ENVIRONMENTAL CHANGE IN
A FRONTIER REGION OF JAVA: BESUKI, 1870 - 1970

NAWIYANTO

A Thesis submitted for the degree of Doctor of Philosophy of
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DECLARATION

I, Nawiyanto, hereby declare that this thesis is entirely my own work

Nawiyanto
July 2007
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ABSTRACT

This thesis examines the relationship between humans and the environment in a region of Java called Besuki, from 1870 to 1970. In this period Besuki experienced rapid environmental change. In a century the region’s environment was radically altered, while in many other parts of Java this change took centuries to materialise. It is argued that the fast-changing environmental realities in Besuki resulted from demographic and socio-economic processes, which took place more or less simultaneously. Drawing upon diverse historical materials, the thesis discusses the role of human agency in changing the environment of Besuki and the responses to the changing environment. In elaborating the argument, the thesis specifically looks at population and major forms of natural resource use, including agriculture, forest extraction, fishing, and conservation, and their role in altering the environmental realities of Besuki.

The theoretical framework which informs the argument of the thesis comes primarily from frontier theories, as employed especially by Turner, Flannery, and Butcher, which deal mainly with how the resource frontiers were created, expanded and eventually closed, sometimes through the exhaustion of available resources, sometimes through the achievement of a stable economic system. The frontier analysis is sharpened with environmental adaptation and conservation politics approaches. The environmental adaptation approach elaborates the ways in which humans responded to the environmental problems and new environmental realities. The conservation politics approach looks at the emergence of conservation interest and its transformation into public and policy issues, conservation measures, and their execution.

The thesis concludes that the advance of the frontiers of Besuki was driven by combined factors of population growth, market demand, and technological innovations. These forces generated the rapidly-expanding frontiers of settlement, agriculture, forest exploitation, and fishing, as indicated by the emergence of Besuki as a region with the largest proportion of migrant population in Java, as a leading centre of agricultural production and the second largest fishing complex in Indonesia. On the environment, these big transformations brought about the stronger presence of the human-made environmental landscapes and their related problems, thus pushing back the boundaries of natural forests. The closure of the Besuki frontiers, however, was not exclusively due to the reality that there were completely no longer new areas to move into, but also partly due to the interest
in nature conservation, which led to human efforts to limit the impact of economic change on the environment.
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CHAPTER I
INTRODUCTION

1.1 Background and Research Questions

Indonesia is an example of a country with mounting environmental problems. Besides the unabated deforestation and biodiversity loss, forest fires, floods and landslides often strike the country year after year.\(^1\) Although one might argue that the causes of Indonesia’s environmental problems lie in the present and the recent past, it may be demonstrated that the core of the problems is not new, but has historical parallels dating back through several centuries. Ricklefs, for example, mentioned that deforestation already occurred in several parts of the Java’s northern coast in the late seventeenth and early eighteenth centuries.\(^2\) Elson also cursorily noted the damage to the forest of Java in his comprehensive work on rural life during the Cultivation System period (1830-1870).\(^3\) Research on environmental history might be able to offer some of the main explanations to the question why environmental problems emerged or were absent in the past.\(^4\) Such outcomes could possibly be achieved through a long-term analysis or by comparing the main forces that affect the environment in the past and present. The continuity or change in forces at work may explain the presence or absence of environmental problems.

From a more theoretical perspective, research on environmental history will broaden the territory of historical study in Indonesia. Much attention has long been paid to socio-political issues, not only at the national level but the regional scope as well. It is obvious that the need for an understanding of decolonization processes, political elite formation, and nation-state building, has been one of the driving forces behind the trend. But Indonesia’s past is more complex than merely a contest for hegemony among centres of political power or resistance against the colonial rulers. Other aspects also need to be

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\(^1\) It is estimated that by 1997 fires had destroyed more than 180,000 hectares of forest in Kalimantan and Sumatra; 7.3 million hectares of forest have been converted to other purposes during the last 14 years and caused a heavy loss of bio-diversity, Indra Ismawan, *Resiko Ekologis di Batik Pertumbuhan Ekonomi* (Yogyakarta: Media Pressindo, 1999), pp. 29-32. It is predicted that Indonesia will lose one fourth of its 17,500 islands from a combination of factors: forest loss, global warming and rise of sea level. “4000 Pulau di Indonesia akan Tenggelam”, *Kompas*, 5 August 2002, p. 20.


uncovered in order to make “a more human history”. Although the scholarly horizon has been extended especially in the last two decades to socio-economic aspects resulting from the growing concerns about development issues, the interest in environmental history of Indonesia remains poor. Even at a broader level, it is only quite recently that this frontier of historical study began to open with the environmental history project of the Koninklijk Instituut voor Taal-, Land- en Volkenkunde (Royal Institute of Linguistics and Anthropology, KITLV), called EDEN (Ecology, Demography, and Economy in Nusantara) commencing in 1992.

There are three basic difficulties that caused the marginal scholarly interest in the environmental history of Indonesia. First, the lack of scientific knowledge on ecology makes historians uncertain and poorly equipped when exploring this field of historical study. Second, historians are used to dealing with issues that directly relate to either political, social, economic, or cultural aspects of the past realities. Many historians feel uncomfortable when focusing on non-human issues. The third difficulty concerns a lack of historical information. Large parts of the historical materials frequently contain information that have no direct relevance to environmental history. Under such circumstances, environmental historians need to rely on relevant information in the remaining unexplored historical sources, and their ability to look differently at the commonly used historical sources. Equally important is the ability to use non-orthodox historical sources, including the environment, as a historical document.

It comes as no surprise that as they have long been overlooked, environmental issues were insufficiently treated in the historical discussions. It is true now that environmental issues increasingly form part of the academic discussion. One of the most influential works has been Clifford Geertz’s *Agricultural Involution*. Geertz argued that the claims on land and labour of expanding plantation agriculture had caused Javanese farmers to become static. Instead of moving forward, they experienced growth without development due to the seemingly endless ability of rice agriculture to absorb the growing

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labour force. With the continued increase of population and limited opportunities for the expansion of arable land, Geertz suggested that a process of shared poverty among indigenous farmers inhibited the development of farm agriculture in Java. Arthur van Schaik discussed the decreasing soil fertility as a part of the arguments challenging the basic assumptions of Geertz’s theory, in particular the idea that the irrigated field ecology of Java was stable with the improved irrigation system. Meanwhile, Anne Booth discussed environmental change in the form of expansion in cultivated lands to demonstrate gradual development of the agriculture sector in Indonesia. Pierre van der Eng discussed environmental issues related to expansion in agricultural fields to upland areas and its ecological dangers, and environmental considerations for farmers’ crop choices in his work on productivity growth and policy impact on Indonesian agriculture. Both works by Booth and Van der Eng have added another challenge to Geertz’s agricultural involution theory. In his work on upland Tengger, Robert Hefner also broadly discussed the environmental impact of commercial agriculture. But all these studies place environmental issues as a supportive element, rather than a primary focus.

The growing number of studies focusing on the contemporary period convey strong impressions that environmental problems have only recently emerged in Indonesia, without having roots in earlier periods. In the context of forestry, the damage to forests has often been linked to the policies of the New Order. Similarly, other observers separately remarked that the Green Revolution under the New Order led to the increasing area of degraded land, water pollution and deforestation. Meanwhile, Jan Palte asserted that the irrigated field bias of the New Order agricultural policy has been the main factor

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9 Geertz, *Agricultural Involution*, pp. 96-98.
responsible for damaging the environment. Even though to a certain degree these views correspond with reality, the resulting understanding of Indonesian history is far from being balanced across space and over time. It seems more reasonable to link environmental issues in the New Order period to questions of scale and rapidity of change, rather than perceiving them as completely new phenomena, that have no historical precedents in the earlier periods.

A number of publications on environmental histories of Indonesia resulting from the EDEN Project cast light on a variety of environmental issues regarding human-environment relationships in the country. An edited work by Peter Boomgaard, David Henley and Freek Colombijn discusses a variety of forest resource uses in separate places in the archipelago. A similar work but with more balanced discussion of marine and forest resource extraction, with a greater emphasis on contemporary periods and a much broader coverage, including other Southeast Asian countries has also been published. Two comprehensive studies, one by Han Knapen on Southeast Borneo and the other by Henley on North and Central Sulawesi throw light on how demographic and socio-economic processes were adapted to and eventually transformed the environmental realities in different places in the outer islands of Indonesia during the colonial periods. A study by Boomgaard uncovers the perceptions of tigers and the human-tiger relationship in colonial Indonesia and Malay world, while Jet Bakels explores the relation between humans and wilderness.

Despite that fact, the existing studies of environmental histories of Indonesia mostly focused on the so-called the outer islands of Indonesia, with few exceptions. A compilation work by Victor T. King examines various environmental history issues related to agricultural images behind colonial policies, environmental adaptations, disease

17Peter Boomgaard, Freek Colombijn, and David Henley (eds), Paper Landscapes: Explorations in the Environmental History of Indonesia (Leiden: KITLV Press, 1997).
environment, and changes in land use in Sumatera, Kalimantan, and Sulawesi. \(^{21}\) Most articles of this pioneering compilation of the Indonesian environmental history focus on islands outside Java. Criticism of imbalanced treatment in favour of the outer islands of Indonesia has been raised by Nancy Lee Peluso in the case of forest issues. \(^{22}\) Moreover, the few studies focusing on Java including Peluso's work often narrowly deal with one form of resource use or look at the issues from a Java-wide perspective, neglecting the diverse ecological realities across the island.

The present study deals with environmental change in a Javanese frontier region called Besuki. By focusing on environmental change, the present study joins the attempts at expanding the frontier of historical study in Indonesia beyond conventional issues under the banner of environmental history. Two concepts, environmental history and the frontier, deserve clarification. Environmental history is basically a study of mutual relations and influences between humans and their environment in the past. \(^{23}\) Although environmental history and ecological history are sometimes interchangeably used in several studies, environmental history is seen as more appropriate. The reason is that this study concerns human agency, while ecological history tends to deal with agents that are non-human. Ecological history, as a historical study of the relationship among organisms, including humans as an integral part of the whole ecosystem, is an almost impossible task to perform. \(^{24}\) Historians often do not have well-developed analytical tools to carry out such an enormous task, which demands multiple skills and an interdisciplinary approach. These requirements are indispensable because they must draw upon historical materials written in the language of natural sciences, which often use specific technical terms, concepts, and mathematical formulas. Understanding what elements formed the ecology and how all the elements interconnected and operated as an ecosystem is also vital. \(^{25}\)

The second concept, the frontier, was first formulated by Frederick Jackson Turner to describe the migration-linked successive expansion of American settlement towards

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\(^{23}\) Peter Boomgaard, "Introducing Environmental Histories of Indonesia", in Boomgaard, Colombijn, and Henley (eds), *Paper Landscapes*, p. 2.

\(^{24}\) Knapen, *Forests of Fortune*, pp. 3-4.

wilderness in search for new untapped natural resources to exploit.26 The influence of Turner’s frontier theory spread widely beyond the American continent and a great number of studies employing this model, either in casual or more serious ways, have been produced. In this study, the frontier refers to a process by which nearly empty space with abundant under-used resources, such as uninhabited and uncultivated lands, untapped forest and marine resources are brought under utilisation. The closure of the frontier comes when there are no longer new spaces with resources to extract or no further expansion is allowed due to the need for protecting nature in its original form.

Environmental history basically covers three major areas of enquiry: natural environments of the past, human modes of production, and perception, ideology, and value.27 This study, however, deals primarily with the first two areas of enquiry. The area of perceptions, ideologies and values is not pursued due to the difficulties in unraveling these aspects from the historical materials at the writer’s disposal. Moreover, the links between cultural values and actions or attitudes to nature are often obscure. Rather than being a determining factor, cultural values only provide a range of possible actions and attitudes and give meaning to them. Unsurprisingly, both Western and Eastern values have been claimed as resulting in both exploitative and stewardship attitudes to nature.28

The focus of the present study is directed to two key issues: (1) the role of humans in changing the environment, (2) their responses to changing environmental realities. In elaborating the issues, there are four major aspects that need to be examined: (a) population, (b) natural resource use, (c) diseases and noxious wild animals, and (d) conservation. Relating to demographic issues, the major questions are: What was the population size of Besuki? What factors were responsible for its growth? How did the growing population size affect the frontier of settlement and demographic patterns? In regard to natural resource use, this study will look at agriculture, forest and marine resources. Major questions that apply to all the three forms of resource use include: How did the human mode of production alter the natural environment? What factors affected the frontiers of resource use? How did they impact on resource stocks? What responses were developed to adjust to the changing resource stocks and natural environment realities?

Moving on to diseases and noxious wild animals, the primary questions are: What kinds of diseases were endemic in the Besuki region? What factors were responsible for their spread? How did they impact on the region’s population? What control measures were taken to contain the problems? Similar forms of question are applied to the problems of noxious wild animals. Finally, the conservation aspect deals with questions that are more political in nature. How did the conservation movement develop? By which groups or interests were conservation issues brought into the political arena? In what areas did the conservationists put their concerns? What conservation measures were introduced and were they effectively executed on the field? What kind of problems countered their effective implementation? In connection with the frontier theories, it is interesting to examine the consequences of Besuki’s frontier history on the environment. Did Besuki represent one of the frontier societies with a bad environmental reputation? Did population growth and commercial extraction of natural resources on the frontier lead to overexploitation, resource depletion and species extinction? Was interest in sustainable resource use completely absent in the frontier? Was over fishing already a serious problem before 1970?

1.2 Spatial and Temporal Settings

The spatial setting of the study is an area called the Besuki residency. Besuki residency is no longer in existence today, following the abolition of the residency administrative level in 1965. This residency was situated in Java’s Eastern Salient. In most of the period of its existence, it consisted of four regencies: Panarukan, Bondowoso, Jember, and Banyuwangi.29 Together with Malang/Pasuruan residency, this region was often referred to as the Oosthoek during the Dutch colonial period, and long constituted a contested political frontier among major centres of political power in Java and Bali.30 Warfare for hegemony between the successive Javanese kingdoms of Majapahit, Demak, and Mataram on the one hand and Blambangan on the other, supported by Balinese kingdoms, often struck the region.31 After obtaining the region in 1743 from the Susuhunan Pakubuwana II of

Surakarta, the Dutch succeeded in ending the era of war in 1772. The residency of Besuki was first established in 1814, but obtained its fixed administrative territory in 1882 with the incorporation of Banyuwangi.

The choice to focus on Besuki was made on the basis that environmental history is best done in a relatively compact region, defined by similar ecological conditions. The Besuki residency as a unit of analysis can more or less meet such requirements. Compared with many other parts of Java, Besuki has less rainfall and a seasonally dry climate. Rather than being covered by rainforest vegetation as found in the western part of Java, Besuki is characterised by a predominantly monsoon forest. Its ecological distinctiveness was strengthened by other demographic and socio-economic aspects. Until around 1870 the Besuki region remained extensively forested, sparsely populated and economically less developed than many other parts of Java. With this background the region offers an interesting area for research because in the following decades the region changed radically. Demographically, the region was transformed from one of sparse population, the least crowded in the whole of Java, into a more densely populated area. Between 1890 and 1930, for example, the population density of Besuki increased by 125 per cent, whereas the population density of Java only increased by 70 per cent. From an economically less important region, Besuki was transformed into a leading centre of agricultural production. During 1926-1930, for example, 25 per cent of tobacco exports from Java originated from Besuki, while the region constituted only 7.5 per cent of Java’s total land area. In addition, the second largest fishing complex in Indonesia could be found in Besuki.

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37Boomgaard and Gooszen, Changing Economy in Indonesia, 11, pp. 217-218. A comparable increase in population density took place in Priangan and Pasuruan residencies.
processes took place rapidly, bringing a radical shift of the frontiers of Besuki in a shorter period of time than those in Java which took several centuries. In contrast to the region’s big transformations, little is known about how the processes occurred and affected the natural environment of Besuki.

The temporal setting of the study covers a period between 1870 and 1970. The year of 1870 is taken as the starting point with a main consideration that the region began to enter a new era of rapid transformation in demographic, socio-economic and environmental terms. In 1912 R. Broersma depicted Besuki as “Een Gewest in Opkomst” (an emerging region).40 1970 is taken as the end of the study based on the consideration that this year can broadly be seen as a point marking the beginning of the “Green Revolution” program put into effect by Indonesia’s government. This program basically emphasized agricultural development through intensification of land use, rather than expansion. Another reason is that by taking 1970 as the end point, this study will be able to demonstrate the historical roots of environmental change, problems, and solutions that have often been associated exclusively with Indonesia’s government under President Soeharto (1967-1998). Focusing on a period prior to 1970 is also challenging in regard to the prevailing view that only from the 1970s did Indonesia face serious environmental problems and their dire socio-economic impact.41 As a matter of fact, environmental issues and solutions to environmental problems were part of the historical realities of pre-1970 Indonesia.

1.3 Historiographical Survey and Theoretical Framework

Environmental history has been approached in different ways. One approach deals with environmental history from a problem-oriented perspective. B.W. Clapp’s study on the environmental history of Britain illustrates this kind of approach. By taking the industrial revolution as the starting point, Clapp analyses pollution problems and natural resource depletion, and the various responses to overcome the emerging problems and to conserve the environment.42 In Indonesia, environmental history with a problem-oriented approach has also been produced, for instance by Luc Nagtegaal on urban pollution in Java during the early colonial period and by Harold Brookfield on land degradation in a broader context.
of Indonesia.\textsuperscript{43} Also in this model are Robert Cribb’s article on pollution, which elaborates dynamic interplays between economic development, pressure groups, and bureaucratic control concerning the problem, and the article by Anton Lucas on river pollution during the New Order period, showing the active role of environmental groups in pressing the government to deliver solutions.\textsuperscript{44} Another article is by Colin MacAndrews, showing the use of environmental issues by the New Order government and various social groups for their own goals and interests.\textsuperscript{45}

Another way of approaching environmental history is from an environmental change perspective. Ann Young discussed the long-term processes and changes that have shaped the present Australian environment, which illustrates such an approach. Young argued that the establishment of European settlement has changed drastically the Australian landscape and impacted on the environment. Examining various forms of human engagement with the environment, from resource uses to conservation, Young concluded that agriculture has been the most striking element shaping the Australian landscape and provoked wide debates on land use and sustainable strategy issues particularly against forestry and conservation interests.\textsuperscript{46} Also in this group is the work by Madhav Gadgil and Ramachandra Guha on India, which distinguishes four modes of resource use: gathering and shifting cultivation, pastoralism, settled cultivation, and industry. Gadgil and Guha argue that British colonialism was a turning point in the environmental history of India, bringing new conceptions in human-natural resources relations: humans as conquerors and separate agents from nature, desacralizing nature, and responding to market mechanisms of resource distribution.\textsuperscript{47}

Also part of the environmental change approach includes studies dealing with human impact on the environment. One classic work underlining the role of humans as modifiers of the environment is the work of geographer, George Perkins Marsh, first


\textsuperscript{46}\textsuperscript{46}Ann R. M. Young, \textit{Environmental Change in Australia since 1788} (Melbourne: Oxford University Press, 2000), pp. xv-xvi, 63-93.

\textsuperscript{47}\textsuperscript{47}Madhav Gadgil and Ramachandra Guha, \textit{This Fissured Land: An Ecological History of India} (Berkeley: University of California Press, 1993). pp. 45, 115-116
published in 1864. Also in this category is a compilation work by William L. Thomas that appeared in 1955. A number of articles within this cluster have recently appeared. On pre-colonial Southeast Asia, Anthony Reid argued that development of irrigated rice cultivation, commercial agriculture, and forest exploitation caused the loss of forest cover and large mammal habitat. An article by Jeya Kathirithamby-Wells examined the impact of human activities on mammal populations in Malaysia. More comprehensive studies have also recently appeared. Knapen’s work on environmental history of Southeast Borneo highlights the impact of humans on the environment and their adaptations to the growing environmental pressures as carrying capacity was exceeded. Henley’s work on North and Central Sulawesi thoroughly examines the complex interconnections involving demographic and economic processes with changing environmental realities.

