, suggested that foresters in developing countries should research how trees and agricultural crops could be grown together using an extended form of taungya.<sup>64</sup> However, V. S. Rao, Inspector General of Forests for India, disagreed. He doubted whether taungya could be used for forest plantations and worried that taungya cultivators would squat on the land, leading to political difficulties.<sup>65</sup>

This changing view on taungya among Indian foresters could be found in the discussions at national forestry conferences in India. The Eighth Silvicultural Conference of India in 1951 noted that taungya was showing signs of strain and was not as satisfactory as previously thought.<sup>66</sup> The ninth conference in 1956 recommended that taungya be substituted by other methods of artificial regeneration, such as mechanised plantations. Simultaneously, Indian foresters argued for a firmer attitude towards shifting cultivation.<sup>67</sup> At the tenth conference in 1961, taungya was even not on the agenda.<sup>68</sup>

Meanwhile, at the Fifth World Forestry Congress in Washington in 1960, U Aung Din (mentioned above), one of the speakers at the UNSCCUR, presented a paper. By this time, he had become an FAO regional forestry officer and took a general view of forests and forestry in Asia, but did not mention the advantages of taungya.<sup>69</sup> The Burma Forest Department submitted a paper concerning forest policies in colonial and postcolonial Burma, which explained the significance of taungya in Burmese forestry in the colonial period. However, it did not refer to taungya after the Second World War at all.<sup>70</sup>

At this conference, shifting cultivation was stressed as a serious threat to the remaining forests in many parts of the tropics. The problem of saving tropical forests from the shifting cultivator was seen as one of the first order.<sup>71</sup> This reflected the negative attitude towards shifting cultivation that was widespread in the FAO. The previous World Forestry Congress recommended that the FAO actively continue its enquiry into shifting cultivation at national, regional and international levels. FAO staff appealed to the international forestry networks and criticised shifting

64 British Commonwealth Forestry Conference, *Eighth British Commonwealth Forestry Conference: East Africa, 1962; Proceedings, Committee Reports and Resolutions of the Conference* (Nairobi: Government Printer, 1962), 21.

65 *Ibid.*, 23–4.

66 *Proceedings of the Eighth Silvicultural Conference, Dehra Dun, December 5th to December 14th, 1951* (Dehra Dun: Forest Research Institute, 1956), 142.

67 *Proceedings of the Ninth Silvicultural Conference, Dehra Dun, December 7th and December 10th to December 19th, 1956* (Dehra Dun: Forest Research Institute, 1960), 33.

68 *Proceedings of the Tenth Silvicultural Conference, Dehra Dun, November 15th to November 20th and November 22nd to November 25th, 1961* (Dehra Dun: Forest Research Institute, n.d.).

69 U Aung Din, 'Forestry Progress in the Far East', GS/P/7/III, FAO.

70 Forest Department of the Union of Burma, 'Policy and Economic Problems in the Conversion of Old-Growth Forests to Managed Stands-Burma', GP/29/IV/A-Burma.

71 *Proceedings of the Fifth World Forestry Congress, University of Washington, Seattle, Washington, August 29–September 10, 1960* (Seattle, WA: University of Washington, 1962), 7.

cultivation in the humid tropical countries as the greatest obstacle to the immediate increase in agricultural production and to the conservation of production potential for the future, in the form of soils and forests. Remedial measures suggested were the introduction of various agricultural and technological improvements and guided social change from a nomadic to a sedentary way of life and to *civilisation*, which could help shifting cultivators to emerge from their blind alley.<sup>72</sup> The FAO's approach to forest management in those countries could be regarded as a 'mission' of modernisation, which attempted to introduce the formula for developing countries in general. Shifting cultivation was criticised not only by foresters but also by agriculturalists in the FAO. The FAO Freedom from Hunger Campaign, which demanded more food production and its equitable distribution, put additional pressure on shifting cultivation, which was condemned as a wasteful, less productive land use that must be changed immediately to permanent cultivation.