Environmental history has also been approached from the viewpoint of cultural values and attitudes. A compilation work by P.A. Stott provides an example of explorations of the indigenous cultural values and perceptions of environment and environmental problems in the context of South and East Asian countries. In the popular imagination, two different cultural values and attitudes to nature are often identified: destructive and harmonious. This dichotomy is usually applied in the context of comparing West and East societies. The validity of the model, however, has recently been challenged by Ole Bruun and Arne Kalland, suggesting that such a model is a myth rather than reality. Referring to the presence of environmental problems among the supposedly nature-minded Asian

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51 Jeya Kathirithamby-Wells, “Human Impact on Large Mammal Populations in Peninsular Malaysia from the Nineteenth to the mid-Twentieth Century”, in Boomgaard, Colombijn, and Henley (eds), Paper Landscapes, pp. 215-260.
52 Knapen, Forest of Fortune.
53 Henley, Fertility, Food and Fever.
societies, Bruun and Kalland point out the particularistic and pragmatic nature of people’s approach to nature rather than one determined by normative values.56

There are studies representing cultural and attitude-based approaches to environmental history but with a different emphasis on the making of environmental awareness. Richard Groves argued that environmental notions among European colonial states grew in line with colonial expansion. This expansion brought them to an awareness of the distinct environment of the colonised countries and strengthened their sensibilities to environmental damage caused by colonialism. The role of colonial scientists in growing awareness and sensibility to environmental issues such as forest degradation, soil erosion and species extinction was crucial. Although small in number, colonial scientists, mostly botanists and naturalists, were able to exert significant influence on colonial environmental policies by providing knowledge and contextualising environment damage and the need for environmental conservation in the fundamental question of colonial crisis and its survival.57

Another version of the model directs its focus on environmental politics, by elaborating the dynamic process through which particular groups and interests bring environmental issues into political agenda, the policy-making process, and conservation measures. Robert Cribb argues that scientific evidence, non-economic and future generation interests affected the formulation of Dutch colonial conservation policies, in which outside pressures played an important role in the process. Cribb also underlines the influence of Dutch colonial conservation on Indonesian conservation policy until the mid-1970s.58

Like environmental history, the frontier as a concept has also been employed in different ways after its first formulation and launching by Turner in 1893, which encapsulates settlement expansion towards the American wilderness. According to Turner, the basic characteristic of a frontier is the availability of free, uninhabited lands with untapped resources. The movement towards wilderness took place through successive waves of migrants, first the trader and the trapper, followed by the rancher, the miner, the

farmer, and finally the townsman, attracted by the abundantly available unused natural resources. The westward advance of one frontier opened the way for the next frontier and each wave of migrants was attracted by a different resource obtaining high values in the broader market. This development, according to Turner, shaped the American character focusing to individualism, freedom, and materialism.59

Turner’s frontier model has had widespread influence beyond the United States of America. A good example is Melody Webb’s study on Canada’s Yukon Territory, which not only elaborates successive geographical movements of British and Russian pioneers, traders, miners, soldiers, missionaries and settlers, but also extends the discussion to successive frontiers of transport technology from river, trails and roads, to railways, highways, and airways. Webb extends Turner’s frontier that ends with the emergence of urban settlement to the technological frontier, a lasting frontier.60 Also employing Turner’s frontier model is a recent article by Colombijn, which examines three forms of natural resource use, tin mines, gambier cultivation, and forest timber, in frontier societies of Eastern Sumatra.61

In the case of Australia, the frontier concept has been employed by Timothy Flannery to characterise a region where finite natural resources are extracted in a wasteful manner without considering their sustainability. A frontier is created when abundant untapped natural resources turn into economic benefits with the presence of pioneering people with the capability of extracting them. The closure of the frontier occurs when the movement to new areas with resources is no longer possible.62 A similar approach has also been used by John Butcher in his work focusing on marine fisheries of Southeast Asia. Butcher argues that the frontier of fishing in the region was already closed by the end of the twentieth century, after the “great fish race” from the late 1950s to 1970s. The new frontier facing fishing operations in the region is how to run sustainable exploitation both for the sake of fish stocks and food supplies for the people.63


The above historical survey can serve as a guideline to direct the focus of discussion to be pursued in the present study. Relating to the existing historiographic trends, the position of this study is primarily an environmental change approach, rather than a problem-oriented or cultural values and attitudes-focused approach. Besides the fact that Besuki’s historical experience provides an interesting case on which to employ such an approach, the existing historical materials on the region also allow a more coherent discussion from this approach. Dealing primarily with human-induced environmental change and considering the root causes of change, this study combines perspectives of population, resource use, and conservation politics. Although covering an entire century, the present analysis is not intended to develop stages or a chronological model using political or other divides (e.g. Dutch, Japanese, and Independence periods) as has been quite common in political or economic historiography. Rather, it employs a thematic way of analysing because of the nature of the study which embraces diverse forms of resource use and focus areas. Another reason is that the availability of historical materials varies considerably over time and among different aspects. Being extensive for certain periods, but scarce for others, this problem of sources can cause serious discussion gaps if stages or chronological models are in use.

The theoretical framework which informs the argument of the present study comes primarily from frontier theories. The relationship between the environmental change approach and frontier theories lies on an assumption that there is a link between the extraction of untapped resources induced by the inflow of migrants and market demand and the changing natural environmental realities. Although the movement to new places as newcomers search for settlement areas and natural resources will be explored, the elaboration of diverse frontiers, however, is not intended to develop a successive frontier model, as suggested in the Turnerian case. There is no simple frontier succession in the case of Besuki. There is also no intention to suggest that the Besuki frontier has any effect on the local or even the national character. The framework employed here is closer to Butcher’s and Flannery’s frontiers, in the sense that the process of expansion and closure of the frontiers is one of the primary concerns. The use of Butcher’s frontier framework will be extended to other forms of resource use too, not only in the context of marine fisheries. Both Flannery and Butcher acknowledge the instrumental role of demographic, technological, and commercial factors in frontier development.
Technology facilitates resource exploitation. But it is a double-edged sword. On the one hand, more developed technologies can lead either to a more intensified use of the existing resource or an expansion of the frontier of resource use.\textsuperscript{64} In agriculture, livestock helps agriculturists in their advances to new agricultural lands and diverse crops facilitate the creation of diverse agricultural frontiers. Technology also has the potential of offering solutions to environmental problems, for example in the fight against environment-linked diseases and noxious plants and wild animals and in the adaptation to climatic uncertainty. On the other hand, by increasing humans' ability to run resource extraction and to modify the environment, technology translates the side effects of humans on the environment such as resource depletion, species extinction, and environmental degradation.\textsuperscript{65} Relating to forest and fisheries, J.R. McNeill argues that overexploitation of resources resulting from the growing population and market demands is the major driving force behind environmental problems.\textsuperscript{66} Flannery attributes environmental problems to maladaptation, referring to incompatibility between the ways in which natural resources are used and the environment.\textsuperscript{67}

The frontier framework will also be sharpened with environmental adaptation analysis as done by Knapen and Henley in different regional case studies in colonial Indonesia. By so doing, not only are the changing realities of the natural environment understood, but insights into their impact on people's livelihood and interests, and the ways in which the people responded and adapted to the environment-linked problems and new environmental realities will be obtained as well. Such an analysis will extend and enrich the frontier framework which deals mainly with how the resource frontier was created, expanded and eventually closed. Conservation politics that in the Indonesian case have been explored by Cribb and Boomgaard will also be complementarily employed to round up the analysis. Their inclusion is based on the consideration that the extraction of natural resources is significantly affected by the interest in nature conservation and its incorporation into state policies.

The above overview of the environmental historiography and theoretical framework has led to three major issues, which the present study will elaborate based on the case study

\textsuperscript{64} Butcher, \textit{The Closing of the Frontier}, pp. 75, 164-167; Flannery, \textit{Future Eaters}, p. 357.
\textsuperscript{65} Butcher, \textit{The Closing of the Frontier}, pp. 165; Flannery, \textit{Future Eaters}, p. 369.
\textsuperscript{67} Flannery, \textit{Future Eaters}, pp. 389-390, 399-400.
of the Besuki region. The first issue is the role of migration-led population growth, technological and commercial developments in the advance of the frontiers. The second issue concerns the relationship among population growth, commercial uses of natural resources, and interest in nature conservation with closure of the frontiers. The last one deals with the responses and solutions to the environmental problems and the growing pressures on the environment stemming from the increasingly large population size and more developed extraction of natural resources.

1.4 Source Materials
This study draws upon a great number of source materials. The primary sources include archival materials, travel accounts, official publications, and contemporary newspapers. Among the archival materials are annual reports of Besuki and Banyuwangi (Algemene verslagen, 1824-1889) and memoranda of transfer of duties (Memories van overgave, 1913-1938) made by residents of Besuki for their period of administration. Part of these memorandums has been published.68 Other archival materials include Cultivation Archives (Archieven Cultures, 1867), General Secretariat (Algemeene Secretarie, 1919-1920) and Archives of the Indonesian Presidential Cabinet (Arsip Kabinet Presiden RI, 1950-1959). Most archival materials were obtained from the National Archives of the Republic of Indonesia (Arsip Nasional Republik Indonesia, ANRI), Jakarta. A small number of the archives were obtained from the National Archives (Nationaal Archief, NA), in The Hague, The Netherlands.

Published travel accounts that are used here include, among others: J. Beete Juke (1847), P. Bleeker (1849), Franz Junghuhn (1852-1853), C.J. Bosch (1857), and J. Hageman, Jcz. (1863, 1868), together with P.C. Arends (1882), C.M. Vissering (1912), J. Loogen (1941), and A. Hoogerwerf (1971).69 These materials were collected from the National Library of Australia and the libraries of the Australian National University in Canberra. Also obtained from these libraries are statistical data for the Dutch colonial period contained in the series of Changing Economy in Indonesia, the 1930 colonial census (Volkstelling), and a few statistical data on fisheries. The traditional literature of the region also provides useful information for pre-1870 Besuki. Babad Besuki-Bondowoso,

69See bibliography.
transliterated by Wondosoebroto from Javanese into Malay in 1938, describes the opening up of Besuki and Bondowoso areas by Madurese migrants. transliteration 70 Babad Wilis contains information on early political development in the region. This literature was composed by Purwasstra (1773) and transliterated with critical comments by Winarsih Arifin (1980) and appeared in another version too. 71 Much richer information is contained in Babad Blambangan, compiled by Arifin (1995). 72 These materials complement Dutch sources, such as P.P. Roorda van Eysinga (1849-1850), F. Epp (1849), and C. Lekkerkerker (1923). 73

A great number of official and private organisation publications came from diverse places. Fourteen volumes of reports of the Prosperity Investigation Commission (Onderzoek naar de Mindere Welvaart) were obtained from the National Library of Australia. There are valuable materials from the National Library of the Republic of Indonesia in Jakarta, including: reports of the Netherlands Indies Department of Public Work (Verslag over de Burgelijke Openbare Werken), Communications of the Public Health Service (Mededeelingen van den Dienst der Volksgezondheid), annual Reports of the Forestry Service (Verslagen van den Dienst van het Boschwezen). Part of the Forestry Reports originated from the Library of the Department of Agriculture (formerly, Bibliotheca Bogoriensis) in Bogor and the Royal Tropical Institute Library in Amsterdam. Private organisation reports, produced by the Netherlands Indies Society for the Protection of Nature (Verslag van de Nederlandsch Indische Vereeniging tot Natuurbescherming), provide useful information relating to conservation issues. These materials were largely collected from the National Library of the Republic of Indonesia in Jakarta. Meanwhile, contemporary newspapers and magazines also came from diverse places of origin: Trompet Masjarakat (1950-1958) from the micro film collection of the Menzies library of the Australian National University; Warta Besoeki-Shuu (1944-1945), Pewarta Soerabaia

(1914-1952), and Malang Post newspapers and Sinar Tani and Besoekisch-Nieuwsblad magazines from the National Library of the Republic of Indonesia.

A number of organisational publications provide quite specific information. Information on agriculture is largely contained in Landbouw, De Bergcultures (later, Menara Perkebunan), Mededelingen van het Besoekisch Proefstation, Pertanian, and Teknik Pertanian. These materials were obtained from the Regional Library of Yogyakarta Province at Malioboro, Yogyakarta, and the Research Centre for Estate Crops (formerly Besoekisch Proefstation) at Kaliwining, Jember (East Java). Valuable publications for the discussion of forest and nature protection are Tectona (later, Rimba Indonesia), Tropische Natuur (later, Penggemar Alam), De Indische Jager, De Nederlandsch Indische Jager, and Gema Perhutani. An extensive part of these materials was found in the Library of the Faculty of Forestry, Gadjah Mada University, Yogyakarta. Some materials were also collected from the Research Centre for Estate Crops at Kaliwining, Jember and from the Bogor-based library of the Department of Agriculture. De Indische Jager and De Nederlandsch Indische Jager were collected from the Royal Netherlands Institute of Southeast Asian and Caribbean Studies (KITLV) at Leiden and the Library of Royal Tropical Institute (KIT). Valuable sources for fisheries discussion are Visserijnieuws (later, Berita Perikanan), Pewarta Oseana, Terubuk. Apart from the National Library of the Republic of Indonesia, most of the editions of Berita Perikanan were collected from the micro film collection of the National Library of Australia. Pewarta Oseana and Terubuk editions were found at the Library of the Faculty of Agriculture, Gadjah Mada University, Yogyakarta.

Apart from the contemporary sources, the present study has also benefited from numerous published and unpublished studies collected from diverse places in Australia, Indonesia, and the Netherlands. A dissertation by J.W. de Stoppelaar (1927) provides useful information on rights to lands, marine resource use, and ethnic relations in the region.74 A study on customary laws among the region’s Madurese and Osing communities has also been produced by Atmosudirdjo.75 More recent studies on Jember by Mulkan (2000) and on Banyuwangi by Centre for Village Studies, Gadjah Mada University (1990)

74J.W. de Stoppelaar, Balambangansch Adatrecht (Wageningen: Veenman and Zonen, 1927).
75R. Slamet Prajudi Atmosudirdjo, Vergelijkende Adatrechtelijke Studie van Oostjavase Madoerezen en Oesingers (Amsterdam: Poortpers, 1952).
provides useful insights in social relations at micro level in the 1960s. A valuable guidebook for the region’s natural environment is *The Ecology of Java* produced by Tony Whitten, Roehayat Emon Soeriaatmadja, and Suraya A. Afiff (1996). A number of unpublished reports stored in the library of *Balai Konservasi Sumber Daya Alam* (Jember) contain valuable information on conservation areas of Besuki.

Finally, it is also important here to make a short note on orthography. The Indonesian names employed in this study follow the official spelling used from 1972: Besuki rather than “Bezoeki” or “Besoeki”, “Jember” rather than “Djember”, “Banyuwangi” rather than “Banjoewangi” or “Banjoewangie”, “Panarukan” rather than “Panaroekan”. The names of institutions, however, are kept in their original spelling, thus “Besoeckisch Immigratie Bureau”, rather than “Besuki Immigratie Bureau”. The names of authors have been rendered in their original forms without abbreviating them, for example Rd. Soepardi Poerwokoesoemo rather than R.S. Poerwokoesoemo, E.C. Jul. Mohr rather than E.C.J. Mohr. The name of the same author may appear in a rather different way, thus Rd. Soepardi Poerwokoesoemo in one publication and R. Soepardi in another, Shigeru Sato in one publication and Shigeru Satō in another.

### 1.5 The Structure of the Study

This study consists of nine chapters. Following this introduction, Chapter II provides an overview of the demographic, socio-economic and political developments of the Besuki region prior to 1870 and elaborates its distinctive features compared with the island of Java in general. Chapter III discusses population growth in the Besuki region by comparing it with the whole of Java. It deals with population size, factors affecting population growth and the effects of population growth on settlement frontiers and demographic patterns. Chapter IV elaborates the creation and closure of the agricultural frontier. It examines how cultivated lands expanded in Besuki, elaborates the role of the development of farm and estate agriculture in the process and their impacts on the environment by employing crop production systems and agricultural technology analyses. Chapter V discusses the development of the forest resource use: teak, jungle wood, and fauna and elaborates their

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77 Whitten, Soeriaatmadja, and Afiff, *The Ecology of Java*. 
effects on forest resource supplies and forest environment. Chapter VI deals with the same issues but in a different context, fish resource extraction. The chapter discusses the marine environment, fishing technologies and fishing operations and examines the human impact on fish stocks and the marine environment. Chapter VII deals with environmental problems arising from diseases and noxious wild animals, and elaborates the responses and methods employed to contain the problems. Chapter VIII discusses the politics of nature protection. It elaborates the development of conservation movement, conservation measures and their execution in Besuki. Finally, Chapter IX draws the major conclusions of the study.
CHAPTER II

SETTING THE SCENE: BESUKI BEFORE 1870

2.1 Introduction

This chapter presents an overview of the pre-1870 Besuki region and provides the historical setting for the core chapters which follow. A concise picture of the earlier conditions will be necessary to understand the demographic and socio-economic processes that modified the region’s environmental realities, and the problems the region encountered in the transformation process. There are strong impressions emerging from various studies that pre-1870 Java was already largely deforested, densely populated, and environmentally transformed into irrigated field and other agricultural landscapes. With regard to forest in Java, Peter Boomgaard depicted the four decades prior to 1870 as “the age of destruction”. Clifford Geertz regarded the same period as a time when the population of Java experienced “an explosion” and Java was turned into its final form, centering on the irrigated field (sawah) system, which distinguished it from outer Indonesia resting largely on swidden agriculture. W.F. Wertheim considered Java identical to a sawah landscape and called South Sumatra “a second Java” due to its extensive sawah area. This chapter argues that in many aspects, pre-1870 Besuki constituted a distinctive region compared with the rest of Java. Its peculiarity was the result of interconnected natural and historical forces.

2.2 Geographical Conditions

The region of Besuki in the present study refers to the four regencies (kabupaten) of Banyuwangi, Bondowoso, Jember, and Panarukan (later, Situbondo) that existed during colonial times and into the early independence era. The former residency of Besuki was situated in the extreme corner of East Java (Map 2a). There were three coastal areas: the Madura Straits in the north, the Bali Straits in the east, and the Indian Ocean in the south. The Pasuruan residency (once called Malang), formed its western boundary. The

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two residencies were frequently referred to as the Eastern Salient (*Oosthoek*) during colonial times.\(^5\)

The region has a mountainous landscape (Map 2a. and Plate 2.i). A Portuguese traveler, Tomé Pires, describes Blambangan (later, Besuki region) as a mountainous country.\(^6\) In the northwest of the region, the Hyang mountains, with the extinct Argapuro volcano soaring at its apex, stretch from Probolinggo to northern Jember. To the northeast, the Hyang mountains are connected with the Ringgit volcano in Panarukan. In the northeast lie the Ijen mountains with soaring volcanoes of Raung and Merapi, which was described by L. van Vuuren as “one of the most remarkable volcanic areas in the world”.\(^7\) Once sailing via the Bali Strait in 1596, Cornelis de Houtman was impressed by the view of smoke emitted by Merapi.\(^8\) The slopes of the region’s two mountains merge and form the Bondowoso highlands, while in the south, the range of

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\(^7\)L. van Vuuren, “Geographical Aspect of the Netherlands East Indies”, in L.M.R. Rutten (ed.), *Science in the Netherlands East Indies* (Amsterdam: De Bussy, 1929), p. 14; There is another, better known Merapi in central Java.

Watangan, Mandiku, Meru and Betiri hills separates the lowland of Jember from Banyuwangi.  

Geologically, according to R.W. van Bemmelen, Besuki's narrow north coast is an eastward continuation of the southern fringe of the Kendeng mountain complex consisting of Pandan volcano, the anticline of Jombang and Mojokerto, and the Penanggungan volcano, Pasuruan. Ringgit-Beser and Baluran mountains are an integral part of Besuki's north coast. The region's mountain complexes of the Hyang and Ijen with its intermontane plains of Jember-Bondowoso and Banyuwangi are part of the Solo Zone. The lowland of Jember stretches southward to Puger and, together with the lowland of Lumajang, meets the Blitar Sub-zone. The fragments of hill ranges between Puger and Betiri, the island of Nusa Barung, and Blambangan Peninsula are structurally part of the Southern Mountains of Java.

There are two main rivers that cut across the region of Besuki. Originating from the Hyang mountains, Kali Sampean flows north to the Madura Strait at the Tanjung Pacinan through the Bondowoso and Panarukan regencies. Meanwhile, Kali Bedadung emerges from several streams that flow south from the Hyang and the Ijen mountains.

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9 P.J. Veth, Java: Geographisch, Etnologisch, Historisch, Vol. 3 (Haarlem: Bohn, 1903), pp. 572-577; ANRI, Arsip Residensi, Besuki 2a.5, “Verslag van Bezoek en Banjoewangie 1832”.

and passes through the Jember regency to the Indian Ocean in the Puger district. A number of small streams also flow to the surrounding seas in a different direction. Kali Banyuputih flows from the Ijen mountains to northeastern Panarukan. Kali Mayang originates in the Ijen mountains and flows to the Indonesian Ocean after merging with Kali Ambulu and Kali Sanen. Obtaining their springs from the Ijen mountains, Kali Baru cuts across the area of Banyuwangi and flows to the Indian Ocean, whereas Kali Setail flows to the Bali Straits. These rivers provided irrigation for agricultural fields on the region’s plains and other domestic uses. But river transport was marginal as the rivers were not navigable.

The region’s soil is generally described as fertile, except in the limestone mountain ranges in Blambangan and the southeastern part of Jember. Two main factors explain the high fertility. First, fertility was a result of a series of volcanic eruptions in the past. Historical records show that Raung volcano erupted in 1586, 1638, 1730, and 1817. From 1600 to the 1970s, Raung volcano recorded 47 active periods, with the latest activity during the period in 1977. An eruption of Argapura volcano was recorded in 1597, whereas one of Ijen volcano was recorded in 1952. Franz Junghuhn mentions earlier eruptions of the Ijen volcano occurring in 1796 and 1817.

All these eruptions, in ejecting ashes, sand, stones and other volcanic materials to the surrounding areas, not only caused disaster to humans, but also rejuvenated soil fertility. Volcanic ash was transported by air during the eruptions, and partly carried further downwards by streams. Under the influences of climate and chemical processes, volcanic materials partly formed the black dust soil profile in the region.

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13The Bedadung and Sampean rivers were navigable downstream by canoe, but only over a limited distance. Hageman, “Over het Rijzen”, p. 231; C.M. Vissering, *Een Reis door Oost-Java* (Haarlem: Bohn, 1912), pp. 59-60.


particularly between the Ijen and Baluran and on the plain between Lumajang and Puger.19 According to van Padang, a number of hillocks found at the west slope of the Raung constituted the remnants of the volcanic materials ejected by the volcano.20 Mostly consisting of young volcanic soils, Besuki generally has good soils as one major foundation for agriculture.21

Despite causing erosion and soil nutrient drain in some areas, rivers formed fertile alluvial soils in river valleys and coastal plains.22 Besides ash rains from the Raung and Semeru volcanoes, the fertile southwestern plain of Jember had been affected by streams bringing mud and volcanic materials from the Raung volcano. The fertile southern plain of Banyuwangi resulted from a similar process, but its northern plain was composed of materials from the Merapi volcano. This volcano also formed the fertile plain of Panarukan. Meanwhile, Kali Sampean bringing materials from the Raung volcano composed the fertile plain stretching from Prajekan northward to the Sampean delta.23 The fertile narrow plain of Besuki district was formed by the Deluwang River.24 In some places in the north coast, such as Besuki and Panarukan districts, the siltation process steadily extended the coastline to the north.25

Another striking element was forest. There was a lot of forest in pre-1870 Besuki. Many settlements that had been established were often still surrounded by forest.26 Tombe, a French ship captain going by land from the north coast of Banyuwangi to Surabaya, reported in 1805 that the route was still in the form of footpaths running through jungles and parts of them needed to be cleared often.27 Parts of the cleared tracts of forest seem to have experienced natural regeneration. Although once cleared in the 1770s to facilitate the movement of the Dutch troops in repressing

21The best soil for farming is volcanic soils, moderately weathered in a climate with a dry season, but with sufficient irrigation. Arthur van Schaik, Colonial Control and Peasant Resources in Java: Agricultural Involution Reconsidered (Amsterdam: Koninklijk Nederlands Aardrijkskundig Genootschap, 1986), p. 44.  
26Babadj Bayu indicates that when VOC soldiers launched a military campaign against Bayu, they were forced to open up new paths through forest because the palace was situated in the middle of forest. Winarsih Partaningrat Arifin, Babadj Blambangan (Yogyakarta: Bentang and Ecole Francaise de’Extrème Orient, 1995), pp. 262, 286.  
the local resistances, the southern slope of the Raung volcano was found to be already covered with forest again in 1844.28 Natural re-vegetation also occurred in part of the Baluran area after it was abandoned around the late decades of the sixteenth century possibly due to diseases, warfare or volcanic eruption.29 The largest part of Besuki forest was categorized as non-teak forest, together with the other forest districts of Priangan, Krawang, Banyumas, and Bagelen.30 Donner classifies it as deciduous monsoon forest, naturally developing in areas with small quantities of rainfall and a prolonged dry season. In a broader context, the vegetation of Besuki reflects a trend of decreasing rainfall from west to east across the island of Java.31

The Besuki residency was also among the few regions of Java with extensive marine areas. They are found in the northern, eastern and southern parts of the region and form part of the Sunda Shelf. This shelf covers the western parts of the Indonesian waters connecting the islands of Java, Sumatra, and Borneo and a number of smaller groups of islands in the Java Sea and South China Sea with the Asian continent.32 The northern waters of the region, known as the Madura Straits, are characterized by flat, muddy and shallow bottoms, as is the Java sea.33 From the west to the east, the Madura Straits become increasingly deep and north of Panarukan, the depth increased to not less than 81 metres.34 The region’s water environment provided good fishing grounds, particularly the plankton-rich Bali Straits.35

As in other Indonesian areas, monsoons constitute the primary forces regulating the region’s environment. Closely linked to the west and east monsoons, there are two different seasons. The dry season, associated with the west monsoon, broadly runs from May to September, whereas the rainy season occurs for the rest of the year and is linked to the east monsoon. In the broader context of Java, there are peculiarities too. Besuki has a drier climate and less rainfall compared to the western parts of Java.36 Colonial

28Rd. Soepardi Poerwokoesoemo, Jati Jawa ( Tectona grandis Linn) (Jakarta: 1956)p. 34.
30Poerwokoesoemo, Jati Jawa, p. 35.
35Subani and Sudradjat, “Penelitian Plankton”, p. 93.
observations found that the longest rainless period in Java was observed in Situbondo and Besuki districts. Under W. Köppen’s climate classification, Besuki region has the Aw climate, meaning tropical climate with a prolonged dry season. During the dry season the average rainfall in Bondowoso, for example, only ranged from 0-10 days/month, while in West Java (Bogor, Priangan), by contrast, it reached more than 20 days/month. Of course, there were local variations, such as the higher rainfalls in Bondowoso and Jember areas than on the north coast, and the higher rainfalls in the southern slopes of the Ijen mountains than in its northern slopes, affected by topographical factors especially the high mountains.

The above discussion has broadly shown the geographic characteristics of the Besuki region and its peculiarities in the context of Java as a whole. As an arena for human activities, the region not only offered potential in terms of natural resources, but also presented particular challenges of how the existing potential could be turned into something valuable economically. In the following sections, human agency is introduced. The role of human agency in utilizing natural resources and consequently, modifying the natural environment would also depend on a set of interrelated factors of population size, commercial and technological development, and socio-political conditions.

2.3 Demography

Early statistical information on the population of Besuki is hard to find. Only since the nineteenth century has rough statistical data on the population of Java been available, but most scholars regard the figures as unreliable because they were produced on an incomplete estimate basis. The data, however, can still be used to indicate the broad demographic trends. Prior to 1870 the region of Besuki was the most sparsely populated region of Java. In 1870 the region’s population density was 66 inhabitants per square...
kilometre. In the three other most sparsely populated regions of Java (Banten, Krawang and Priangan), population densities were still higher, respectively reaching 78, 76, and 97 inhabitants per square kilometre. In the most densely populated residencies like Kedu and Bagelen, population density figures, by contrast, were 360 inhabitants and 390 inhabitants per square kilometre respectively, whereas in other residencies population density ranged from 146 to 340 inhabitants per square kilometre.\footnote{P. Boomgaard and A.J. Gooszen, \textit{Changing Economy in Indonesia}, Vol. 11: \textit{Population Trends 1795-1942} (Amsterdam: Royal Tropical Institute, 1991), p. 217.}

The above information might come as a surprise, given the fact that the region had emerged in the historical arena more or less at the same time as the Majapahit kingdom. The region was granted to Arya Wiraraja of Sumenep, Madura as a reward for his support to the founder of Majapahit in defeating Jayakatwang of Kediri, ousting Mongol soldiers from Java, and establishing the Majapahit kingdom. Wiraraja administered the Blambangan area and established his palace in Lumajang (West of Jember).\footnote{Slametmuljana, \textit{A Story of Majapahit} (Singapore: Singapore University Press, 1976), p. 51; Sartono Kartodirdjo, Marwati Djoened Poesponegoro, and Nugroho Nutosusanto, \textit{Sejarah Nasional Indonesia}, Vol. 2: \textit{Jaman Kuno} (Jakarta: Departemen Pendidikan dan Kebudayaan, 1975), p. 260.}

During the era of Majapahit (1293-1527), the population of Blambangan was probably quite large. This might be indirectly evident from the official visit of the greatest king of Majapahit, Hayam Wuruk, to the region. The indigenous inhabitants of Blambangan were called the Osing group.\footnote{C. Lekkerkerker, "Balambangan", \textit{De Indische Gids}, 45, 2 (1923), pp. 1031-1032.} In his report written in 1513-1515, Pires described how the Blambangan ruler, who controlled the lands of Canjtam, Panarukan, Pajarakan, and Chamda (Jember), had a large number of subjects.\footnote{Cortesão (ed.), \textit{The Suma Oriental}, p. 198.} There might have been fluctuations during the periods of war. The military conflict in the region during the Majapahit kingdom is represented in the story of Damarwulan and Menakjingga, which tells of the war between Majapahit and Blambangan.\footnote{Lekkerkerker, "Balambangan", p. 1081; H.J. de Graaf and Th.G.Th. Pigeaud, \textit{Kerajaan-kerajaan Islam Pertama di Jawa} (Jakarta: Grafiti, 1985), p. 207.}

With the fall of Majapahit (1527), Blambangan became an independent kingdom. But the region's position between the growing power of the Islamic kingdoms of Central Java to the west and the Balinese Hindu kingdoms to the east, made it a target for a series of military expeditions from both sides between 1546 and 1764.\footnote{I Made Sudjana, \textit{Nagari Tawon Madu: Sejarah Politik Blambangan Abad XVIII} (Denpasar: Larasan Sejarah, 2001), pp. 1; Lekkerkerker, "Balambangan", pp. 1036-1051.} Military expeditions from Central Java were sent to Besuki region by the Demak kingdom in 1546 and the Mataram kingdom during 1636-1640, which led to a series of succession
The wars did not produce a clear winner, but did create considerable disruption to people’s lives. During these relatively unstable periods, there were frequent efforts from both sides to reduce the strength of the kingdom in control of Besuki. The region of Besuki was clearly a contested area, a feature that led the region’s demographic development to a rather different path from many parts of Java.

The conflicts probably had an economic dimension too. Since the fourteenth century, the region had been famous for its richness in food products. In a labour shortage economy, the expansionist policy launched by the conflicting political centres was not aimed at controlling more territory per se to achieve political ambitions, but rather at controlling the labour forces, as the most important way to accumulate wealth. Babad Bayu tells that Jagapati, the ruler of Bayu kingdom (between Jember and Banyuwangi), displaced many inhabitants from the surrounding villages to settle in his realm. Babad Besuki indicates that Tumenggung Sentong (Bondowoso), allowed Ki Wirobroto and other Madurese migrants to clear Besuki forest to establish settlements and agricultural fields, but asked for their loyalty to him, while Tumenggung Banger (Probolinggo) also wanted them to be his followers.

Due to the continued political instability, the population of Besuki increased little until the end of the eighteenth century. The lengthy wars of succession obstructed population growth in the region. Anthony Reid has even estimated that during the eighteenth and nineteenth centuries, the population growth in Central and East Java was -0.85 per cent per annum. Besuki was one of the regions experiencing low population growth. Ann Kumar estimates that during this period the population of Besuki decreased steeply from around 80 – 100,000 to only about 5,000 – 8,000. That is a

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51 Arifin, Babad Blambangan, p. 228.
52 Wondosoebroto, Babad Besuki, pp. 9-15.
55 Ann Kumar, Java and Modern Europe: Ambiguous Encounters (Surrey: Curzon, 1997), p. 207.
decline of -1.25 to -1.38 percentage per annum, much higher than the rates of decline in East and Central Java as a whole.

Several factors help to illuminate the process of depopulation. The first factor is mortality caused by warfare. A traditional source, Babad Blambangan, clearly indicates that many people died during the periods of warfare. A massacre taking 300 lives was reported to have occurred in Besuki in 1709. The high rate of mortality should not be associated merely with the people killed in the battlefields, but also with deaths due to the indirect impact of warfare including food shortages and crop failures. The destruction of food crops was used as a war tactic on all sides. Labour shortages or the passage of troops caused occasional famines and misery throughout Southeast Asia.

Such hardships also befell Besuki. By 1768 and 1771 food shortages emerged in Blambangan, Puger, Panarukan, and Besuki due to the military tactics—such as blockades and controlling rice producing centres—used by the Verenigde Oostindische Compagnie (United East Indies Company, VOC) troops to defeat the local kingdom.

Second, political instability forced inhabitants to flee to more secure places such as forests and mountains, and to other surrounding areas which could give sanctuary during the political turmoil. During warfare, for example, some of the inhabitants of Besuki fled to the island of Nusa Barung and to Bali to avoid being captured and deported. Third, some of the inhabitants were caught and deported to the Mataram capital after the defeat of Blambangan. In 1646, for example, the Mataram military expedition deported around 5,000 from the region following the defeat of Blambangan. In the following year, the Mataram ruler planned another deportation of 1,500 people. Meanwhile, the Buleleng military expedition deported 800 people from the same region in 1697. For the winners, deportation was not only intended to weaken the defeated rulers and to prevent immediate rebellion from taking place, but was also a source of

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62 Sudjana, Nagari Tawon Madu, pp. 29-30.
prosperity. In Mataram, for example, the deported people were employed to do various manual labour jobs.63

About 1800 the Besuki region had better political stability, which provided one basic condition for population growth. Political stability followed the success of the Dutch colonial rule in suppressing the remnants of the rebellious forces led by Prince Pakis, the ruler of Bayu kingdom, in 1797.64 Figure 2.1 reveals that between 1820 and 1870 the population of Besuki tripled. The absence of statistical data on births and deaths makes it difficult to assess the role of natural factors in the region’s population growth, but it is likely that their relative importance was less than the immigration factor. From around 1820 the inflow of migrants were greatly stimulated by the incentives offered by the colonial administration in Besuki, including establishment support, agricultural tools and tax exemptions.65 Despite the growing population size, until 1870 the Besuki residency remained the most sparsely populated region of Java.

![Figure 2.1 Population of Besuki, 1820-1870](image)


Looking at the lower administrative division, the population was not evenly distributed across the region. Population figures by Bleeker for 1845, excluding

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64Sudjana, Nagari Tawon Madu, p. 93.
Banyuwangi, suggested that the population was still concentrated in the northern coastal districts of the region and that the population was predominantly Madurese in almost all districts.\footnote{66} This population concentration in the north apparently remained unchanged until around 1870 as Figure 2.2 demonstrates. The values it offers, of course, are only indicative due to the less reliable statistical data and crude administrative comparison. For example, the then Jember area was only a district of Bondowoso although it covered a larger area than the rest of Bondowoso regency. Despite the shortcomings, the underlying trend was quite clear that Jember and Banyuwangi were still sparsely populated. At the start of the period covered by this thesis, therefore, Besuki was relatively sparsely populated, with opportunity for an expansion of the settlement frontier in the region. To understand this expansion, however, we also need to consider the economy.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2_2.png}
\caption{Figure 2.2 Population Distribution in the Besuki Residency, 1865}
\end{figure}

\*Note: Figure for Panarukan includes the north coast and Besuki districts in Tennekes’ population data. Source: J. Tennekes, “De Bevolkingspreiding der Residentie Besoeki in 1930”, \textit{Tijdschrift van het Koninklijke Nederlandsch Aardrijkskundig Genootschap}, 80 (1963), p. 335.

\subsection{2.4 Economy}

Agriculture had been the foundation of the pre-1870 Besuki economy. Despite the lack of statistical data, it is likely that the largest part of the region’s population engaged in agriculture, which embraced irrigated field (\textit{sawah}), dry field (\textit{tegalan}), and shifting (\textit{ladang}) cultivations (discussed further in Chapter IV). Among the three practices, irrigated cultivation was probably the most important form.\footnote{67}
On the basis of Raffles’ estimate, R.E. Elson has suggested that by 1815 on average each village in the then Banyuwangi residency had 15.9 hectares of irrigated field and 2.3 hectares of dry field. Meanwhile, in the then Besuki residency there were on average 24.2 hectares of irrigated field and 21.9 hectares of dry field. It is likely that the significance of dry lands in terms of acreage might have been higher than the statistical data suggests, given the shortcomings in the counting methods employed. But the creation of irrigated fields seems to have strongly attracted colonial interest. Between 1815 and 1828 more than 9,000 hectares of irrigated lands were established in Besuki. The completion of irrigation projects in Besuki in 1831 was reported to have converted more than 700 hectares of dry field to irrigation. Similarly, the conversion of more than 400 hectares of dry field into irrigated ones was reported in 1850.

In terms of acreage, not much is known about the significance of shifting cultivation in the region. Qualitative evidence, however, indicates that the practice did exist in the region before 1870 and was also observed in several other sparsely populated regions of Java including Priangan, Krawang, Banten, and Cirebon. They were basically farmers who “cleared forest and scrub land, burned the slashed vegetation” for growing dry rice and other agricultural crops. Traditional literature such as Sri Tanjung, written by Citragotra in the mid-eighteenth century mentions the existence of shifting cultivation practices. Although agriculture was substantially important for the farmer’s lives, it was by no means their only source of livelihood. Some of the farmers also engaged in other activities such as hunting and gathering forest products. The Osing people were well-known hunters and skillful forest explorers. The main object of hunting was wild oxen. Furthermore, Elson noted that

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71Elson, Village Java, pp. 238, 240.
72Elson, Village Java, p. 10.
75Sudjana, Nagari Tawon Madu, p. 22.

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in the 1830s farmers and their families in Besuki occasionally went to the southern forests for a couple of months to tap sugar palms.\textsuperscript{76}

Some inhabitants earned their livelihoods from fishing. \textit{Sri Tanjung} mentions explicitly fishing activity, types of fishing boats, fishing implements, and diverse fish species captured in the shallow and deep waters of Banyuwangi.\textsuperscript{77} Small fishing communities were observed in several parts of the Banyuwangi coasts especially along the Bali Straits.\textsuperscript{78} Excluding Banyuwangi, in the Besuki region by 1861 there were 1,058 fishermen, with 692 fishing boats.\textsuperscript{79} In general, the Indonesian fishing boats depended on wind-powered technology.\textsuperscript{80} The number of fishermen in Besuki constituted around 0.35 per cent of the total population, much lower compared with the percentage of fishermen in Java as a whole for 1820.\textsuperscript{81}

Characterized strongly by an agriculture dominated-economy, agricultural products played a important role in the Besuki region. There is little information for the earlier centuries, but the main agricultural item from the sixteenth century was rice, although corn and cassava were also found. Rice was mainly grown in irrigated fields, and partly in dry fields. A traditional literature indicates that Ki Wirobroto, a pioneering Madurese migrant to Besuki district, grew rice both in irrigated and dry fields.\textsuperscript{82} But the region also produced paddy grown on dry fields,\textsuperscript{83} which appears to have been the case in eastern Java since the pre-Majapahit period.\textsuperscript{84}

Rice was produced in Besuki for subsistence and commercial needs. In earlier reports and traditional literature, the region was often described as a rice exporter. Pires noted that Blambangan was a rich land and produced large amounts of foodstuffs.\textsuperscript{85} Similarly, Balthasar Diaz, a Portuguese priest, reported in 1559 that Panarukan was the

\textsuperscript{76}Elson, \textit{Village Java}, p. 11.
\textsuperscript{78}Sudjana, \textit{Nagari Tawon Madu} p. 22.
\textsuperscript{81}Population figure used as divider from Tennekes, \textit{“De Bevolkingspreidings"}, p. 335; for Java overall, it is estimated that there were about 35,000 fishermen (3 per cent of the total population) in 1820, see Boomgaard, \textit{Children of the Colonial State}, p. 117.
\textsuperscript{82}R. Wondosoebroto, \textit{“Babad Besoeki-Bondowoso"}, Handwritten Manuscript (Bondowoso: 1938), p. 5.
\textsuperscript{83}Sudjana, \textit{Nagari Tawon Madu}, p. 21.
\textsuperscript{85}Cortesão (ed.), \textit{The Suma Oriental}, pp. 197-198.
richest foodstuff-producing region of Java, in terms of rice, meat, and vegetables. Based on a British traveler’s report, M.A.P. Meilink-Roelofsz mentioned that “the country of Panarukan abounded in food products”. A Portuguese missionary source reported the coming of a British ship commanded by Thomas Cavendish to Blambangan in March 1588 for trade exchange. Meanwhile, in the traditional literature Blambangan was said to export rice to Ambon, Batavia, and Banda.

The region’s capacity to export rice probably fluctuated. During the period of warfare, rice production declined due to labour shortage and crop destruction. The decline was indicated by the failure of the VOC to collect quantities of rice set as delivery quota for trade. With the establishment of political stability and irrigation improvement, the region was able to regain its role as rice surplus area. In 1840 per capita rice production in Besuki was 188 kilograms (in paddy), below the average figure for Java overall reaching 200 kilograms. However, by 1850 it increased to 356 kilograms, which placed Besuki as a region with the highest per capita rice production among all residencies of Java.

Besuki also had trade products collected from the forest. The major item was birds’ nests, one of the tropical delicacies highly sought-after on the China market. The indigenous rulers and then the VOC organized the collection of birds’ nests on a lease right basis. For example, in 1784 the rights for collecting birds’ nests in Banyuwangi was granted to Han Boi Ko and Tan Han Ho, Chinese traders from Surabaya, who employed 48 people for the job. According to the agreement, the two Chinese should pay 1000 rijksdaalders (about 2,500 guilders) annually to the VOC. A similar right was given to another Chinese with an annual lease of 850 Spanish dollars. In 1790, a Mandarese, Captain Buton, obtained the right to collect birds’ nests in West Blambangan, including the districts of Prajekan, Sentong, Jember and Sabrang. But then

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86 Arifin, Babad Blambangan, p. 309.
87 Meilink-Roelofsz, Asian Trade, p. 152.
89 Arifin, Babad Blambangan, p. 278.
90 Political instability and labour shortage reduced the natural resource uses. The successive removal of palace capitals from Kedawung (Puger) to Bayu (1565), Macanputih (1697), Kutalateng (1774), Ulupampang (1774), and finally to Banyuwangi (1774) absorbed a large part of the existing inhabitants and consequently, made the region only able to produce limited quantities of agricultural products, mostly for domestic needs. Sudjana, Nagari Tawon Madu, pp. 39, 91.
91 The per capita rice production is converted from data given by Elson in picol (1 picol = 62.5 kg). Elson, Village Java, p. 114.
the right was transferred to the Regent of West Blambangan after the death of Captain Buton during the Dutch military campaign against piracy.94

The region’s integration into broader commercial networks increased significantly under the Cultivation System (1830-1870). Two major products serving the means of integration were coffee and sugar. Although coffee had been grown earlier in Puger and other districts, it remained less significant in the region.95 In 1815, there were only 105,000-110,000 coffee trees, but during the Cultivation System the plantings of coffee expanded remarkably. In 1830 in the Bondowoso regency there were only 391,000 coffee trees. The number increased to 6,079,000 coffee trees in 1840 and by 1848 it grew to 8,363,000 coffee trees. The largest coffee gardens were found in Wonosari and Bondowoso districts, each of which had more than 2 million coffee trees. In Jember and Puger, by contrast, each had less than 600,000 coffee trees.96 Under the Cultivation System, coffee was turned into the region’s largest population-mobilizing cash crop production, followed by sugar in second place. In its peak year in 1854, around 24,000 households got involved in sugar cultivation, whereas 38,000 households were in coffee cultivation. In other years, there were consistently more households involved in coffee cultivation than in sugar and other forced crop cultivations.97

Unlike coffee gardens, sugarcane cultivation was still restricted to the region’s north coast, especially Besuki, Panarukan, and Situbondo districts (Map 2b). In 1830 there were about 500 hectares of sugarcane area in Besuki. By 1855 the area grew to around 1,600 hectares, with five sugar mills in operation. Three sugar mills operated in Panarukan.98 From 1855 to 1870 the area under sugarcane was relatively constant, ranging around 1,400-1600 hectares, and so was the number of sugar mills.99 About one third of the region’s cane cultivation was initially undertaken on dry fields, but the
practice was eventually abandoned. This development followed the emerging view that the best location for sugarcane was on irrigated lands.\textsuperscript{100}


To facilitate the exploitation, measures were taken by the colonial authority to improve transport infrastructure. Before 1830 the region’s transport infrastructure remained poorly developed. An 1813 report revealed this situation in Banyuwangi.\textsuperscript{101} In 1824 the Resident of Besuki stated that most roads in the region could only be traversed on foot.\textsuperscript{102} Goods were conveyed by horses, but it was also common that people carried goods on their shoulders.\textsuperscript{103} From 1830 the situation gradually improved. In 1836 the Resident of Besuki reported that main roads in the interior connecting Puger, Jember, and Bondowoso were widened in order to be passable by wheeled traffic.\textsuperscript{104} Improvement was also made to the road connecting Besuki region with Probolinggo in the west.\textsuperscript{105} Post-stations were established where horses were changed and people could

\textsuperscript{100} Elson, Village Java, p. 59.
\textsuperscript{101} ANRI, Arsip Residensi, Banyuwangi 1, “Monthly Report of the District Baniowangie, 1813”.
\textsuperscript{102} ANRI, Arsip Residensi, Besuki 2a.4, “Algemeen Verslag van Residentie Besoeki, 1824”, p. 13.
\textsuperscript{103} Elson, Village Java, p. 16; Raffles, The History of Java, p. 197.
\textsuperscript{104} ANRI, Arsip Residensi, Besuki 3.2, “Algemeen Verslag van Residentie Besoeki 1836”.
take a rest for a while. In 1844 Junghuhn reported four post stations between Puger to Lumajang. In 1862 there were ten post-stations from Puger to Bondowoso.