In these circumstances, colonial and former colonial British foresters argued for taungya at the Commonwealth and international forestry conferences. At the Eighth Commonwealth Forestry Conference, Malcolm V. Laurie, Director of the Commonwealth Forestry Institute, Oxford,<sup>73</sup> introduced one of the items on the agenda, titled 'The Use of Fire as an Aid to Silviculture and as a Means of Reducing Fire Hazard'. He mentioned the Scientific Council for Africa South of the Sahara (CSA)<sup>74</sup> meeting of specialists on open forests in tropical Africa held in Ndola, Northern Rhodesia, in 1959, which dealt with the use of fire in relation to *chitemene* (local shifting cultivation). A. L. Griffith, silviculturalist of the East African Agriculture and Forest Research Organisation, also referred to the CSA meeting and suggested that the Committee on Silviculture of the Commonwealth Forestry Conference might consider the report of the meeting. D. Moore, Conservator of Forests for Trinidad and Tobago, also asked the committee to consider the use of fire.<sup>75</sup> The committee admitted that the use of fire, including taungya, was a well-developed and often essential technique in many countries, although techniques varied to fit the local ecological conditions.<sup>76</sup>

In 1963, the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas was held in Geneva. This conference was considered a developed version of the UNSCCUR and more than 2,000 papers were submitted. There were 1,665 participants and 96 governments

72 FAO Staff, 'Shifting Cultivation', *Unasylva* 11 (1957), 9–11. Emphasis added.

73 Professor Laurie had experience both in India and with the British Forestry Commission. He was the last of the old 'India hands' in the Commonwealth Forestry Institute. See Jeffery Burley et al., 'A History of Forestry at Oxford University', *British Scholar* 1 (2009): 240–1, doi.org/10.3366/brs.2009.0007.

74 The Scientific Council for Africa South of the Sahara (CSA) was established in 1950 and became the first multinational organisation for technical co-operation in Africa.

75 British Commonwealth Forestry Conference, *Eighth British Commonwealth Forestry Conference*, 46–7.

76 Report of the Committee on Silviculture, *ibid.*, 115–21.

were represented.<sup>77</sup> Agriculture, including forestry, was one of the main subjects and the problem of shifting cultivation in the humid tropics was one of the agenda topics. Participants argued that population growth resulted in a progressive reduction in the length of fallow periods, which became too short to restore fertility, so that productivity declined. The problem, therefore, was to find a system of land use that could be substituted for shifting cultivation. Among the presenters of papers, H. G. Hardley, Conservator of Forests for Burma, suggested that the Forest Department of Burma had made use of shifting cultivation to restock stable areas with teak and other valuable species, and emphasised the utility of taungya. Though the utility of fire for artificial regeneration in the humid tropics was admitted, the conference concluded that the success of taungya in Burma was ‘not normal’ because few countries had so highly developed a forestry service as Burma, where the maintenance of teak forests was also of major economic importance.

## Colonial forestry revisited: Hybrid forestry practices in international forestry networks

At the Sixth World Forestry Congress in Spain in 1966, the trend of discussion concerning taungya and shifting cultivation began to shift. One of the technical commissions established by the Congress, ‘Forest Questions Specific to Tropical Regions’, discussed the potential of extending and modifying the taungya system, as a means of artificial regeneration and controlling shifting cultivation. There were essentially two reasons why taungya was again a topic of discussion.

First, support for flexible approaches to shifting cultivation was increasing among foresters. W. E. Webb, consulting forester to Forestal International Ltd in Canada, who worked for the Canadian Colombo Plan, presented a paper on the type of shifting cultivation called *jhumial/jhum* practised in the Chittagong Hill Tracts in what was then East Pakistan, now Bangladesh. He suggested that *jhumial/jhum* must be changed urgently to a system of permanent intensive agriculture.<sup>78</sup> However, numerous other consultants presented papers at the commission supporting more feasible methods, including taungya. For example, U Aung Din suggested that it had been extremely difficult for local communities to stop shifting cultivation and the use of fire because these practices were social and economic customs, and therefore ways should be found to cope with them.<sup>79</sup> U Aung Din also advocated

77 United Nations, *Science and Technology for Development: Report on the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas*, vol. 3: *Agriculture* (New York: [United Nations], 1963), vii.