Like the road infrastructure, the means of transport was improved too. From the 1830s the use of animal-drawn carts appears to have grown. Elson stated that in the 1850s many animal-drawn carts and their drivers went to Besuki from Probolinggo and Pasuruan to transport sugarcane. In Banyuwangi, horse-drawn carts were employed to convey cash crop products, but in some cases goods were transported with carrying poles. The growing use of animal-drawn carts was partly reflected in the steep increases in livestock numbers particularly horses and oxen. In 1827 only 31,100 horses and 65,200 oxen existed in the Besuki region and by 1856 they increased to 43,300 horses and 95,700 oxen. Both horses and oxen had grown in number in the 1860s and the following decades, and probably so did the animal-drawn carts.

Under the Cultivation System, the Besuki region became economically more integrated with the broader commercial network. In the local context, the system stimulated the increased uses of the natural resources especially lands and forest, and consequently altered the environmental realities of the region. The human-made environmental landscape expanded, replacing the original vegetation. But the progressive environment-changing influences of the Cultivation System seem to have declined from around the mid-1850s as no significant expansion of coffee gardens occurred. The trend was indicated by the decrease in households involved in coffee production from about 38,000 households in 1854 to 26,000 households in 1855. The number of households remained constant or slightly increased until around the mid-1860s. Although there were increases in the late 1860s, they never surpassed the 1854 figure. Only from 1870, parallel with the coming of a new colonial era, did the forces of the environment-changing economic activities, especially agriculture and forest extractions, arrive back in the scene, on an even larger scale, boosted by other combined factors of growing population size, more developed technologies, and more diversified estate crops grown in the region.

106 Junghuhn, Reizen Door Java, p. 371.
107 The station posts were established in Puger, Kasian, Balung, Rawatamtu, Rambipuji, Sempusari, Jember, Arjasa, Jelbuk, and Suger. J. Hageman, Jcz., "Over de Nijverheid in Zuid Oostelijk Java", Tijdschrift voor Nijverheid en Landbouw in Nederlandsch Indië, 8 (1862), pp. 56-57.
108 Elson, Village Java, pp. 224-225.
109 Elson, Village Java, pp. 66, 253-254.
110 ANRI, Arsip Residensi, Banyuwangi 26, “Jaarlyksch Verslag Residentie Besoeki en Banjoewangi 1828”; Verslag van het beheer en den staat der Kolonie over 1856, Bijlage W.
111 In 1890 there were 58,900 horses and 216,200 oxen in the Besuki residency. Koloniaal Verslag van 1892, Bijlage A, pp. 36-37.
112 Baardewijk, Changing Economy in Indonesia, 14, pp. 253-255.
2.5 Socio-Political Conditions

For centuries the Besuki region constituted the territory of the Blambangan kingdom, both as an independent power and as a constantly changing vassal of the larger empires in East and Central Java, and Bali. Due to political instability, the center of political power in Blambangan was often relocated from one locality to another. Until 1596 the palace was in Panarukan; it moved to Puger until 1659, and subsequently to Bayu (1659-1665), Macanputih (1665-1697), Kultanateng (1697-1774), Ulupangpang (1774), and finally to Banyuwangi (1774). In 1743, during the Central Java-based Mataram vassalage of Blambangan, the area was ceded to the VOC, according to a contract between Governor General Van Imhoff and Susuhunan Pakubuwana II.

Despite the taking over of Blambangan, the region was still regarded by the VOC as economically less important than other parts of Java. This was the reason why in 1763 Governor of the North Coast of Java, W.H. Ossenbergh, declined the request of the ruler of Blambangan, Prince Pati, for military aid in his fight against Prince Wilis. Prince Wilis won the fight and became the ruler of Blambangan. But in 1764 the Mengwi ruler of Bali detained Prince Wilis and appointed Gusi Murah and Kutha Bedah to rule Blambangan. The conquest of Blambangan by the VOC was due to strategic reasons in response to the emerging alliance between Gusi Murah and Kutha Bedah and the British traders, the biggest commercial rival of the VOC. The Company officials, especially Johannes Vos in Semarang and his representatives in Surabaya, were worried that Blambangan would be used by the British traders as a foothold for expanding political influences.

The success of the VOC-enthroned loyal figures, Mas Anom and Mas Weka, in ruling Blambangan did not automatically put local resistance to an end. Two major rebellions were led by Prince Wilis (1768), who was released from the Mengwi detainment, and Prince Pakis or Jagapati (1771-1772). Prince Wilis was a descendant of the great ruler of Blambangan, Tawang Alun, and wanted to expel the VOC from Blambangan. Prince Pakis was Wilis' follower who later identified himself as the

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113 Sudjana, Nagari Tawon Madu, p. 117.
reincarnation of Prince Wilis and led another resistance against the VOC. Although the leaders were caught, the remnants of the rebellious groups continued their resistance. It took more than a decade for the Dutch to eradicate them. Therefore, the VOC often viewed the region as "a favourite place of hiding for rebels, criminals and bands of brigands". The region became a source of marine insecurity due to pirates (remnants of the local and Mandar-Buginese rebellious groups) who posed a serious threat to Dutch trade interests, and were located especially in Grajagan and Nusa Barung. The military expeditions and the establishment of the military forts in Banyuwangi and Watu Ulo were primarily intended to end smuggling activities involving English, Balinese, Mandar-Buginese, and others, and to prevent the region from becoming a rendezvous of the anti-Dutch parties. With the intention to isolate Blambangan from its alliances with the Hindu kingdoms of Bali, in 1771 the Dutch encouraged the conversion of the Blambangan royal family to Islam.

Following the pacification process, thoughts of how to generate profits from Besuki gradually grew among the Dutch officials. A report by Resident W.H. van Ysseldyck around 1800 indicated the intention to bring the "wastelands" consisting of mountainous and forest-covered lands into cultivation. Due to a lack of officials, the Dutch administration leased the districts of Besuki and Panarukan to a Chinese, Han Tjan Pit. This meant that Han Tjan Pit was given the right to collect taxes from the rented villages. The intention to directly manage the Besuki region apparently revived with the repurchase of the districts by Raffles in 1814. At this time Besuki and Puger were administered as one residency together with Probolinggo. Banyuwangi was added in 1827, but became an independent Assistant-Residency in 1849 and the Assistant Resident for Banyuwangi also administered the Assistant Residency of Bali and Lombok. In 1855 Probolinggo separated from Besuki and in 1882 Banyuwangi was reintegrated into Besuki. From this year on the administrative area of the Besuki residency was relatively stable until the abolition of the residencies throughout

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118 Boomgaard, Children of the Colonial State, p. 27.
119 Kumar, Java and Modern Europe, pp. 210-211; Sudjana, Nagari Tawon Madu, pp. 81-82; Kwee, The Political Economy of the Java’s Northeast Coast, p. 74.
121 Wijayati, Tanah dan Sistem Perpajakan, p. 48.
Indonesia in the mid-1960s, with a brief exception between between 1928 and 1931 when Besuki was divided into Bondowoso and Jember residencies.124

One major problem confronting the direct management was labour shortage and as a solution immigration was strongly encouraged by the colonial officials in Besuki. Unlike many other parts of Java, only in the Besuki region did immigration become an integral part of colonial development. The immigration on both colonial and individual initiatives made the multi-ethnic character of the region’s population increasingly clear. Of course, this character was not a nineteenth century phenomenon, but had historical roots in the earlier periods. Besides the Madurese and Osing groups, there were Mandar-Buginese minorities, mainly the descendants of Kraeng Galesong and his followers who fled from Makasar after it had been defeated by the VOC in 1669.125 The presence of Chinese was also observed. Several Chinese figures had even been appointed as the ronggo (regent) of Besuki, Han Sam Kong (1772-1776) and Han Mi Djoen (1776), who later administered Puger and Bondowoso (1796).126 But only with the incoming migrants from the early nineteenth century was the presence of non-Osing groups strengthened. In the northern districts, the Madurese group grew dominant, but around 1845 the Osing remained the largest population of Banyuwangi.127 The Javanese population was also more significant, but remained smaller than the first two groups. The number of Europeans, Chinese, and Arabs increased too.128

Apart from the growing multi-ethnic character, there was one major sociological feature which contributed to Besuki’s distinctiveness. Land ownership in the region was predominantly private land tenure, rather than communal as commonly found in Java.129 The predominantly private land ownership in Besuki is partly linked to the Madurese migration. Another possible explanation is that the impact of the Cultivation System

128In 1830 the numbers of European and Chinese in Besuki were 138, 466, and 1,580 respectively. By 1870 there were 472 Europeans, 1,073 Chinese, and 2,845 other Asians. Boomgaard and Gooszen, Changing Economy in Indonesia, 11, pp. 124, 127, 130.
may have been lighter in Besuki than in most parts of Java. Consequently, there was no need to share the burden of compulsory services among the villagers. This is based on an argument that the communal landownership was a creation of the Cultivation System. Central to this argument is the policy of communalising of land and the redistribution of communal land among landless farmers. This policy allowed landless farmers to be regarded as landowners, and compulsory services could be imposed upon them.¹³⁰

A more plausible explanation is related to the fact that the conversion of land from private hereditary tenure to communal ownership in the extreme corner of East Java was prohibited by the central government in Batavia in 1849.¹³¹ Besuki then was a sparsely populated region. There were wide opportunities for agricultural expansion to uncultivated lands. Communalisation and redistribution of lands among landless farmers were not necessary because unlike many other parts of Java, Besuki had no acute problem of landlessness. The best way to broaden the tax base was therefore to encourage new settlers to open up new lands. This confirms an argument that communal landholding did not develop in sparsely populated regions.¹³²

The ease of gaining access to land and the availability of large unoccupied tracts would have been among the major factors why the region of Besuki attracted migrants. The early notions of property rights to land were relatively simple. Property rights to land (adat ownership) could be established by simply clearing the forest or virgin land, followed by continued occupation.¹³³ In Banyuwangi, land obtained by opening up forest was called sabe mamandung or sabe yoso (created farm lands).¹³⁴ The first clearers (cakal bakal) not only had the right to cultivate, but could also hand the rights to land to their heirs.¹³⁵ Such lands were locally called tanah tingalan, tilaran, or

sangkolan (lands inherited from ancestors).\textsuperscript{136} As Booth has pointed out, new settlers would only make heavy investment in clearing forest and creating new fields if there was a guarantee that they could possess and bequeath the land to their heirs.\textsuperscript{137}

With the abundantly available uncultivated lands, it is very unlikely that inheritance process would immediately have led to land fragmentation. The more likely path was the expansion of cultivated lands, which in the long run also paved the way for the formation of separate settlements. There are folk stories illustrating forest clearings for agriculture and legendary formation of new settlements to resolve increased population.\textsuperscript{138} Although traditional rulers claimed ownership, there were no actual restrictions for the commoners. New inhabitants were welcome to use natural resources such as clearing forest for settlement and agricultural activities and making use of forest products, to exchange their loyalty and tribute for goods and labour.\textsuperscript{139} The transfer of political control from traditional rule to the VOC, and then to the pre-1870 Dutch colonial administration, did not bring much change to the situation.

2.6 Conclusion

This chapter has shown that pre-1870 Besuki was quite distinctive compared with the rest of Java as a whole. In geographic terms, the distinctiveness collectively materialized in the region’s striking mountainous landscape, lower rainfall, and drier climate. These qualities might be found elsewhere in Java, but they often only occurred separately. Unlike in many other parts of Java where forest cover had shrunk remarkably, in Besuki forest remained the major element of the region’s landscape, despite the supposedly increased clearing of forest during the Cultivation System period.

Besuki’s distinctiveness was further reinforced by its socio-economic aspects. In demographic terms, in contrast to the overpopulated Java, Besuki remained sparsely populated. As a long-contested frontier, the region experienced periods of low population growth. Under such circumstances, the region’s development greatly depended on the inflow of migrants from outside Besuki. The ease of gaining access to

\textsuperscript{137}Anne Booth, \textit{Agricultural Development in Indonesia} (Sydney: Allen and Unwin, 1988), p. 73.
\textsuperscript{138}The folk story of Lembu Setata and Lembu Sakti are associated with the formation of presently existing villages including Alas Malang, Padang, and Canthuk, whereas the folk story of Sulung Agung and Agung Sulung is attributed to the formation of villages such as Lateng, Gladhak, and Ginthangan. Suripan Sadi Utomo and E. Yonohudiyono, \textit{Cerita Rakyat dari Banyuwangi} (Jakarta: Grasindo, 1996), pp. 7-16.
lands, the availability of extensive uncultivated lands, and some support provided by the colonial authority provided pull factors for migration to Besuki. The inflow of migrants paved the way for agricultural development under the Cultivation System, which made the economy of Besuki more closely integrated with the broader commercial networks. Parallel with this development, several improvements were also brought to infrastructure and means of transport. However, all these factors, together with the fact that the region’s population remained relatively small, despite the notable increases, and the fact that the technology was still predominantly animal powered, meant that the region remained unable to generate larger accumulative forces than those already working and transforming drastically the environmental realities of many other parts of Java. Until around 1870 major agricultural centres and human settlements were still concentrated in the northern districts and the hinterlands of Besuki mostly remained in wilderness.
CHAPTER III
POPULATING THE REGION

3.1 Introduction
Apart from natural forces, human beings constitute the “prime movers of environmental change”.
It is logical that population issues, especially the causes and effects of population growth, have attracted much interest in the study of environmental history. Java is widely known as one of the world’s most densely populated islands. This demographic feature was the result of long-term rapid population growth from the nineteenth century. Although the growth rates and causes of the growth remain a matter of debate, there seems to have been one common agreement that the population growth in Java was almost exclusively caused by natural factors: declining mortality rate and rising/constantly high birth rate. The role of migration in the process was marginal.

The present chapter examines population growth in the Besuki residency in the 1870-1970 period. The primary reason behind this discussion is the fact that demographic change plays a crucial role in the transformation of environmental realities. It is argued that unlike the rest of Java in general, the rapid population growth in the Besuki region was due primarily to migration, rather than natural factors of mortality and natality. In elaborating the arguments, the population growth in Besuki is compared to that of Java overall. Special attention will also be paid to the processes by which the population growth led to the expansion of settlement frontiers, and altered the region’s demographic patterns.

3.2 Population Size and Population Growth
It is difficult to elaborate with any certainty on population growth in colonial Java including the residency of Besuki. Historical records containing population data are incomplete. Although Java has seen much better population data than the outer islands of Indonesia, the situation also varied from one residency to another. Another major problem is that the reliability of statistical data on population available from the nineteenth century is in doubt.

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Widjojo Nitisastro, for example, argued that population data from nineteenth-century Java were deficient because they were produced based on very rough estimates or were taken from the local officials who collected data without proper techniques, leading to under-reported results. Bram Peper underlined that the nineteenth century population data suffered under-reporting problems caused by the lack of government interest in such data, poor technical and organizational apparatus, and the lack of appreciation among the Indonesians. However, it is very likely that the pre-nineteenth century population of Besuki was low due to warfare as found in Pasuruan.

Although after 1880 the quality of population data might have improved, partly due to the adoption of a better system of population enumeration conducted every five years throughout Java, population data remained deficient. The ways in which population data were collected still caused under-reporting problems. Among the existing population data, the most reliable was the 1930 Population Census. Its superiority compared to the earlier figures was associated with factors including better preparation, collection and processing of the data. Despite the existing shortcomings, the pre-1930 population data might be useful, at least to provide an indication of the population size and population growth.

Figure 3.1 presents population size in Besuki in particular years and indicates its growth trend in the period 1870-1971. Java has become an often-quoted illustration of rapid population growth in a pre-modern economy. Corrections in population data might result in lower percentages, but careful calculations consistently demonstrated that population growth rate on Java remained higher than that of the world overall. Across Java itself, however, the population growth rate was unevenly distributed. As indicated in Figure 3.2 the average annual population growth in Besuki was much higher than that of Java overall in the period 1880-1961. Exceptions are the periods prior to 1880 and after 1961. The first exception is primarily due to the legacy of the low population growth caused by the political instability in the region.

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1Nitisastro, Population Trends.
2Peper, Pertumbuhan Penduduk, pp. 82-83.
4Boomgaard, Children of the Colonial State, p. 167.
5Nitisastro, Population Trends, pp. 58-59, 71-74; Peper, Pertumbuhan Penduduk, p. 82.
Figure 3.1 Population in Besuki Residency, 1870-1971

Figure 3.2 Annual Population Growth in the Besuki Residency and Java, 1870-1971

Note: Besuki residency ceased to exist from 1965, but the residency has been defined as the four regencies (kabupaten).

One striking feature emerging from the comparison is that from 1880 to 1930 the difference in average annual population growth was very remarkable. Except for the period 1890-1900, Besuki enjoyed an annual average population growth of more than 3 per cent, much higher than the percentage for Java overall of below 2 per cent. During the period
1900-1930, Besuki had the highest annual population growth rate of all residencies in Java, more than 3 per cent. In the regency of Banyuwangi the annual growth rate between 1920 and 1930 reached 7.5 per cent.\textsuperscript{10} Although for the 1930-1940, 1940-1950, 1950-1961 periods Besuki’s annual average population growth was lower than the previous decades, the percentage remained higher than that of Java.

Another noticeable feature of the comparison between Besuki and Java is that average annual population growth showed a rather different trend in each. In Besuki the average annual population growth from 1870 to 1930 tended to increase. In Java for the same period, it fluctuated, but with a noticeable declining trend. From a five-decade comparison, four periods of increase and only one period of decrease are observed in the case of Besuki region, whereas in Java by contrast, only two periods of increase and three periods of decrease occurred. From 1930 both Besuki and Java overall presented the same broad trend. The decades of 1930-1940 and 1940-1950 for Besuki and Java were marked by a continual decline in annual average population growth rate. They were followed by a period of increase, 1950-1961, and a period of decrease, 1961-1971.

From 1930 Besuki experienced a remarkable decrease in annual population growth rate. Nevertheless, it remained higher than that of Java as a whole. One main reason for the decreasing annual population growth was the 1930s economic depression that hit hard the region’s commercial agriculture sector. The collapse of the plantation economy reduced employment opportunities and consequently, the inflow of migrant workers decreased drastically.\textsuperscript{11} Although some of the migrant workers might have been absorbed in farm agriculture, as indicated by the rapid expansion of the region’s food crop production,\textsuperscript{12} economic hardship forced the Indonesians of the region to adopt birth control. This is indicated by the fact that in the 1930s the number of births in Besuki dropped substantially, possibly to the lowest rate since the 1880s. The decrease in population growth was partly also due to the outflow of European estate workers to Europe.\textsuperscript{13}


\textsuperscript{11}ANRI, “Memorie van Overgave van den Resident van Besoeki, Ch. A. van Romondt over de periode 30 Januari 1935-26 Februari 1938”, p. 59; ANRI, “Memorie van Overgave van den Resident van Besoeki, 1931-1934”, p. 33.


The annual population growth in Besuki continued to decline in the 1940s and so did that of Java in general. For the first time after more than a century, the region of Besuki experienced an annual average population growth rate of below 1.90 per cent. Van der Eng has even estimated a population growth rate of -0.60 per cent in 1944/1945. In Java the decrease was generally linked to the dire consequences of the Japanese occupation and the revolution war, such as declining standards of living, increasing mortality, population displacements, and marriage postponements. It is likely that all these things might have been factors as significant in causing low population growth in Besuki as they were in Java overall. There is some evidence showing the scarcity of food and textiles, deteriorating prosperity, and steep increases in deaths in the Besuki region especially during the Japanese occupation years. The gloomy conditions remained unchanged until the late 1940s.

In the 1950s the annual average population both in Besuki and Java increased substantially. The improved political stability following the Dutch recognition of Indonesian independence brought the major abnormalities of the previous decade to an end. Basic commodities including food and textiles were in better supply, supported by improvement in health conditions bringing an increase in births and significant decline in deaths. Moreover, refugees and displaced people went back to their homes and resumed normal lives. Initially, they took refuge to other places, together with the Indonesian armies abandoning Besuki as the consequence of the Renville Agreement of 1948, which resulted in the recognition of Besuki and several other parts of Java as Dutch territory. With the end of Dutch colonialism they returned and in general, in the 1950s the people’s living conditions in Besuki improved. The higher annual average population growth in Besuki in

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16 As food grew scarce, the Japanese in Besuki encouraged the inhabitants to reduce rice consumption and substituted rice with non-rice foodstuff, including items that had never been consumed before like grasshoppers, used tea leaves, mango and rambutan kernels. “Pangan ing Mangsa Perang”, Warta Besuki Shuu, 21 February 2605 [1945]; The scarcity of textiles led to the campaigns urging the more efficient use of the available clothing materials and the use of clothes made from gunny sacks, rubber sheets, gedebok (banana tree), and others. See, “Pendjelasan Poetoesan Tyuo Sangi in”, Soeara Asia, 30 November 2603 [1945]; “Bahan Pakaian Pendapatan Baroe”, Soeara Asia 31 July 31 2604 [1944]; “Pakejan dari Ghadebbhoeg”, Warta Besoki-Shuu, 29 November 2604 [1944]; The number of deaths grew from 36,000 in 1939 to 47,000 in 1944, computed from Aiko Kurasawa-Inomata, “Rice Shortage and Transportation”, in Peter Post and E. Touwen-Bouwsma (eds), Japan, Indonesia and the War: Myths and Realities (Leiden: KITLV Press, 1997), p. 126.
the 1950s was due to inflows of migrants to the region seeking employment opportunities, especially after the plantation enterprises resumed their operations. In contrast to the 1950s, in the 1960s the population growth of Besuki decreased substantially. The region’s population growth rate was much lower than that of Java, which overall experienced a slight decline. The economic hardship in the 1960s forced many inhabitants to migrate, but they shifted their destination from the plantations to urban areas. Most of them looked for their fortunes in Surabaya, which became the most important rural-urban migration destination in East Java province, especially for poor villagers seeking a livelihood. Others even migrated outside Java. A significant number of the spontaneous migrants in West Kalimantan were reported to have come from the Jember and Bondowoso regencies in the mid-1960s. Another major reason was the horizontal clash between the communist members on one side and the Islamists and nationalists on the other side. In the Wuluhan district of Jember alone, for example, hundreds of people were said to have been killed in such a clash. A great number of deaths resulted from similar clashes in parts of Banyuwangi, such as the Karangasem and Cemethuk incidents and various communist revenge killings.

3.3 Components of Growth

The previous section showed that there is a significant difference in the population growth rate between Besuki and Java. In numerical terms, population growth is the consequence of deaths, births, and net migration. An acceleration of population growth can be the result of increasing birth rates, decreasing death rates, and/or an increase in net inward migration.

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22In Tanggu Kulon village of Banyuwangi, four people were said to have been killed in the conflict between the two groups. “Peristiwa Tanggu Kulon, Banyuwangi: Kesaksian Abdul Gafur”, in Tim Cidesindo, Mengguntung Lipatan Sejarah (Jakarta: Pustaka Cidesindo, 1999), p. 83; In the Karangasem ambush, thousands of people were claimed to have been killed, whereas 63 people were said to have been killed in the Cemethuk incident. “Peristiwa Cemethuk Banyuwangi: Kesaksian Maedori”, in Tim Cidesindo, Mengguntung Lipatan Sejarah, p. 113. There was probably an exaggeration of the number of deaths in this testimony, but it is sure that the violent clashes in the mid-1960s caused an abnormal death rate in the region. Another report mentioned 24 bodies found in three burial wells in Cemethuk, but no mention of the number of deaths in the Karangasem ambush. Centre for Village Studies, “Rural Violence in Klaten and Banyuwangi”, in Robert Cribb (ed.), The Indonesian Killings 1965-1966: Studies from Java and Bali (Clayton: Monash Papers on Southeast Asia No. 21, Centre of Southeast Asian Studies Monash University, 1990), pp. 154-157.
However, it is difficult to establish the relative importance of each factor for Besuki and Java in the absence of conclusive statistical data. Prior to 1880, for example, not all residencies of Java provided statistical data on death and birth rates, so data on the number of births and deaths remained incomplete. This shortcoming makes it difficult to compare trends in the role of each factor contributing to the population growth between Besuki and Java overall, but it is very probable that the relative importance of each factor changed over time. The scant data available have been used to compile Table 3.1.

Table 3.1 Crude Birth and Mortality Rates in Besuki and Java, 1880-1939 (per 1000)

<table>
<thead>
<tr>
<th>Period</th>
<th>Besuki residency</th>
<th>Java total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth rate</td>
<td>Death rate</td>
<td>Net</td>
</tr>
<tr>
<td>1880-1884</td>
<td>27.0</td>
<td>15.4</td>
</tr>
<tr>
<td>1885-1889</td>
<td>25.0</td>
<td>13.8</td>
</tr>
<tr>
<td>1890-1894</td>
<td>23.0</td>
<td>13.5</td>
</tr>
<tr>
<td>1915-1919</td>
<td>n.a.</td>
<td>21.2</td>
</tr>
<tr>
<td>1920-1924</td>
<td>n.a.</td>
<td>13.4</td>
</tr>
<tr>
<td>1925-1929</td>
<td>n.a.</td>
<td>10.4</td>
</tr>
<tr>
<td>1930-1934</td>
<td>n.a.</td>
<td>11.4</td>
</tr>
<tr>
<td>1935-1939</td>
<td>17.3</td>
<td>13.5</td>
</tr>
</tbody>
</table>


3.3.1 Mortality

Table 3.1 shows that between 1880 and 1940 Java enjoyed a declining mortality rate overall. A calculation for the period 1820-1880 by Peter Boomgaard suggested a similar result.23 A declining mortality rate was also reflected in the case of Besuki. The exception for both Besuki and Java were periods of major epidemics, 1880-1884 and 1915-1919. The first abnormal period of high death rates was caused by the fever epidemic which hit West Java particularly, whereas the second period of high death rates was due to the influenza pandemic which hit Central and East Java in 1918.24 This confirms the general observation that in a low income society fluctuations in death rate are largely caused by epidemics.25

There are different views on mortality and its links to the population growth in Java. Some observers argued that the establishment of political stability, the so-called Pax

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Neerlandica, created the necessary condition for population growth, by removing Malthus' preventive checks, famine and insecurity.\textsuperscript{26} Besides the creation of political stability, several observers linked the increase in population growth to the colonial measures taken to reduce mortality including the western medical system and famine provisions.\textsuperscript{27} Other observers, however, doubted the efficacy of the colonial interventions in the medical field in bringing the number of deaths down. Even in nineteenth-century Batavia where the presence of the Europeans was strong, Abeyasekere maintained that the impact of such measures was small.\textsuperscript{28} Similarly, Nitisastro stated that in the nineteenth century there was no significant improvement in the conditions of health among the population of Java.\textsuperscript{29}

As generally in Java, the absence of warfare following the establishment of the Dutch colonial rule in Besuki certainly provided a positive environment for population growth. In contrast to the earlier periods when the region was frequently struck by a series of wars and consequently, had low population growth rates, the higher population growth in Besuki from 1870 certainly took place in a politically stable period. The absence of warfare reduced the occurrence of famines as the consequence of crop failure stemming from the acts of war. It is worthy of note that destruction of food crops was frequently used as a war tactic in Besuki and also elsewhere in Southeast Asia.\textsuperscript{30} Famine, together with endemic and epidemic diseases, constituted key factors explaining abnormal death rates.\textsuperscript{31} The colonial authority in Besuki was indeed aware of the fact that the region of Besuki had chronic problems of health and attempt was made to address the issues (discussed further in

\textsuperscript{28}Susan Abeyasekere, "Death and Disease in Nineteenth Century Batavia", in Owen (ed.), *Death and Disease*, p. 197.
\textsuperscript{29}Nitisastro, *Population Trends*, p. 42.
\textsuperscript{31}Timmer, *Child Mortality*, p. 88.
Chapter VII). The often-quoted measures were the introduction of vaccinations, western medicines and health facilities, and medical officials.32

There is, however, no evidence that the colonial medical system in Besuki was more successful in reducing mortality than in other parts of Java, but rather remained average. It was frequently reported that the conditions of health in the region remained unsatisfactory, both in colonial and post-colonial times.33 As elsewhere in Java,34 the promotion of the colonial medical system in Besuki encountered problems. In Bondowoso the Indonesian inhabitants were reported to have little faith in colonial medicines and health practices. In Panarukan the Indonesians went to hospital for medical treatment only with coercion. A report from Jember revealed that both common people and village heads had an aversion to western health practices, whereas among the Indonesians of Banyuwangi, hospital was seen as more or less identical with prison.35 Not surprisingly, in 1929 Resident A.H. Neys reported that one of Bondowoso’s public hospitals located in Besuki was abolished due to a lack of patients.36 Even the ratio of the inoculated people to the total population in Besuki was lower than the average. In 1950 the proportion of the inoculated people in Besuki was 26 per cent, lower than East Java overall, which reached 32 per cent.37

The main factor affecting the lower death rate in Besuki is more likely to be the better material standards of living. Besuki has been the often-quoted example of a region enjoying improvements in welfare resulting from the Cultivation System.38 Later, an 1893 report described the Indonesians of Besuki as the richest and most prosperous in the entire

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34 For example in Purworejo and Pasuruan. Colin Brown, “The Influenza pandemic of 1918 in Indonesia”, in Owen (ed.), *Death and Disease*, pp. 244-245.


37 The percentages of the inoculated people in the residencies of East Java were: Surabaya (40.8 per cent), Malang (28.1 per cent), Kediri (30.1 per cent), Madiun (33.9 per cent), Bojonegoro (42.2 per cent), and Madura (30.7 per cent). Kementerian Penerangan, *Republik Indonesia*, pp. 595-597.

island of Java. \(^{39}\) Welfare improvements were also enjoyed during the subsequent periods, according to two reliable indicators. First, meat consumption in Besuki was much higher that that of Java as a whole. Based on the official figures, in 1915 there were more than 58,000 cattle and buffalos slaughtered in Besuki, constituting 17 per cent of the total livestock. This was the highest among the residencies of Java. \(^{40}\) By 1948 the number of slaughtered cattle and buffalos in Besuki was 66,600 and 33,100 head respectively, constituting 13 per cent and 8 per cent of the total livestock. In Madura where meat consumption was considered among the highest, the slaughtered cattle and buffaloes were respectively 36,700 and 250, or around 9 per cent and 2 per cent of the total livestock. \(^{41}\)

Second, the better material standard of living is also evident in that the per capita rice production of Besuki was always much higher than that of Java overall. In 1900, for example, the per capita rice production of Besuki was 250 kilograms, exceeding Java’s 165 kilograms. By 1930 the figures for Besuki and Java were 244 kilograms and 175 kilograms respectively. \(^{42}\) During 1950-1954 the average per capita rice production in Besuki was ranked the highest among all residencies in Java. It was 215 kilograms, far exceeding the figure for Java of 143 kilograms. \(^{43}\) The higher per capita rice production not only made food supply in the region more secure, but also provided a sufficient surplus of rice for trade to earn the cash required for other purchases. Besides the better standard of living, another possible reason for the lower death rate was partly linked to the remarkable proportion of migrants in Besuki’s population. It implied that demographically the region’s population was largely made up by a young adult group, which normally had the lowest mortality rate compared with children and older groups of the population. It also meant that the region might have had a smaller proportion of infant and child deaths than Java overall, an exception to the general high infant mortality commonly found in many places. \(^{44}\)

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\(^{39}\) "De Oeconomische Toestand van de Gewesten die door den Geprojecteerden Spoorweg Probolinggo-Pasirian Worden Dooronsneden", De Indische Gids, 15, 1 (1893), p. 1078.

\(^{40}\) Jaarboek van het Departement van Landbouw, Nijverheid, en Handel in Nederlandsch Indië 1915 (Weltevreden: Landsdrukkerij, 1924), pp. 273-274.


\(^{42}\) Computed from P. Boomgaard and J.L. van Zanden, Changing Economy in Indonesia, Vol. 10: Food Crops and Arable Lands, Java 1815-1942 (Amsterdam: Royal Tropical Institute, 1990), pp. 118, 121.


In general, the case of Besuki offers support for the suggestion, for example by Breman, Gardiner and Mayling, that socio-economic factors were the key explanation for the declining mortality of Java, rather than improvements in the medical and public health conditions. Although the mortality rates between Besuki and Java overall differed, it appears that the existing gaps during the normal years were not too striking. In such conditions, however, the more rapid population growth of the Besuki region stemming from natural factors would still be probable, only if the average birth rate (natality) were much higher than that of Java overall.

3.3.2 Natality

The term “natality” refers to the number of births per thousand inhabitants (crude birth rate). The birth rate could also be expressed more specifically in another term “fertility”, referring to the average number of births per thousand females. It is difficult to get a clear understanding of the region’s crude birth rate due to the scanty information and the poor quality of the data on births stemming from the inadequate birth registry. Improvement in the birth registry was only gradually made from the 1930s, but it was not implemented in the Besuki residency before 1956. Despite the limited information these data can offer, they might provide indications of the past reality.

There is a growing view among scholars recognizing the role of rising fertility in affecting rapid population growth in colonial Java. This view could be seen as a reaction to the earlier arguments emphasizing the role of the decreasing mortality rate. Boomgaard maintained that instead of declining mortality, the rising fertility played a more important role in explaining the rapid growth rate of the nineteenth century Java population. Similarly, Norman Owen underlined the significance of rising fertility in the context of the rapid population growth in colonial Southeast Asia. R.E. Elson also recognized the importance of the rising fertility, although in his view based on the Cultivation System

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45 Breman, Djawa, pp. 43-47, 52; Gardiner and Mayling, “Morbidity and Mortality”, p. 87.
46 R. Soedarjono, Pendaftaran Penduduk, Kelahiran dan Kematian di Indonesia (Djakarta: Kementerian Kesehatan R.I., 1957), pp. 6-7, and Appendix 2. Improvement was made by issuing a birth register consisting of three copies for each birth, written by and or on behalf of the village head.
48 Norman G. Owen, “Toward a History of Health in Southeast Asia”, in Owen (ed.), Death and Disease, p. 11.
period (1830-1870), the declining mortality still made a much bigger contribution to the sustained population growth of Java.\(^49\)

In terms of birth rates, as can be seen in Table 3.1, Besuki had a lower birth rate than Java in general, especially in the late 1930s. This trend seems contradictory to the earlier argument underlining the better material standard of living among the inhabitants of Besuki. It has been argued that the improved prosperity explained higher birth rates and earlier marriages, leading to a longer reproductive period for woman to have children.\(^50\) A plausible explanation of the lower birth rate in Besuki might be related to the status of Besuki as the main destination for seasonal and permanent migration by males. One of the consequences of this was that Besuki might have had a lower number of women compared to the number for Java in general. The feature is indicated by the sex ratio (number of males per 100 females) of the population, as presented in Figure 3.3. As can be seen, the sex ratio of the Besuki population was generally higher for males than that of Java, with the most notable gaps occurring in the 1905-1930 period. Even between 1920 and 1930 Besuki proportionally had a larger male than female population, a feature that had never occurred in the population of Java in general.

![Figure 3.3 Sex Ratio of the Besuki and Java Population, 1880-1971](image)

Note: Sex ratio is defined as number of males per 100 females

\(^{49}\)Elson, *Village Java*, p. 291.

\(^{50}\)Dick, Houben, Lindblad, and Thee, *The Emergence of A National Economy*, p. 62.
The explanation for the higher sex ratio in Besuki compared with Java is the male-dominated inflow of migration. Figure 3.4 indicates that the number of male migrants was bigger than that of female migrants. This was most likely related to the fact that some of the migrants were unmarried. More importantly, it was common that migrants coming to the region of Besuki, especially from Sumenep and Pamekasan in Madura, were married people who migrated temporarily during the off-season when there were no activities on their farms. During this time they looked for temporary employment as plantation workers in Besuki and presumably did not add to the birth rate at their destination.\(^{51}\)

Another striking feature of Besuki’s birth rate, as demonstrated in Table 3.1, was a declining trend. H. Gooszen argued that the declining trend in the birth rate in Java in the last two decades of the nineteenth century was mainly due to the declining prosperity among the indigenous population which caused marriage postponements and young migrations.\(^{52}\) Such an argument, however, still has its own problems for Besuki. First, declining prosperity must also have brought an increase in death rates. Incomplete data

\[^{51}\text{Onderzoek naar de Mindere Welvaart der Inlandsche Bevolking op Java en Madoera, Vol. 9c: Overzicht van de Uitkomsten der Gewestelijke Onderzoekingen naar de Economie van de Desa en daaruit gemaakte gevolgtrekkingen (Batavia: Kolff, 1911), Bijlage 2, p. 21; ANRI, Memori Serah Jabatan, p. cxxi.}\]

\[^{52}\text{H. Gooszen, A Demographic History of the Indonesian Archipelago, 1880-1942 (Singapore: ISEAS, 2000), pp. 132-133.}\]
make it impossible to arrive at firm conclusions for Java. However, an estimate by Gardiner and Mayling suggested that mortality in the late nineteenth century fluctuated considerably, mainly due to epidemics. However, the case of Besuki indicated a declining trend in mortality, which makes it difficult to justify the soundness of the declining prosperity argument. Contrary to Gooszen’s argument, Maddison even suggested that the material standard of living including among the Indonesians of Java actually improved, rather than declined.

The more plausible explanation for the declining birth rate in Besuki especially in the two last decade of the nineteenth century is likely due to the lower fecundity, the natural ability of adult females to reproduce children. Fecundity is affected by various factors such as age, nutrition, illness, and the nature of work. Although the better material standard of living in Besuki supported a higher fecundity, more factors were counter productive. First, women’s involvement in physical work, especially in the agriculture sector, was high. Secondly, fecundity in the region was diminished by venereal diseases causing earlier infertility and impotency. As an estate area with male-dominated migrants, Besuki is also likely to have suffered significantly from venereal diseases. Thirdly, fecundity was also lowered due to Besuki’s environment, which was prone to malaria. It is very likely that the last two phenomena might have been as significant a factor causing lower fecundity in Besuki as it was in the estate areas of Sumatera and newly developed migrant sites.

With its lower birth rate, it is unlikely that Besuki would have reached a much higher rate of population growth than Java. Even though Besuki had a lower death rate, there may not have been a big difference in the net natural rate of growth between Besuki and Java. In fact, during normal years when there were no major epidemics, the net natural growth of Java exceeded that of Besuki. Given this consideration, it is obvious that the rate of natural growth cannot explain the higher rate of population growth in Besuki. The main explanation must therefore be the inflow of migrants from other places.

55Gooszen, A Demographic History, p. 148.
56Female participation in industrial labour in Besuki was also higher than that of Madura, Surakarta, Madiun, and Kediri, see Siddharth Chandra, “The Role of Female Industrial Labour in the Late Colonial Netherlands Indies”, Indonesia, 74 (2002), p. 110.
57Onderzoek naar de Mindere Welvaart, 9 (14), p. 82.
58Gooszen, A Demographic History, pp. 148-149
3.3.3 Migration

Besuki had long been known as a migration destination. The region of Besuki was one of the residencies in Java with a high migrant populace.\textsuperscript{59} There were seasonal and permanent migrants. The first category embraced people migrating to seek temporary work in other places without intending to settle. A large number of seasonal migrants from Madura sought employment for a few months by working as rice harvesters and agricultural labourers. After harvesting, and at the end of the Islamic fasting month, they went back to their homes to celebrate \textit{Lebaran}.\textsuperscript{60} The second category includes people migrating from their homes to other areas for the purpose of settling in the new place. Temporary migration often paved the way for permanent migration. Elson estimated that in the nineteenth century there were 800-900 Madurese migrants per year who never returned to Madura.\textsuperscript{61} It is very likely that this feature also prevailed in the twentieth century, probably even with an increased number. Resident A.H. Neys in 1929 still reported the continuing flow of migrants from Madura into Besuki.\textsuperscript{62}

Until the end of the nineteenth century, most migrants originated from Madura. This trend can be elaborated on the basis of both push and pull factors. In terms of push factors, there were two important reasons encouraging migration from Madura. The first reason was the poor natural resources that could not support people in Madura because the soil was infertile, with a relatively high population density.\textsuperscript{63} The island of Madura contains many limestone deposits, which means that a very limited area of land is suitable for agriculture.\textsuperscript{64} The second reason was related to excessive military conscription and labour services demanded by the Madurese rulers in the nineteenth and twentieth centuries.\textsuperscript{65} Migration was one of the ways open to Madurese people to avoid the heavy burden imposed on them. In other words, migration served as an alternative for improving material living standards and as an escape from oppressive rulers.\textsuperscript{66}

In terms of pull factors, the region of Besuki was an attractive place for Madurese groups to settle. This was due to the existing traditional ties, particularly between

\textsuperscript{59}Boomgaard, \textit{Children of the Colonial State}, p. 177.
\textsuperscript{61}Elson, \textit{Village Java}, p. 12.
\textsuperscript{62}ANRI, \textit{Memori Serah Jabatan}, p. cxxi.
Bondowoso and Sumenep, a city on the island of Madura. The close relationship was established in the eighteenth century after the regent of Bondowoso took a Madurese prince of the Sumenep royal family as his son-in-law who brought with him a number of Madurese followers to the region in 1768.\(^{67}\) In addition, there had been also a number of Madurese who had pioneered migration to the region since the early period of Majapahit.\(^{68}\) This created a historical tie between the island of Madura and the extreme comer of East Java. Over the centuries, the pioneering migrants were followed by their relatives and neighbours.\(^{69}\) Another pull factor was the development of export agriculture, both plantation and smallholder agriculture, which created new employment opportunities.\(^{70}\) The Besuki region also offered prospective immigrants wide opportunities for opening up farm fields and settlements. Even during the 1930s Besuki was still reported to have large forest reserves and uncultivated lands.\(^{71}\)

Another important factor was the development of a transport network in Besuki. Although the improvement in transport facilities was not the only factor, it is doubtful that migration would have accelerated without it. The development of the transport network not only made geographical mobility easier, it also reduced the cost of transport significantly. Both advantages encouraged more people especially the poor to explore the economic opportunities of other regions. The rapid movement of Javanese migrants from the more densely populated regions in Central and East Java to the region was greatly facilitated by the completion of a railway line connecting Jember and Banyuwangi, which opened in the early twentieth century.\(^{72}\) The influx of Javanese migrants was partly linked to the

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\(^{67}\) Arifin, *Babad Blambangan*, p. 262.


\(^{69}\) Elson, *Village Java*, p. 12.


expansion of tobacco cultivation on irrigated fields. The Javanese was seen as more experienced with the irrigated fields ecotype than workers from Madura where the dry ecotype predominated.\(^7^3\) The estate managers also found that the Javanese workers were more diligent, docile, and obedient than the Madurese ones. Therefore, labour recruitment was no longer exclusively directed to the Madurese, but to the Javanese as well (Map 3a).\(^7^4\)

Figure 3.5 indicates that until 1930 the role of migration was crucial in the process of populating Besuki. Migration was especially dominant in the Jember and Banyuwangi regencies where agricultural production on farms and plantations for local consumption and for distant markets both in Indonesia and overseas grew rapidly. The percentage of migrant population in Besuki was clearly far above the percentage for Java and Madura overall, as indicated in Figure 3.6. Compared with the other residencies of Java, the percentage of migrants in Besuki was ranked the highest, reaching more than 25 per cent of its population. In Batavia the percentage of migrants was only about 12 per cent of the population, whereas even in Priangan, which also experienced high rates of population growth, the percentage was only 3.5 per cent.\(^7^5\) In relative terms, Besuki was the most

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important destination for migrants within the island of Java during the colonial period.\textsuperscript{76} After experiencing decreases in the early 1930s, the inflow of migrants started to resume in 1934.\textsuperscript{77}

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**Figure 3.5 Migrants in the Regencies of Besuki, 1930 (x 1000)**

![Bar chart showing migrants in the regencies of Besuki, 1930 (x 1000).](image)

**Figure 3.6 Migrants as Percentage of Total Population, 1930**

![Bar chart showing migrants as percentage of total population, 1930.](image)

Note: Migrants refers to interregional migrants, defined as residents living in a regency during the time of the census, but born outside the regency.