78 The *jhumial/jhum* could not be stopped and continues today. See Tapan Kumar Nath, M. Inoue, and S. Chakma, ‘Shifting Cultivation (*Jhum*) in the Chittagong Hill Tracts, Bangladesh: Examining its Sustainability, Rural Livelihood and Policy Implications’, *International Journal of Agricultural Sustainability* 3 (2005): 130–42, doi.org/10.1080/14735903.2005.9684751.

79 U Aung Din, ‘Some Forestry Problems Peculiar to Tropical Countries with Special Reference to the Asia-Pacific Region’, *Proceedings: 6th World Forestry Congress* (Madrid, 1966), 3182–6.

introducing village forests to provide firewood and poles for the villagers. These village forests would be managed by the villagers under the supervision of the forest service, eliminating conflict between the villagers and the foresters.<sup>80</sup> W. L. Webb, professor of forestry at Syracuse University in the United States relied on the FAO's data and argued that more than 3 per cent of the total population in the Asia–Pacific region was represented by shifting cultivators, that 22 per cent of the forest area was modified by shifting cultivation, and that each year an additional 1.75 per cent of the forest areas was cut, burned and planted. On this subject, he concluded that restrictive control of shifting cultivation by imposing penalties, such as fines and imprisonment, was ineffective, based on his experiences in the Philippines. Webb suggested that incentive control of shifting cultivation worked more efficiently, and recommended the taungya system, which provided incentives to shifting cultivators.<sup>81</sup> These papers indicated that more foresters shared lessons learned from the failure to eradicate shifting cultivation by the mid-1960s. Additionally, they were influenced by the case studies of the experts who discovered the ecological reasons for shifting cultivation.<sup>82</sup>

In its report, the commission recognised the desirability and possibility of extending the taungya system, as a practical and economic means of artificial regeneration, adaptable to improved land use practices. The commission also approved the proposal that rural populations should be considered in the forestry sector land-use plans, especially providing dedicated village forests for the supply of poles, fuelwood and shelterbelts for the protection of farm crops.<sup>83</sup> Finally, the congress recommended that the newly established FAO Committee on Forest Development in the Tropics should organise a study group of anthropologists, sociologists, economists, foresters, agriculturalists, pedologists, ecologists and representatives of all other disciplines associated with the consequences of shifting cultivation to thoroughly study the issues, consult with one another, and provide guidance to the commission.<sup>84</sup>

The second reason why taungya was again a topic of interest was that foresters began to consider it as a form of agro-forestry. Ogbé reported that the taungya system had proven successful as a means of large-scale regeneration in Nigeria and emphasised that this system offered great benefits via the growth of both tree and food crops.<sup>85</sup> K. L. Lahiri, Chief Conservator of Forests for West Bengal, revealed there was a great fear of the conversion of forests to agricultural lands in India, as well as in other developing countries. Lahiri argued that as the population of India between 1951 and 1961 had increased by 82 million, this required an increase in the amount of

80 Ibid., 3051.

81 W. L. Webb, 'Restrictive and Incentive Control of Shifting Cultivation', *ibid.*, 3157–62. See also FAO, *Timber Trends and Prospects in the Asia–Pacific Region* (Geneva: United Nations, 1961), 108–13.

82 See, for example, P. H. Nye and D. J. Greenland, *The Soil Under Shifting Cultivation* (Farnham Royal, Bucks: Commonwealth Agricultural Bureaux, 1960), doi.org/10.1097/00010694-196111000-00024.

83 *Proceedings: 6th World Forestry Congress*, 3040–2.

84 Ibid., 3043.

85 G. A. E. Ogbé, 'Regeneration Practices in the High Forests of Nigeria', *ibid.*, 3167–9.

land dedicated to food production. Meanwhile, the per capita forest area in India was 0.22 ha (based on 1959 figures), against a corresponding figure of 0.326 ha in Europe and 3.572 ha in North America. Lahiri expected that the taungya system could offer a model of ‘multiple uses of forest land’,<sup>86</sup> providing both timber and food, without loss to forest areas or expansion of lands permanently dedicated to agricultural use, if it were adequately controlled. He estimated that c. 80,000 km<sup>2</sup> (or 8 million hectares, approximately 10 per cent of the total forest area in India) could be made available for multiple use.<sup>87</sup> Simultaneously, foresters attempted to modify the taungya method to meet the current local conditions. For example, Lahiri experimented with combinations of agricultural crops to extend the terms of cultivation without damaging forest crops, in the hope of providing additional incentives to shifting cultivators and to help secure labour.