\textsuperscript{77} ANRI, "Memorie van Overgave, 1931-1934", p. 33.
During the 1940s, however, the relative importance of migration declined due to the collapse of commercial agriculture. The region lost one of its major pull factors for migration. The subsequent political instability associated with the military struggle for independence further discouraged the inflow of migrants. The situation in the region was tense and military incidents between the Dutch troops and Indonesian militias frequently occurred. Rather than resulting in net migration stemming from the incoming troops, it is likely that the political instability in the 1940s caused more out-migrants. In the 1950s the inflow of migrants to Besuki probably increased as commercial agriculture gradually resumed its operation until the nationalization of the foreign estate enterprises in the region in the late 1950s. But the relative importance of immigration in contributing to the region’s population growth appears to have declined. Despite the declining strength, for decades the inflow of migration served as one major force that transformed Besuki.

### 3.4 Settlement Frontier Expansion

As the population grew in size, the human influence on the physical environment of the Besuki region also grew in scale. One major influence was the conversion of wilderness into settlement (Map 3b). The expansion of the settlement frontier in Besuki could be divided into three main stages. The first two stages, prior to 1870 and 1870-1900 periods, were characterized by the dominant role of the Madurese migrants and a southward migration direction. The third stage, starting from around 1900, was marked by the stronger role of the Javanese migrants and an eastward migration direction originating from the more densely populated parts of East and Central Java.

Prior to 1870 immigrants partly went to the northern districts of Besuki, but mostly to the Bondowoso regency, which constituted a large immigration area in the first half of the nineteenth century. Of particular importance in the pre-1870s development was Sukokerto district, which constituted a border district separating Madurese-dominated districts from other areas occupied mostly by indigenous Osing inhabitants. The districts of Bondowoso became a noticeable migrant frontier not only from the more densely populated northern coastal districts of the region, but also for people coming directly from the island of Madura, particularly Sumenep and Pamekasan.
frontier was reflected in a report of the colonial investigation carried out in the 1860s stating that a great number of villages in the Besuki residency were only recently established.81

Map 3b. Area of Settlement Frontier Expansion in Besuki Before and After 1870 (Tennekes, 1963: 341)

From the 1870s a noticeable change took place. The northern part of Jember especially Kalisat and Jember districts took over the role as migrant frontier, which was previously played by Bondowoso, especially the Sukokerto district. However, one feature remained unchanged. The inflows of migrants largely came from the Madurese ethnic group.82 In 1845 about 30 per cent of the Sukokerto population was Osing, but in 1903, the whole Sukokerto constituted an almost exclusively Madurese population district.83 A similar case was illustrated by Jumpong village of the Wonosari district where the remnants of Osing people were absorbed by the increasingly dominant ethnic group.84 But many

84Onderzoek naar de Mindere Welvaart, 9 (14), p. 5.
Osing inhabitants responded to the influx of Madurese in the late eighteenth and nineteenth centuries by abandoning their villages and developing new settlements into the forest.\textsuperscript{85}

The continuing inflows of migrants took the southward expansion of the settlement frontier to the inland parts of Besuki. There were a number of Madurese migrant figures associated with the establishment of settlements in Jember.\textsuperscript{86} Consequently, not only did the inland population grow in size, but also from the last decade of the nineteenth century the population of Jember started to exceed that of Bondowoso. In 1890 the population of Jember had already reached around 181,000, whereas in Bondowoso the figure was 162,000.\textsuperscript{87} The smaller Bondowoso population, however, was partly also due to local migration to Jember. In the early 1900s Sukajati and Sumbercepok villages of the Wringin district, Bondowoso, had been known for the last three decades as the place of origin of Madurese migrants going to Jember.\textsuperscript{88}

But in southern Jember, the settlement frontier expansion primarily resulted from the eastward migration of the Javanese from East and Central Java. The flow of Javanese migrants grew stronger especially from around 1900. The Patih of Jember, Raden Astro Dikoro, in 1895 reported the coming of a group of 40 people from Kesamben (Jombang) to the Jember regency who established a settlement, called Jombang village. On June 1902, 500 immigrants from Kebumen (Kedu) were reported to have arrived at Jember.\textsuperscript{89} Later, the migrants were mainly recruited through the Besoekisch Immigratie Bureau (the Besoekis Immigration Bureau), which was established in 1910 with a primary objective to promote the Javanese migrant recruitment.\textsuperscript{90} Some migrants came as a group with certain figures

\textsuperscript{86} For example Ki Bihat and Ki Abdussalam (Cangkring village), Ki Muna (Lengkong village), Ki Biro and Ki Bongso (Wirowongso village). J.O.S. Hafid, \textit{Perlawanan Petani: Kasus Tanah Jenggawah} (Bogor; Latin, 2001), pp. 15-17. The exact years mentioned in the study referring to the date of the migrant arrivals probably raise some doubts due to the reliance largely on memories of the interviewed witnesses without corroborating with written sources, and the strong political interest that appear to have affected his account due to his role, as one of the historical players in the Jenggawah peasant resistance, to justify their claims over land rights. There are several inaccuracies in his work. For example, the Surabaya-Probolinggo-Klakah railroad was said to be opened in 1875 (p. 18), but written sources suggest that the route was officially opened in 1895. Another inaccuracy is that Birnie, Van Gennep, and Mathiesen started their tobacco business in Jember from 1859, not 1850 (p. 21). See, S. Nawiyanto, “Perkembangan Transportasi di Daerah Pinggiran Jawa”, in Edi Sedyawati and Susanto Zuhdi (eds), \textit{Arung Samudera: Persembahan Memperingati Sembilan Windu A.B. Lapian} (Depok: PPKB-Lembaga Penelitian Universitas Indonesia, 2001), pp. 181-182; S. Nawiyanto, “Perubahan Ekonomi di Jember Masa Kolonial”, \textit{Prisma}, 9 (1996), p. 75.
\textsuperscript{87} Tennekes, “De Bevolkingsspreiding”, p. 335.
\textsuperscript{88} \textit{Onderzoek naar de Mindere Welvaart}, 9 (14), p. 9.
\textsuperscript{89} \textit{Onderzoek naar de Mindere Welvaart}, 9 (14), pp. 7-10.
\textsuperscript{90} Broersma, \textit{Besuki}, p. 89.
acting as leaders. A great number of the Javanese migrants settled in Mumbulsari (Mayang district), Wirolegi (Jember district), and Rambipuji district. There were also Javanese immigrants residing in Puger and Tanggul districts.

The Javanese settlements also developed further eastward to Banyuwangi, established by workers recruited for the western estates. There were about 60 parcels of land on the mountain slopes in the western part of Banyuwangi under lease for estates by early 1890. In 1913 the estates of Banyuwangi imported around 8,600 workers. Between 1911 and 1914, the total of imported workers reached about 43,000 people. Although not all imported migrants did so, some seem to have stayed permanently. In the Banyuwangi regency, the Javanese settlements developed especially in the Genteng district (Kalibaru, Glenmore, Cluring and Brasen) and partly also in the Rogojampi district.

The expanding settlement frontier might have been one of the major considerations for changes in colonial administrative division. In order to accommodate changes and to make colonial management more effective, the Jember district was separated from the Bondowoso regency and became an afdeeling (division) in 1883, and a regency in 1928. A similar process took place at a lower administrative level. In 1896 Jember and Sukokerto districts were reorganized into four districts. Besides Jember and Sukokerto, the process resulted in two newly established districts, namely Mayang and Rambipuji. Later, Wuluhan district was formed by separating several sub-districts from the district of Puger.

For example, Mbah Karni and Mbah Dempo were the pioneers of settlement in Wuluhan. Mulkan, Islam Murni, p. 175; Mbah Joyo with his group from Magelang (Central Java) came to Gumuksgawae sub-village (dusun), whereas another group of Javanese led by Mbah Suryo from Kendal (Central Java) settled in Curahkendal sub-village, whereas Mbah Budo and his group from Ponorogo (East Java) came to Curahbundu sub-village. Hafid, Perlawanan Petani, p. 18.


Gooszen, A Demographic History, p. 59. Three sub-districts recorded the place of origins and birth of the immigrant carefully. In the first half 1906, 10 of the 787 migrants constituted a step-migration: 1 was born in Kediri and came to Banyuwangi via Surabaya, 9 were born in Kedu, moved to Kediri, later to Banyuwangi.


Gooszen, A Demographic History, p. 64.


Onderzoek naar de Mindere Welvaart, 9 (14), p. 6.
Kalisat district was formed by abolishing the district of Sumberwaru and ceding several
villages to the district of Jember. Furthermore, Besuki district was formed by merging the
districts of Besuki and Mlandingan and ceding a number of villages to the district of
Bondowoso. In the Banyuwangi regency, Cluring district was established in 1932; initially
it was part of the Genteng district.98

At village level, administrative change was more striking. Between 1890 and 1920
the number of villages went up from 688 to 784.99 In this period around 100 hundred new
villages were established. Broersma noted in 1912 that in Jember alone the number of
villages tripled in less than three decades.100 The number of villages continued to increase
during the last two decades of the effective Dutch colonial rule.101 By 1950 the total
number declined to 715,102 probably due to the political instability during the 1940s, which
led to some villages becoming inoperative. The number of villages apparently grew again
until the early 1960s. But following the abolition of the residency and district
administrative levels in 1965, village administration was reconsidered. In the 1970s there
were 717 villages in the residency, and the highest number of villages was found in
Besuki’s most densely populated regency of Jember with 215 villages, followed by
Bondowoso with 192 villages, Banyuwangi with 175 villages, and Panarukan with 135
villages.103

3.5. Demographic Patterns

Besides settlement frontier expansion, population growth exerted significant influence on
the region’s demographic patterns. In terms of population density, in pre-1870 Besuki the
northern coastal districts were above the inland ones, but in the subsequent periods this
pattern was gradually reversed. With a figure of 172 inhabitants per square kilometre in
1890 the population density of Bondowoso exceeded that of Panarukan (97 inhabitants per
square kilometre) and it became the most densely populated regency in the region.104

100Broersma, Besoeki, p. 21.
101For example, in 1932 there were 15 new villages created in the Banyuwangi regency. ANRI, “Memorie van
Overgave, 1931-1934”, p. 27.
102Kementerian Penerangan, Republik Indonesia, pp. 132-133.
103Daftar Nama-Nama Pedukuhan Kotamadya/Kabupaten Se Wilayah Kerja Pembantu Gubernur di
104In the same year in Jember and Banyuwangi regencies the population densities were 55 and 22 inhabitants
per square kilometres respectively. Onderzoek naar de Mindere Welvaart der Inlandsche Bevolking op Java
en Madura, Vol. 9c, Part 3 (Batavia: Kolff, 1911), pp. 6-7.
During the first decades of the twentieth century, the population of inland districts continued to grow even more rapidly and consequently, some inland districts become more densely populated. The 1930 colonial census shows that Jember had a population density of 278 inhabitants per square kilometre, while in Bondowoso and Panarukan the population densities were respectively 238 and 184 inhabitants per square kilometre. This development placed Jember as the most densely populated regency in the region, taking over the position held previously by the Bondowoso regency. Banyuwangi remained at the bottom rank with a population density of 133 inhabitants per square kilometre.\(^\text{105}\)

The pattern was strengthened further during post-colonial times. As Figure 3.7 indicates, from 1930 to 1970 the population density in all regencies of Besuki grew significantly, but the highest growth took place in Jember where it doubled. The other regencies followed in the same order as the one that prevailed in late colonial times. In a broader regional context, Jember has emerged as one of the four largest towns of the East Java province, after the capital city of Surabaya, and two other towns, Malang and Kediri.\(^\text{106}\) At the sub-district level, the Kencong, Umbulsari, and Gumukmas, and Jember sub-districts of Jember had a population density of more than 1,000 inhabitants per square kilometre. Even in the Jember sub-district it reached more than 3,000 inhabitants per square kilometre, while all districts in Banyuwangi, by contrast, had a population density of less than 1000 inhabitants per square kilometre, except Cluring. In Panarukan only two sub-districts, Panji and Situbondo, had a population density of more than 1,000 inhabitants per square kilometre.\(^\text{107}\) There are no sub-district data for Bondowoso, but it is very likely that its population densities were lower than those in Jember.

\(^{105}\) *Volkstelling 1930, Vol. 3: Inheemsche Bevolking van Oost Java* (Batavia: Landsdrukkerij, 1934), Table 8, p. 141; C. Lekkerkerker, *Land en Volk van Java* (Groningen: Wolters, 1938), Table 1, pp. K-1


In terms of the ethnic distribution pattern, there was significant change too. Up to around 1870 it might be said that there were two major ethnic groups which more or less equally shared the region. The Madurese group was predominant in the districts of the Panarukan and Bondowoso regencies. The Osing people constituted the predominant ethnic group in the Banyuwangi regency and Jember district, but were also strongly present in Puger district. In other words, the northern part of the Besuki residency was occupied by Madurese and the southern part belonged to the Osing people. From 1870 onward a rather different feature grew stronger. The inflow of Madurese and Javanese migrants gradually pushed backward the Osing element of the region’s population. As Table 3.2 shows, by 1930 the Osing still constituted a major proportion of the population only in two districts of Banyuwangi. While the Madurese remained predominant in Bondowoso and Panarukan, Jember was shared more or less equally among the Madurese and the Javanese groups. A striking line of separation could possibly be drawn in Jember. The northern part of Jember including Kalisat, Mayang, and Jember districts constituted a Madurese-populated area. The southern part of the regency, including Wuluhan and Puger districts, by contrast was a Javanese populated-area. The intersection area between the two ethnic

groups was the Rambipuji and Tanggul districts. Outside the three major groups, there was proportionally no substantial change.

Table 3.2: Ethnic Distribution of Population in Besuki by District, 1930 (percentages)

<table>
<thead>
<tr>
<th>Regency</th>
<th>District</th>
<th>Javanese</th>
<th>Madurese</th>
<th>Osing</th>
<th>Other*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jember</td>
<td>Tanggul</td>
<td>34.5</td>
<td>63.1</td>
<td>-</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Puger</td>
<td>75.1</td>
<td>24.3</td>
<td>-</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Wuluhan</td>
<td>73.5</td>
<td>22.8</td>
<td>2.8</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Rambipuji</td>
<td>36.6</td>
<td>61.1</td>
<td>1.6</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Jember</td>
<td>11.4</td>
<td>80.3</td>
<td>8.1</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Mayang</td>
<td>4.7</td>
<td>93.2</td>
<td>1.7</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Kalisat</td>
<td>2.4</td>
<td>95.7</td>
<td>1.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Banyuwangi</td>
<td>Genteng</td>
<td>70.0</td>
<td>18.2</td>
<td>11.3</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Rogojampi</td>
<td>11.7</td>
<td>10.3</td>
<td>76.8</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Banyuwangi</td>
<td>14.0</td>
<td>25.1</td>
<td>48.5</td>
<td>12.4</td>
</tr>
<tr>
<td>Bondowoso</td>
<td>Tamanan</td>
<td>0.5</td>
<td>99.3</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Bondowoso</td>
<td>0.4</td>
<td>99.3</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Wonosari</td>
<td>0.6</td>
<td>99.2</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Prajekan</td>
<td>0.7</td>
<td>99.1</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td>Panarukan</td>
<td>Besuki</td>
<td>1.0</td>
<td>97.6</td>
<td>-</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Panarukan</td>
<td>1.3</td>
<td>98.3</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Situbondo</td>
<td>0.7</td>
<td>99.2</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>Sumberwaru</td>
<td>2.1</td>
<td>97.4</td>
<td>-</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Note: Other refers to the Europeans, Chinese, and other Asians, and Indonesian people not included in the first three main groups, such as Sundanese, Balinese, and Makasarese.

Source: *Volkstelling 1930, Vol. 3: Inheemse Bevolking van Oost Java* (Batavia: Landsdrukkerij, 1934), Table 1, p. 22.

With the omission of ethnic category in the postcolonial censuses, it is hard to map changes in the region’s ethnic composition. The linguistic map, however, shows that the post-colonial reality did not change much. In Panarukan and Bondowoso, Madurese continued to be the predominant group, whereas in Jember both Javanese and Madurese apparently remained more or less equally important. In Banyuwangi, around the early 1970s the Javanese were dominant in Genteng, whereas in the two other districts the Oising group occupied the major proportion of the population. But across the regency the presence of the Madurese ethnic group was also strongly observed. The three groups were culturally distinguishable. Apart from a different language, the Madurese also had unique cultural traits with strong Islamic influences. They were well-known for their strong obedience to Islamic rules. The mosque was the centre of their social life and their religious

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leaders had the highest position in society. In terms of language, there were no fundamental differences between the Javanese and Osing, except for the fact that each spoke a dialect. However, both groups had different cultural traits. Unlike the Javanese ethnic group of the region, the Osing people did not appreciate the Javanese traditional performances such as shadow puppet (wayang kulit), and traditional drama (wayang wong, and kethoprak), but rather preferred the Balinese dance and their own cultural performances.

3.6 Conclusion
This chapter has indicated the rapidly growing population size in Besuki from circa 1870. In most of the period under consideration (1870-1970), the annual population growth in the region was always higher than that of Java in general. The remarkably high growth rate was achieved especially between 1900 and 1930, which in the colonial history of Indonesia was known as the Ethical Policy era. Benefiting from the better material standards of living and possibly the migration-linked lower infant mortality, the region seems to have enjoyed lower death rates. These advantages, however, were counter-balanced by the region’s male-dominated migrants and lower sex ratio which led to the lower birth rate. Although births and decline in deaths contributed to the population growth, both natural factors were clearly too small to make a big different to the region’s rapid population growth and to generate a strikingly distinct feature from that of Java in general. Rather than natural factors, the inflow of migrants played a much bigger role in the process of populating the Besuki region. Migration was the key factor responsible for the exceptionally high rate of population growth in the region in comparison with the population growth of Java overall, which was mainly affected by the net natural growth rate.

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Parallel with the growing population size, the region’s settlement frontier expanded quite rapidly. The migrants mainly from the island of Madura and several parts of Central and East Java played a major part in the expansion process. The dominant role of the Madurese migrants was observed until around 1900 and formed a gradual process of southward expansion from the northern coastal districts to the inland parts of the region. This process transformed an extensive area stretching from Panarukan, Bondowoso and to the northern part of Jember into a predominantly Madurese area. The Madurese influences, however, were weaker in the southern part of Jember where the inflow of Javanese migrants was strong. The eastward flow of Javanese migrants became stronger especially from around 1900 and their influence penetrated further east to the western part of Banyuwangi. The effects of the two different inflows of migrants was the same on the indigenous Osing people: a gradual reduction in area of their demographic and cultural influences. On the environment, the growing population size generated larger accumulative human force as prime mover of the environmental realities of the region. One major effect here was the alteration of the natural environment into human settlements. The next chapters will show that the growing population size also facilitated the increased use of natural resources and the expansion of the cultural element in the region’s environment.
CHAPTER IV
CULTIVATING THE LAND

4.1 Introduction
This chapter discusses the creation of and eventual closure of Besuki's agricultural frontier. The argument is primarily informed by a theoretical framework coming from frontier theories. It was Frederick Jackson Turner who first developed the frontier theory in 1893 to explain the expansion of the American settlement towards the wilderness in the west. According to Turner, this process was successive in nature through the waves of migrants, first the trader and the trapper, followed by the rancher, the miner, the farmer, and finally the townsman, attracted by the abundantly available unused resources. The westward advance of one frontier opened the way for the next frontier and each wave of migrants was attracted by a different resource obtaining high values in the broader market.¹ More than a century later, Timothy Flannery used “frontier” to label a region with untapped resources and wasteful ways of resource extraction. The creation of the frontier begins with the presence of pioneering people with the capability of running the extraction of untapped resources. The frontier is closed when the movement to new areas with resources is no longer possible.² In a simpler way, frontier is used to refer to an early stage of development in nearly empty areas with abundant unused natural resources.

As a concept, frontier analysis offers its best value in establishing an explanation of how long-term and continent-wide historical processes interact with strong waves of migration and diverse natural resources. For a regional study, the values of frontier analysis are more limited for two major reasons. First, the frontier dynamics would most likely not easily be shown, given the less diverse natural resource potential the region might have and the narrow space for frontier expansion. Second, a lack of detailed historical information would limit analysis. Emphasizing geographical expansion, one major weakness of the frontier concept is the failure to recognise internal frontier dynamics stemming especially from technological advances, a lasting frontier.³ Moreover, the succession between one frontier to another is not always clear cut. In the context of agriculture, besides the

expansion of cultivated lands, at the same time there was also a spectrum of intensity with which the land resource was utilised. Nonetheless, some frontier characteristics, such as vast “nearly empty” areas, the potential of natural resources, waves of migration, and broader market demands remain relevant to the case of Besuki. The present chapter, however, does not strictly follow specific frontier theories.

This chapter argues that, besides the influence of migrants and commercial opportunities, the expansion of Besuki’s agricultural frontier also went hand in hand with technological development. The increasingly diversified crops and improved technologies equipped both Indonesian farmers and western planters in their advances towards new agricultural lands and their adaptation to the changing agricultural environment. Around the 1950s Besuki became more or less similar to the rest of Java, in the sense that there was virtually no longer space for an expansion of the agricultural frontier. Although the possibilities for expansion were not completely closed, the cost of expansion was considered too expensive in socio-economic and environmental terms. The next section deals with the agricultural environment of Besuki, followed by a discussion of the expansion and closure of the region’s agricultural frontiers. The subsequent sections elaborate smallholder agriculture and plantation agriculture using a crop production approach, and the role of agricultural technologies in the development of Besuki’s agricultural frontiers.

4.2 The Agricultural Environment

The residency of Besuki has a variety of soils (Map 4a). Three major alluvial soils are found in the Wuluhan and Puger districts of Jember, Genteng district of Banyuwangi, and the Besuki and Situbondo districts of Panarukan. Regosol or volcanic ash soils cover the Raung complex from north of Wonosari (Bondowoso) to west of Genteng (Banyuwangi) and part of the Baluran, while latosol soils make up a half-ring forming the slopes of the Ijen mountain from the northern, eastern and the southeastern parts. A mix of latosol and andosol soils comprises the slopes of the Hyang complex stretching from its northeastern and eastern, to southern parts. Regosol and latosol or lateritic soils make up Rambipuji, Jember, Mayang, and Kalisat districts (Jember), Genteng and Banyuwangi districts (Banyuwangi). A mix of regosol and litosol is found in Asembagus, whereas a mix of red-yellow mediterranean and litosol is found in Betiri, Ringgit-Beser, and the north Hyang
complex. A mix of red-yellow mediterranean or limestone soils and grumosol occurs in Blambangan and Nusa Barung.4

Map 4a. Soils of Besuki Residency (Soepraptohardjo, Sahertian, and Dudal, 1960)

The soils in the region are generally fertile, with a few exceptions. As mentioned in Chapter II, the major fertilizing forces are volcanic activities and rivers (Map 4b). Despite the immediate damage unleashed during eruptions, these events were vital to the rejuvenation of soils.5 The ashes of Raung had rich mineral content such as phosphate and potassium and E.C. Jul. Mohr ranked it among the richest of its kind in Java.6 Blown by the winds, in the east monsoon the ashes of Raung affect its south slopes and the plain of

Jember.⁷ Rivers and streams transport volcanic materials containing valuable minerals for crops.⁸ V.K.R. Ehrencron found in 1941 that in Kalibaru river, each litre of water contained 7.2 milligrams of potassium, 19.2 milligrams of calcium, 9.6 milligrams of magnesium, and 0.47 milligrams of phosphorus.⁹ J.W. van Dijk’s observation suggested in 1948 that in Central and East Java, in a five-month west monsoon, irrigation could enrich soils with an average of 16-51 kg potassium per hectare.¹⁰

Climate also exerts a remarkable influence on the region’s agriculture. Solar radiation and temperature in eastern Java, including Besuki, are generally higher than in

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⁸Mohr and Van Baren, Tropical Soils, pp. 332-342.
western Java. The two factors offer advantages in terms of photosynthesis for the growth of agricultural crops. But there are challenges arising from the region’s drier climate and lower rainfall. Unlike in the other parts of Java, especially the pasisir area where flood control became a major problem, in Besuki the problem restricting agricultural operations was limited supplies of water. Here agricultural crops would most likely suffer from water shortage, rather than from other factors.

Both irrigated land cultivation (sawah) and dry land cultivation (tegalan) were present in Besuki around 1870. The existence of irrigated fields in the region was an old phenomenon, dating back to the eastward expansion from Central Java during the tenth century. In general, irrigated lands referred to areas surrounded by low dikes to trap water for muddied crops planting. On irrigated fields different crops could be grown throughout the year. Rice was the most important food crop. Rice planting started at different times among localities, broadly between October and December. Harvest time normally ran from March to June (Figure 4.1). During the dry season, secondary food crops (palawija) were also grown on irrigated lands. Dry fields, by contrast, were characterised by the absence of irrigation and were closely linked to crops that demand less water, including maize, cassava, legumes, and later also tobacco. All these crops (except legumes) were introduced from the Americas during or after the sixteenth century. Among the crops around the early decades of the nineteenth century maize was the most prominent.

In the dry field system, rainfall exerts a dominant influence on agricultural rotation. A survey of the dry field system in the Madurese district of Panarukan found a yearly pattern of planting and fallow periods, which might have represented general practice in the region. The length of both planting and fallow periods varied from one year to another, depending on the length of the rainy season. At times when there was sufficient rainfall, dry

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14Mohr, De Grond van Java, p. 67.
fields might be used for growing maize more than once, but short rainy seasons might allow only one planting a year. The use of dry fields usually started in December and ended at different times in different places, roughly from June (Figure 4.1). Outside the planting period, dry fields were left fallow, ranging from three to six months.18

Figure 4.1 Sunshine, Rainfall and Cropping Seasons in Besuki

![Sunshine, Rainfall and Cropping Seasons in Besuki](image)


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Besides irrigated and dry land cultivation, swidden cultivation was also practised. Compared with the first two agricultural systems, however, information on swidden agriculture in the region is scarce. The practice was linked to farmers who cultivated agricultural crops, mostly dry rice and other food crops, by clearing forest and scrub lands, often with the use of fire. The fields were brought under cultivation until yields were regarded as minimum, after which they were left fallow to allow natural vegetation to rejuvenate their fertility. Several years later, the plots were brought back into cultivation. Considering the rotational patterns of cropping and fallowing periods, swidden agriculture could only develop when forest land was still abundantly available. Swidden agriculture appears to have been rather similar to dry land cultivation, with the only striking difference being that the fallow period for dry fields was much shorter. As time went by, farmers were forced to use their lands more intensively by reducing the fallow period, and a shift from swidden to tegalan agricultural practice took place. The passing of swidden agriculture represented a frontier development, in a sense that the early, simple stage of agriculture gradually developed into a sedentary and more mature stage of agricultural systems.

In ecological terms, the three agricultural systems had consequences for the environment. One common consequence was that to a certain degree all of them altered the natural environment to a human-made landscape. But each had a different influence, too. Irrigated land cultivation was generally less vulnerable to erosion than dry fields due primarily to the construction of dikes. Irrigated lands also experienced fertility renewals from irrigation carrying soil minerals, while dry land cultivation relied mainly on the fallow periods to recover its fertility. With a longer fallow period, swidden agriculture offered bigger chances for the natural rejuvenation of soil fertility and was less vulnerable to erosion than dry land agriculture. The promulgation of the 1870 Agrarian Law, however, restricted swidden agriculture because such a practice would be undertaken on areas in Java that fell under a category of unoccupied lands (woeste gronden) owned by the state. The

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major beneficiaries of this regulation were the western planters who obtained opportunities to develop estates on lands obtained from the colonial government on long term leases. In the following sections, the process through which extensive parts of the region’s environment were significantly altered by agricultural activities is discussed.

4.3 The Expansion of the Agricultural Frontier

As Besuki was sparsely populated, until 1870 there were extensive uncultivated lands. In many parts of Java, however, the growing population already reached a point where land had become scarce. Many poor inhabitants found limited opportunities to maintain their livelihood. Traditionally, the growing population was absorbed in the agricultural sector by expanding cultivated lands, which represents a simple frontier expansion. Such a response was preferable to intensification, because it involved simple techniques and offered real solutions in terms of crop outputs. But in many parts of East and Central Java, the agricultural frontier had been fully developed. Although there still was space on hills that could be cultivated, the need for erosion control and mountain road construction made it high-cost land. The cost of making the reserve of lands productive was too high relative to the relocation to other parts of Java to meet the need for farm land.

The region of Besuki was among the few regions of Java in the nineteenth century, including also Priangan and Pasuruan, that provided opportunities to expand agricultural land. This opportunity was not only because of the fact that the region was sparsely populated, but also because it held sufficient unexploited fertile soils available for agriculture. Moreover, in the mental map of the Javanese and Madurese, the region of Besuki was not a new territory. For the Javanese, the region had been identified as part of their territorial and socio-political expansion. Meanwhile, in the mental map of the Madurese, Besuki was popularly identified as the closest area for migration which offered opportunities for improving migrants’ material conditions of living. This expectation could hardly be met in Madura, with its predominant dry and infertile limestone soils.

The development of Besuki’s agricultural frontier had taken place earlier, but from around 1870 it entered a distinctive phase. That year marked the beginning of a new era

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26Chapter II.

called the liberal colonial policy, which opened wide opportunities for private entrepreneurs to lease land for establishing agricultural estates following the promulgation of the 1870 Agrarian Law. The closing of the agricultural frontier elsewhere in Java meant that certain types of plantation agriculture were more or less impossible to introduce without great social destruction. In addition, the cost of short-term leases of farm-land was high relative to the exploitation of unused areas under long-term leases. Facing such challenges, the expansion of plantation agriculture was directed to nearly “empty” areas in Java and in the outer islands of Indonesia. The existence of nearly “empty” space in Besuki meant that plantations could be established on the region’s land which, if it were in Central Java, would already be full of irrigated land.

![Figure 4.2 Cultivated Land in Besuki 1870-1971](image)

Note: Total cultivated land excludes the European-owned estates.

Figure 4.2 demonstrates the expanding agricultural frontier of Besuki between 1870 and 1971. We can distinguish four major stages of the region’s cultivated land expansion: 1870-1910, 1910-1940, 1940-1950, and 1950-1971. In the period 1870-1910, cultivated land in Besuki grew by 80,000 hectares. One major expansion took place in Jember. An 1893 report mentioned that in the plain of Jember stretching from the foot of the Hyang volcano to the Indian Ocean, more and more agricultural fields were established from one

year to another. Similar expansion took place in Kalibaru and Celuring in Banyuwangi regency where Van Gent in 1911 reported the widespread conversion of forest lands into agricultural fields.

The period 1910-1940 saw a more rapid expansion. One reason for the rapid expansion was the revision of the system used to estimate farm land for tax purposes, which brought more upland areas into the statistics. But the increase also stemmed from the opening up of the forest land for agricultural fields. Such activities took place along the northern slopes of the Kendeng hills (Panarukan), but more land was brought under cultivation in Jember and Banyuwangi. Between 1910 and 1920 there were 180,000 hectares of newly cultivated land. From 1920 to 1930 the scale of expansion declined, but still in this decade more than 50,000 hectares of new cultivated lands were added. Kalibaru was the area where a major expansion occurred, partly also around Grajagan. The 1930s expansion resulted in 18,000 hectares of new agricultural fields. Around 2,500 hectares was established in Bajulmati and Sanggaran, Banyuwangi by the Surabaya-based Federation of Labour Unions to resettle unemployed workers from urban Surabaya. The last notable expansion was in the 1940s, more or less in the same areas of Banyuwangi and Jember where the process had been previously started.

The improvement in transport facilities, especially the railway network, played an instrumental role in facilitating the expansion. Before the railway network was established, agricultural fields developed primarily along old road network linking Besuki and Panarukan in north coast to Puger, via Bondowoso, Jember and Rambipuji. The

32Palte, *Upland Farming*, p. 44.
34"Boekka’an Anjor neng e Reg. Panaroekean", *Sinar Tani*, 4, 8(1930), p. 11; *In den Zuidoost-hoek van Besoeki* (S.n; s.l.), p. 23.
36In Banyuwangi regency, 300 hectares of agricultural lands were established in Kalibaru and Giri sub-districts. "Penduduk Sugihwaras Keluar Djawa", *Trompet Masjarakat*, 24 May 1953, p. 2; "Banjuwangi: Penjeleseian Tanah Pringgodani", *Trompet Masjarakat*, 4 August 1958, p. 4; some villagers created farm lands in Bangorejo (Cluring). "Bersedia Memimpi Transmigrasi", *Trompet Masjarakat*, 1 November 1951, p. 4; in Jember around 300 hectares of agricultural land was established by employing prisoners. "Oreng Okoman ban Paperrangan", *Warta Besoeki Shua*, 20 September 2604 [1944]; around 500 hectares of agricultural land was created in Silo-Mandiku (Jember). "Bupati Tak Bersedia Memberi Perintahnya", *Trompet Masjarakat*, 9 June 1951, p. 4.
construction of the railway added a new trend. A major agricultural land expansion occurred in areas near and along the railway network as found in Tanggul (Jember) and south Banyuwangi. The improved irrigation made an expansion of rice and sugar cultivation in lowland Jember and rice cultivation in lowland Banyuwangi possible. Meanwhile, the availability of diverse agricultural crops contributed to the movement towards different agricultural environments. Maize was indispensable from the movement towards the uplands of Besuki. Tobacco facilitated the movement towards both the region’s uplands and lowlands. Rubber and coffee played a significant role in facilitating the expansion towards mountain areas. The adoption of diverse crops equipped agriculturists in their advances towards different agricultural frontiers.

Around the 1950s, the region’s agricultural frontiers were practically closed. There was no longer any notable expansion of cultivated land. This reality was partly reflected by the declining cultivated land per capita in the region. The average cultivated land per capita in Besuki was 0.17 hectares in 1870 and grew to 0.19 hectares in 1930, despite the rapidly growing population. In 1940 the cultivated land per capita was 0.16 hectares, but it dropped to 0.12 hectares in 1961, far below the area of 1870. Unsurprisingly, in the 1950s Besuki saw an escalating incidence of conflict over land. As land grew scarce and landholding was unequal, contest over land could trigger social tensions. In Kalisat and Jenggawah (Jember), and Purwojoyo (Banyuwangi), conflicts over land occurred between the farmers and the estates. The estate enterprises demanded the return of lands that the farmers had illegally occupied since the 1940s. The farmers’ rejection led to their detainment. In Silo-Mandiku (Jember) and in Pasanggaran and Alasbuluh (Banyuwangi), farmers were in

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conflict with the Forest Service. It happened when, for the sake of flood reduction, the Forest Service took back forest lands for afforestation (further discussed in Chapter VIII).  

Another indication was the fact that from the 1950s there seems to have been a shift in the role of Besuki from a migration destination to a migration place of origin. In 1952 seven households (25 inhabitants) from Besuki transmigrated outside Java. The number was small compared with Madiun (1,982 inhabitants) or Kediri (1,015 inhabitants). But the departure of migrants did indicate that the region’s agricultural frontier could no longer be extended and / or that there were no other sources of livelihood at least for these people. In the 1960s more households joined the program. Between 1969 and 1973 from the Jember regency alone there were 1,150 households (5,186 transmigrants). Even from Banyuwangi in 1972-1975 around 13,400 inhabitants were reported to have transmigrated to several places outside Java. At the end of the period covered by this study, Besuki

Map 4c. Major Crop Distribution in the Besuki Residency (Adapted from Mackie, 1997: 266; Onderzoek naar de Mindere Welvaart, 7 (14): 44)
became more or less similar to the rest of Java, with no opportunity for an expansion of the agricultural frontier. Diverse agricultural crops developed across the region (Map 4c). In the following sections, the ways in which and with what crops smallholder and estate agriculture made use of agricultural lands will be elaborated.

4.4 Smallholder Agriculture
Smallholder agriculture in Besuki was carried out on irrigated and dry land. It produced food crops and cash crops for domestic and international markets. The role of smallholder agriculture in shaping the region’s environmental realities was quite remarkable. In terms of acreage, smallholder agriculture constituted a more dominant element in the region’s agricultural landscape than plantation agriculture. In 1922, for example, smallholder agriculture occupied 75 per cent of Besuki’s total cultivated lands, with only 25 per cent for plantation agriculture. By 1930 the proportion of plantation agriculture grew to 36 per cent, but it was still less than that of lands devoted to smallholder agriculture. A great variety of food crops were grown on smallholder agriculture, but rice and maize were the most important in most parts of the region. The importance of the two crops, however, was not evenly distributed across the region due to the different local environments. Apart from this feature, smallholder agriculture in most places across Besuki and also Java had one thing in common, namely that there was seasonally governed crop rotation.

4.4.1 Rice
Throughout the period 1870-1970 and even after, rice was a principal food crop grown in the smallholder agriculture of Besuki. The northern districts including Panarukan and Besuki were initially the region’s major centres of rice production, but large quantities of rice were also produced on the east coast of Banyuwangi. As the agricultural frontier gradually moved to the inland parts of the region, the rice crop appeared to have been part of the expansion. Several places emerged as new rice-producing centres, including Puger and Wuluhan in Jember and Rogojampi and Kalibaru in Banyuwangi. The expansion was

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47 *Landbouwlatas*, 2, pp. 203-204.
facilitated by a combination of factors such as growing population size in the sparsely populated parts of the region, construction of irrigation facilities, and improved transport networks opening up the relatively isolated inland parts of Besuki.

In general, there were two broad varieties of rice grown in the region, as reported by Rothenbuhler in the early nineteenth century: quick-ripening varieties (padi genja) and long-ripening varieties (padi dalem).\(^4\) In many districts in the region, quick-ripening rice varieties were usually grown when irrigation was thought likely to be in short supply with the late start of the wet season.\(^5\) In a normal season, however, farmers preferred planting long-ripening varieties because they offered better yields. The early 1900s reports mentioned that Bali rice varieties, reaching maturity between five to six months, were the most popular in Banyuwangi.\(^5\) Other long-ripening varieties, as found in Jember, included dermayu, jarbatu, kropak, and gropak, whereas among the quick-ripening varieties were pelangmas (95 days) and partulongan (78 days).\(^5\) A mixed planting of different maturing rice varieties was common as one of the strategies to reduce the harvest failure inflicted by diseases, pests, and climatic irregularities.\(^5\)

Rice was grown both on irrigated and dry land. On irrigated land rice was grown in all districts across the residency during the rainy season. Only in a few places such as the districts of Wonosari, Besuki, Wringin, Banyuwangi and Rogojampi, was rice planting also undertaken during the dry season. Meanwhile, on dry lands the rainy season rice cultivation was found in all districts.\(^5\) Manggistan found similar practices among the farmers of Probolinggo, west of the Besuki region.\(^5\) A 1907 report revealed that the cultivation of rice on dry land during the rainy season was 5,400 hectares or around 9 per cent of Besuki’s

\(^{4}\) NA, Van Alphen and Engelhard Collection, 19b, No. Inv. 113, “Copie-Brief van F.J. Rothenbuhler aan Engelhaard over de Toestand van de Rijstteelt in Java’s Oosthoek, 19 April 1806”, p. 10; “De Rijstkultuur op Java”, Bijdragen tot de Taal, Land, en Volkenkunde van Neerlandsch Indië, 1, 2 (1853), p. 67.

\(^{5}\) Onderzoek naar de Mindere Welvaart der Inlandsche Bevolking op Java en Madoera, Vol. 7 (14): Samentrekking van de Afdeelingsverslagen over de Uitkomsten der Onderzoekingen naar de Irrigatie in de Residentie Besoeki (Batavia: Albrecht, 1908), pp. 33, 38.


\(^{5}\) “Pertjobaan Pantoen ing Dosesoeng Nangkkaan (Bndonwoso)”, Sinar Tani, 5, 1 (1930), p. 1; Vink, Dasar Dasar Usaha Tani, p. 205.

\(^{5}\) Onderzoek naar de Mindere Welvaart, 5 (14), pp. 60-63.

total rice cultivation for the season.\textsuperscript{56} Another report stated in 1908 that in Jember dry land cultivation produced half as much rice as irrigated land cultivation.\textsuperscript{57}

Table 4.1 Production of the Unhusked Rice and Planted Area in Besuki, 1870-1971

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (x1000 tons)</th>
<th>Planted Area (x1000 hectares)</th>
<th>Average Yields (Ton/hectare)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1870</td>
<td>110.2</td>
<td>47.1</td>
<td>-</td>
</tr>
<tr>
<td>1880</td>
<td>106.7</td>
<td>55.2</td>
<td>1.93</td>
</tr>
<tr>
<td>1890</td>
<td>119.1</td>
<td>61.2</td>
<td>1.95</td>
</tr>
<tr>
<td>1900</td>
<td>136.1</td>
<td>70.4</td>
<td>1.93</td>
</tr>
<tr>
<td>1910</td>
<td>159.8</td>
<td>81.9</td>
<td>1.95</td>
</tr>
<tr>
<td>1920</td>
<td>252.5</td>
<td>138.9</td>
<td>1.82</td>
</tr>
<tr>
<td>1930</td>
<td>325.5</td>
<td>158.4</td>
<td>2.05</td>
</tr>
<tr>
<td>1940</td>
<td>449.4</td>
<td>203.3</td>
<td>2.21</td>
</tr>
<tr>
<td>1945</td>
<td>435.6</td>
<td>219.1</td>
<td>1.91</td>
</tr>
<tr>
<td>1955</td>
<td>452.3</td>
<td>223.4</td>
<td>2.00</td>
</tr>
<tr>
<td>1961</td>
<td>511.1</td>
<td>231.8</td>
<td>2.17</td>
</tr>
<tr>
<td>1971</td>
<td>1,052.5</td>
<td>270.5</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Notes: Figures include both sawah paddy and dry land paddy. For 1945-1990 planted area refers to harvested area. To achieve homogeneity, paddy production data 1860-1961 are converted into unhusked rice (gabah), with an assumption that the conversion to unhusked rice is 0.65.


The relative importance of rice cultivation on irrigated and dry lands may have fluctuated during 1870-1970 due partly to the fact that both categories of agricultural lands continued to grow in absolute terms. As the irrigation facilities improved particularly from 1910 onward, more dry land was converted into irrigated land. The result was a steep increase in irrigated rice cultivation by almost six-fold, from 47,000 hectares in 1870 to 270,500 hectares in 1971 (Table 4.1). The most striking increase took place between 1910 and 1920, reaching about 60,000 hectares. Other remarkable increases were 1930 to 1940, and 1961 to 1971 reaching about 45,000 and 40,000 hectares respectively. Parallel with the expanding area, there were increases in rice output. The notable increases occurred in the

\textsuperscript{56} Onderzoek naar de Mindere Welvaart, 5 (14), pp. 62-63. Besuki’s total rice cultivation of the season was reported to be 61,200 hectares.

\textsuperscript{57} The average rice output was 40 picol per bau on irrigated lands, and 20 picol per bau in dry lands. Onderzoek naar de Mindere Welvaart 7 (14), p. 24.

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periods from 1910 to 1920 and from 1930 to 1940 with rice output of 93,000 tons and 124,000 tons respectively, but these figures remained smaller than in the late 1960s.

The increase in output resulted primarily from the rising frequency and scale of rice cultivation. The improved irrigation made it possible to double-crop lands that could previously only have been planted with rice once a year. A rough estimate for Besuki suggests an increase in sawah cropping ratio from 1.33 in 1915 to 2.20 in 1940. More rice plantings were observed in areas where irrigation supplies became available. But there were also new rice areas. A 1907 report remarked that in Jember rice was among the major crops grown on a newly cleared forest. A similar phenomenon was observed in agricultural lands newly established in South Banyuwangi. Rice yields, by contrast, remained constant in most periods or only slightly increased, resulting from combined factors of expansion towards more marginal soils, improved water supplies, better rice technology and planting techniques, and climatic events. Commenting on Besuki, P. van der Elst stated that there was a remarkable expansion in terms of area, but little in terms of yields. Only under the Green Revolution from the late 1960s did steep increases in rice yields become possible to compensate for the absence of cultivated land expansion.