After the Second World War, the emerging national states had established forestry for rapid economic growth and the political control of territories. The primary purpose of national forest policies was to produce a sustainable yield of valuable timber to contribute to annual revenue. However, the commission stressed that review and revision of national forest policies in the context of overall land planning in developing countries were necessary. Forest services needed to appeal for the multiple utilities of forests, in addition to generating timber.<sup>88</sup> In these circumstances, foresters presented taungya as a novel form of forestry, compatible with agriculture.

## Conclusion

This work has revealed how new ‘hybrid’ forestry practices such as taungya were produced by the encounter between European forestry models and forest users in colonial regions, although we cannot overlook the unequal power relations and tensions between colonial foresters and indigenous societies. From the 1920s onwards, by examining the discussions at the Empire Forestry Conferences, we found that sharing of experiences throughout the colonies resulted in new management models, which were compatible with the principle of state forestry.

Whereas previous studies have discussed the development of colonial forestry within the framework of a dichotomy between European and indigenous, or modern and traditional aspects, it is important to recognise the impact of the interaction between states and local societies and their changing relationships. This study also

86 ‘Multiple use of forest land’ was a main theme for the Fifth World Forestry Congress in 1960. This indicated the greater participation of non-experts, such as local communities and tourists, in forestry management, which became popular in developed countries. On the other hand, foresters in developing countries used this idea to relate forestry with agriculture.

87 K. L. Lahiri, ‘Land-Use Policy vis-à-vis Forestry Schemes in Developing Countries in the Tropics: An Extension of the Concept of Multiple Use in Forestry’, in *Proceedings: 6th World Forestry Congress*, 3238–9.

88 *Ibid.*, 3040.

offers an empirical case study to challenge the Eurocentric diffusion models of modern sciences in the colonial and postcolonial worlds, as well as to support new perspectives on 'polycentric communication networks'.<sup>89</sup>

Second, this paper has explored how colonial knowledge and practices worked in the multiple forestry networks after the Second World War. Colonial foresters continued to advocate fire as an aid to regenerate valuable trees. Taungya was recognised as a product of their 'ecological discovery' and a hybrid practice that adjusted to local conditions. By the early 1950s, foresters in newly independent countries shared this view. However, from the mid-1950s, they argued that taungya no longer worked as a method of regeneration. Indian foresters began to note its disadvantages, which became evident in the changing social and political conditions, and the increasing difficulty of relying on local people as participants in taungya. Furthermore, they preferred modern techniques of artificial regeneration to taungya. Its merit as a tool to control indigenous shifting cultivation was also discussed less in the forestry networks during the 1950s and early 1960s. Experts who engaged in technical consultation and assistance for developing countries regularly advocated radical approaches to convert shifting cultivation to permanent agriculture.

However, by the late 1960s, international forestry societies began to re-evaluate the taungya system. By that time, forestry experts working in tropical, developing countries empirically realised the difficulty of changing customary land uses, and therefore taungya as a hybrid and compromise method attracted attention again. Taungya was recommended as a method of agro-forestry because multiple uses of forests became one of the agendas of the international forestry networks. Moreover, the development of village forests, which were used and managed by local people under the supervision of forest services, was favourably discussed.

Remarkable similarities were found between these arguments of the international forestry strategies of the late 1960s and the colonial forestry of the 1930s, which aimed to consider local ecologies and societies in tropical countries. Further empirical research is necessary concerning the process by which hybrid forestry, especially taungya, was neglected and reconstructed in multiple forestry networks after the Second World War. Additional research in this area will provide new perspectives and an informed understanding of the legacy of colonial science in the postcolonial world.

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<sup>89</sup> David Wade Chambers and Richard Gillespie, 'Locality in the History of Science: Colonial Science, Technoscience, and Indigenous Knowledge', in *Nature and Empire: Science and the Colonial Enterprise*, ed. Roy MacLeod. *Osiris* 15 special edition (Chicago: University of Chicago Press, 2000), doi.org/10.1086/649328.

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