The expansion in rice production in Besuki was induced by both population growth and market opportunities. The importance of the two factors was evident from the fact that rice produced in Besuki was used not only for domestic consumption but for export trade as well. The growing population size demanded larger quantities of rice and other food crops. Even so, qualitative evidence suggests the flow of rice exports from the region to Madura, Bali and the outer islands of Indonesia. Similarly, rice and paddy were also exported to

59 Calculated based on data given by Boomgaard and van Zanden, *Changing Economy in Indonesia*, 10, pp. 76-95. The ratio is calculated by subtracting the tegal area from the total harvested rice area and dividing the result by the sawah area.
60 *Onderzoek naar de Mindere Welvaart*, 5(14), p. 6.
64 ANRI, "Memorie van Overgave van Resident van Besoeki 1922"; ANRI, "Memorie van Overgave (Voet)", pp. 18-19, 38; from the Banyuwangi port, an amount of 931 tons of rice was exported in 1908 and it increased
destinations in Java such as Pasuruan, Surabaya, and elsewhere. From April to August 1943, Besuki exported 68,400 tons of rice. During the late 1940s the Indonesian government also relied on Besuki in its rice-for-clothes policy with India.

The continuing role of the region as a rice surplus area is surprising. The development of estate agriculture has often been blamed for the decline in food production in Java. The experience of Besuki demonstrates a different story: expansion in estate agriculture did not bring a disastrous decline in food crop agriculture; on the contrary, food crop production continued to increase. One of the major reasons was that farmers still had an opportunity to grow rice on areas used for estate crops, particularly tobacco. In most areas the planting of tobacco was undertaken during the dry season and for the rest of the year the fields could be brought under rice. Moreover, not only was rice grown on smallholder agriculture, this crop was cultivated on agricultural lands controlled by estates as well. The emergence of new rice centres in Jember and Banyuwangi strengthened the region’s historical role as a rice granary in colonial and post-colonial Indonesia. Another explanation may be linked to the fact that a significant proportion of the region’s population adopted a non-rice staple food, maize.

to 1,571 tons by 1909 and down to 1,171 tons by 1910. R. Broersma, Besoeki: Een Gewest in Opkomst (Amsterdam: Scheltema & Holkema, 1912), p. 103.
66With this export figure, Besuki became the largest rice exporting area of Java. In other areas, such as Jakarta, Cirebon, and Malang, rice export was smaller, less than 23,000 tons. Aiko Kurasawa, Mobilisasi dan Kontrol: Studi tentang Perubahan Sosial di Pedesaan Jawa 1942-1945 (Jakarta: Yayasan Karti Sarana & Grasindo, 1993), pp. 96-97; Aiko Kurasawa, “Transportation and Rice Distribution in South-East Asia during the Second World War”, in Paul H. Kratoska (ed.), Food Supplies and the Japanese Occupation in South-East Asia (Basingstoke: Macmillan, 1998), p. 44.
69Broersma, Besoeki, pp. 18-19.
4.4.2 Non-Rice Food Crops

Various non-rice food crops such as maize, cassava, sweet potatoes, and soybean were grown in Besuki. These crops were grown not only on dry land, but on irrigated land as well during dry seasons. The position of non-rice food crops on irrigated fields was very significant. Van der Elst estimated that non-rice food crops (palawija) occupied 66 per cent of Besuki’s dry season irrigated land cultivation in 1874 and 75 per cent in 1914. Among these crops, maize was the most important, followed by cassava. Unlike maize, the significance of cassava was partly linked to its function as a food buffer when food was in short supply (paceklik). Soybean gained a significant position in the region’s agriculture only from the 1930s.

It is difficult to ascertain when maize first reached the Besuki region. Its planting by local pioneer farmers had been mentioned in mid-nineteenth century traditional literature, while other crops were called under a general category, palawija. On dry fields maize was either monocropped or intercropped with cassava and legumes. On irrigated fields maize was an important secondary crop, as reflected in the acreage of the land under this crop compared with that of rice. In 1903 maize cultivation in Besuki reached 87,000 hectares. The closest data for 1900 mentioned 70,000 hectares of rice cultivation. The data for 1920 indicated that the area under maize was 156,000 hectares, with only 134,000 hectares devoted to rice. This crop equipped the Madurese migrants to expand the agricultural frontier towards areas with limited supplies of water in the southern part of the Bondowoso regency.

The importance of maize across Besuki, however, was not evenly distributed. In 1903 there were 30,000 hectares and 35,000 hectares of maize cultivation in Bondowoso and Panarukan respectively. Meanwhile in Jember the area under maize was about 21,000 hectares.

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73 Landbouwatlas, 2, pp. 224-226.
74 In 1940 the harvested area of soybean was 68,000 hectares. Boomgaard and van Zanden, Changing Economy in Indonesia, 10, pp. 99-101.
77 Landbouwatlas, 2, pp. 74-75.
78 ANRI, Arsip Residensi, Besuki 9.4. “Administrative Verslag van Residentie Besoeki over het Jaar 1873”.

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hectares.\textsuperscript{79} Around 1920 the centre of maize production in Besuki was still Panarukan and Bondowoso. In the following periods, maize grew in importance in Jember. In the early 1970s the area devoted to maize in Jember exceeded those in the traditional centres of maize production, Panarukan and Bondowoso. Although in Banyuwangi the area under maize increased over time, it remained small in absolute terms, only 2,300 hectares in 1903. Among the sixteen subdistricts of Banyuwangi in the late 1960s the cultivation of maize was developed only in three places: Giri, Wongsorejo and Tegaldlimo.\textsuperscript{80}

The adoption of maize might have been an adaptive strategy to the environmental realities of Besuki. With the region’s dry climate, the farmers confronted growing difficulties in extending their operations on land with adequate water supplies. Under such circumstances, the farmers had to grow crops with low water demands and one of the best crops was maize. Its ability to grow on almost any type of soil, even where dry rice could barely grow, was of paramount importance.\textsuperscript{81} Maize also offered higher yields per unit of land and labour and less risk of harvest failure compared to dry rice.\textsuperscript{82} The fact that maize was also grown on irrigated lands might have indicated a need for intensified land use to meet the rising need for food from the growing population. For the Madurese of Besuki, maize intake was very high.\textsuperscript{83} A 1954 survey revealed that the majority of inhabitants in Bondowoso, Panarukan, and Jember consumed maize as their staple food, whereas rice as staple food was found only among the inhabitants of Banyuwangi.\textsuperscript{84}

Apart from the growing population and the need for land use intensification, the expanding maize crop was also stimulated by the market. In Besuki maize was grown not only for domestic use but for the export trade as well. In 1936 about 2,900 tons of maize was transported by rail to the other residencies of Java. In the same year about 21,000 tons of maize was shipped from the Panarukan and Banyuwangi ports to overseas and domestic

\textsuperscript{79}Landbouwlatas, 2, pp. 74-75.
\textsuperscript{81}Raffles, \textit{The History of Java}, 1, pp. 121-122.
\textsuperscript{82}Peter Boomgaard, “Maize and Tobacco in Upland Indonesia, 1600-1940”, in Tania Murray Li (ed.), \textit{Transforming the Indonesian Uplands: Marginality, Power and Production} (Singapore: Institute of Southeast Asian Studies, 1999), pp. 63-64.
\textsuperscript{84}50 per cent of the population of Jember and 25 per cent of the population of Panarukan consumed maize as a staple food. Maize was eaten in a mix with rice by 30 per cent, 60 per cent and 62 per cent of the population of Jember, Bondowoso, and Panarukan respectively. Meanwhile, 98 per cent of the population of Banyuwangi consumed rice as a staple food. “Besuki: Situasi Pertanian”, \textit{Trompet Masjarakat}, 11 January 1954, p. 2.
markets. In the early 1950s the main export destinations were the Netherlands and Belgium. After the breakdown of relations with the Netherlands in 1958, exports shifted to Asian markets. In 1966 the countries sharing in Besuki’s maize exports were Japan (81 per cent) and Hongkong (19 per cent). By 1970, 50 per cent of the exports went to Singapore, 34 per cent to Hongkong and 16 per cent to Japan.

Besides maize, other notable non-rice crops were cassava and soybean. Although cassava in Besuki had never reached a significant commercial scale, this crop attracted the interest of farmers because it offered high net returns and ability to grow in marginal soils even without irrigation water. In Besuki cassava was reportedly grown and consumed as the main diet during food scarcity in marginal areas of the region. The adoption of cassava might have indicated the increasingly degraded agricultural environment, especially dry land, in various parts of the Besuki region. A 1908 report revealed that in the Wringin district, numerous dry fields immediately turned to infertile soil. In 1972 there were around 7,400 hectares of degraded dry land. Unlike cassava, the cultivation of soybean was strongly induced by market forces. Grown mostly on irrigated lands during the dry season, soybean in Besuki had a strong export orientation. The main export destination was Central Java and partly also the European market.
4.4.3 Animal Husbandry

Animal husbandry constituted an integral part of village life. Its integration was created in diverse ways. In economic terms, animal husbandry provided farmers with plough animals and animal manure, which supported the agricultural operations. Livestock, especially horses and cattle, were indispensable to the communication system, connecting farm villages with outside markets and facilitating the transport of goods and people from and to villages. Trade and meat were other requirements of major significance that integrated animal husbandry into the villages. In socio-cultural terms, the integration was created through the functions of particular livestock in traditional entertainment and social relations by serving as status symbols. Besides forming part of the lifestyle of the people, animal husbandry also interacted with and influenced the environment. One of the major linking factors between the two elements was feed requirements.

The major livestock in Besuki were cattle and horses. Both livestock were significantly present in almost all parts of the region. Buffalo, by contrast, had only been rather significant in a few districts, but were numerically negligible in many others. These patterns were closely linked to the environmental requirements of livestock. Cattle were more flexible in their living environment, being able to adapt to dry and irrigated areas and from lowland to upland. Buffalo, by contrast, were restricted to swampy areas. The prominence of cattle grew as Besuki’s agricultural frontier expanded in the inland districts. Even in 1922 there were more cattle raised in Jember than in the region’s northern districts, including Bondowoso. The number of buffalo and later horses, however, tended to decline. Birnie remarked that in Jember buffalos were steadily replaced by cattle with the conversion of swamps into agricultural land, the growing influence of the incoming

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94Martine Barwegen, “Browsing in Livestock History: Large Ruminants and the Environment in Java, 1850-2000”, in Boomgaard and Henley (eds), Smallholders and Stockbreeders, p. 298.

95This impression appears when comparing livestock data for 1845 and 1890. P. Bleeker, “Fragmenten eener Reis over Java: Reis door Oostelijk Java”, Tijdschrift voor Nederlandsch Indië, 2, 2 (1849), p. 127; the number of cattle in 1890 was 29,600 (Besuki), 42,200 (Panarukan), 53,800 (Bondowoso), 53,000 (Jember), 37,400 (Banyuwangi). The number of buffalo was 100 (Besuki) and 400 (Bondowoso), 5,900 (Panarukan), 6,300 (Jember), and 7,900 (Banyuwangi). Koloniaal Verslag, 1892, Bijlage A, pp. 36-37.


97Landbouwlatlas, pp. 133-134.
Madurese migrants, and advantages of cattle in terms of working resilience under the sun’s heat.\textsuperscript{98} Similarly, horses experienced a declining trend across the region.\textsuperscript{99} With limited functions linked to transportation, horses were less useful than cattle, especially after railroads, buses, trucks, and pedicabs grew in importance.

In Besuki livestock had multiple values. As elsewhere in Java, livestock became a basis of prosperity (rojo koyo).\textsuperscript{100} Cattle and buffalo were raised as working animals for farms and transport. In the Besuki district farmers popularly used cattle in preparing their farms, while in Panarukan besides cattle, buffalo were used to pull the Javanese ploughs.\textsuperscript{101} With the assistance of cattle and buffalo, it became possible to bring more land under cultivation than relying solely on human power. Cattle and buffalo also provided sources of meat, especially during traditional festivities. In 1915, more than 58,000 cattle and buffalo or 17 per cent of total livestock were slaughtered for this purpose.\textsuperscript{102} In 1948 it reached 66,600 cattle and 33,100 buffalo, making up 13 per cent and 8 per cent of the total large livestock numbers.\textsuperscript{103} Cattle had cultural significance too. In contrast with the Madurese on Madura itself, who preferred bull racing, the Madurese in Besuki more appreciated bull fighting.\textsuperscript{104}

Livestock was also an important part of the region’s trade. In 1915 Besuki was reported to have imported 750 horses, 280 buffalo, and 8,900 cattle.\textsuperscript{105} In 1931 the region imported 6,700 cattle, mostly via Panarukan port and to a lesser extent via Banyuwangi.


\textsuperscript{100}Bakker, “On Livestock”, p. 2.

\textsuperscript{101}Onderzoek naar de Mindere Welvaart, 5 (14), pp. 7, 9.

\textsuperscript{102}This figure was the highest among the residencies of Java. In Madura 17,800 cattle and buffalos or 2.5 per cent of the total large livestock were slaughtered, while in Jakarta 37,500 head or 10.6 per cent were slaughtered. Jaarboek van het Departement van Landbouw, Nijverheid, en Handel in Nederlandsch-Indië 1915 (Batavia: Landsdrukkerij, 1917), pp. 273-274.

\textsuperscript{103}In Madura 36,700 cattle and 250 buffalos or 8.9 per cent and 2.0 per cent of the total large livestock were slaughtered. Huitema, Animal Husbandry, pp. 154-155.


\textsuperscript{105}Jaarboek van het Departement van Landbouw, 1915, pp. 260-262.
Meanwhile, cattle exported from Besuki went mainly to the city of Surabaya for slaughter. With the establishment of the railroads, growing numbers of cattle reached Surabaya and elsewhere in Java. At a later stage, they were transported by truck. By 1948, 70 per cent of livestock in Besuki was for export, a higher percentage than in the cattle-producing island of Madura with a proportion of 57 per cent. With the active involvement in livestock trade, the number of livestock might have fluctuated. But in the long term, the livestock population tended to increase. There were 295,600 big livestock in 1890, which increased to 507,500 in 1930 and to 547,700 in 1948.

That development had a significant impact on the region's environment. Feed is the major factor through which the impact of livestock was imposed on the environment. Livestock was usually herded on common grasslands on which all villagers had the same usage rights, a long-established traditional practice in the region. There was likely a time when the raising of livestock led to the creation of grasslands. But the increased use of land, the growing population, and interest in forest conservation reduced grazing areas. Under such circumstances, more livestock were kept in stables and to feed them, farmers used grass, maize leaves, peanut leaves, and paddy straws collected from fields or bought from the local markets. In 1928, the planting of grasses for fodder had taken place in Jember. Some livestock was occasionally herded on agricultural fields after harvest, while some were still herded on forest lands even until recently. They were believed to cause erosion and deforestation, which raised concerns among the forest officials (Chapter V).

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107 Huitema, Animal Husbandry, pp. 149, 151, 153.
111 Onderzoek naar de Mindere Welvaart, 5 (14), p. 17.
112 "49.05 Ha Dihutankan Kembali", Trompet Masjarakat, 1 January 1954, p. 2; Soekartono, "Perlombaan Perkebunan Rakjat Karesidenan Besuki", Pertanian, 7, 4 (1956), p. 123.; A 1981 report revealed that about 4000 cows, 1,500 sheep, and 1,500 goats were illegally herded in the Karangteko Resort of the Baluran National Park. A Similar practice was reported to be found in the villages of the Banyuputih sub-district (Situbondo), and some villages of the Wongsorejo sub-district (Banyuwangi), Menteri Negara Kependudukan dan Lingkungan Hidup, "Penelitian Pengembangan Wilayah Penyangga Kawasan Hutan Konservasi: Pengembangan Daerah Penyangga Taman Nasional Baluran", Unpublished Research Report (Bogor: Fakultas Kehutanan Institut Pertanian Bogor and Proyek Pengembangan Efisiensi Penggunaan Sumber-sumber Kehutanan, 1986), pp. IV.2-IV.3.
On the whole, the smallholder agriculture of Besuki between 1870 and 1970 corresponds with frontier theories in a sense that movement towards new agricultural lands strongly characterised its development. The important role of migrant farmers in the process was also observable. The case of Besuki's smallholder agriculture also confirms the views of Flannery and Butcher, suggesting the important role of technology in frontier development. The adoption of diverse crops and irrigation technologies, together with the raising of cattle equipped farmers in their advances towards new farm lands. But unlike frontier theories which tended to imply a uniform agricultural environment, the agricultural frontier of Besuki was not uniform. There were irrigated land, dry land, and mountain land frontiers of agriculture. In this context, the expansion of the frontier of agriculture took place not only towards new land, but could occur among different frontiers as well, especially from irrigated land to dry land. A good illustration for this was the expansion of the frontier of rice cultivation resulting from the construction of irrigation facilities. The expansion of the frontier of smallholder agriculture, however, was primarily induced by subsistence and local market needs, rather than the international market.

4.5 Plantation Agriculture

Plantation agriculture also played a major role in the advances of the agricultural frontiers of Besuki. Unlike smallholder agriculture, plantation agriculture was characterized by more capital-intensive and large-scale operations. As shall be shown, this sector was linked to diverse agricultural crops, with different cultivation requirements and socio-ecological consequences for the region.

4.5.1 Sugar

The crop constituted one major legacy of the Cultivation System that continued to shape the agricultural landscape of Besuki. When land was opened up to agricultural operation by private firms from 1870, more people got involved in the estate business. There were new players emerging in the scene, but the nature of the business partly remained unchanged. The sugar industry, which had been a lucrative business, continued to attract some players. The major centre of sugar industry was the northern districts of Panarukan regency.
where land and labour, which became the foundation for sugar industry operations, were sufficiently available. Sugarcane was grown on lands leased from farmers in rotation with food crops. Once sugar planting occupied irrigated lands for more than one year, occasionally even 20 months. During this lease term the farmers provided themselves as sugar plantation workers. Although they could generate income from rent money and wages, there were cases in which the farmers found difficulties in supporting their households during the lease term. Consequently, some farmers were led into indebtedness and eventually lost their lands, resulting in a growing number of big landholdings.

The growing number of sugar factories reflected the expanding sugar cane cultivation in the region. Around 1870 there were 4 sugar factories, which grew to 13 by 1890; this was later rationalized to 10 factories. Among the newly established factories were Prajekan (1883) and Tengarang (1893) in Bondowoso, Asembagus (1885) in Panarukan, and Sukowidi (1895) in Banyuwangi. But there were no sugar estates operating in Jember. This regency began to grow sugar only from the 1920s when the Handelsvereeniging Amsterdam expanded its sugarcane cultivation from Lumajang (Pasuruan). In Jember sugarcane was grown in the southwest, including Kencong, Bondoyudo, and Tanggul. Three sugar factories, Gunungsari (1927), Semboro (1928) and Bedadung (1929), were established. This development formed the last major expansion, which placed Jember as the largest sugar area in the residency. The area under sugarcane grew from around 6,000 hectares in 1903 to 10,200 hectares in 1930, of which 4,200 hectares (41 per cent) were in Jember.

During the 1930s depression, however, the sugar industry in Besuki declined. Of the twelve sugar factories that operated in this area, in 1934 only four were still working—Semboro, Olean, Panji, and Prajekan-Tengarang. Several sugar factories were forced to stop temporarily—these included the Wringin Anom, Buduan, Asembagus, Gunungsari, and Bedadung factories. In addition, two sugar factories—De Maas and Sukowidi—found it impossible to continue. All sugar factories reduced the area of cane cultivation.

118 Personalia, p. 108.
119 The area under sugar was 4000 hectares in Panarukan, 1500 hectares in Bondowoso, and 590 hectares in Banyuwangi. Tennekes, “De Bevolkingsspreiding”, pp. 377-379.
Several factories including Semboro, Gunungsari and Bedadung in Jember and Wringin Anom, Panji, and Asembagus in the other regencies terminated land lease contracts.\textsuperscript{122} Signs of a recovery in the late 1930s ended with the Japanese occupation, which brought further decline. In 1943 there were only three sugar factories in operation, several factories including Semboro, De Maas, and Olean, being only temporarily operated.\textsuperscript{123} Other factories were converted to different purposes with the Tengarang and Sukowidi factories used for rice processing, while the Bedadung factory was closed down.\textsuperscript{124}

In the 1950s, the region’s sugar industry resumed. Until the end of the 1960s, however, it appears to have been unable to reach the prewar operation levels. Around 1957 in the residency of Besuki there were eight sugar factories in operation with a total area of 7,100 hectares.\textsuperscript{125} There was no expansion in area under estate cane during the independence decades, a trend prevailing in the Java sugar industry as a whole in the 1950s and the 1960s.\textsuperscript{126} Smallholder cane in Java, by contrast, grew considerably.\textsuperscript{127} The same trend took place in the Besuki residency especially Bondowoso, where there was a notable increase in area under smallholder sugar cultivation.\textsuperscript{128} Such an operation, however, was not a new phenomenon in a few places in Java such as Malang, Kediri, and Jombang.\textsuperscript{129}

In terms of yields, the post-colonial sugar industry in Besuki as elsewhere in Java was on the decline. An estimate for Java suggested that sugar yields per hectare were roughly 45 per cent below the pre-war period, with yields ranging from 69 to 89 quintals per hectare between 1962 and 1966, compared with 160-172 quintals per hectare between

\begin{footnotes}
\item\textsuperscript{121}Abraham Nurcahyo, “Manajemen Pabrik Gula di Situbondo Dalam Menghadapi Krisis 1925-1941”, Unpublished M.A. Thesis (Yogyakarta: Gadjah Mada University, 1999), p. 124.
\item\textsuperscript{122}S. Nawiyanto, “The Economy of Besuki during the 1930s Depression”, in Peter Boomgaard and Ian Brown (eds), \textit{Weathering the Storms: The Economies of Southeast Asia in the 1930s Depression} (Singapore: Institute of Southeast Asian Studies, 2000), pp. 178-179.
\item\textsuperscript{124}Postma, d’Hane and von Meijenfeldt, “De Javasuikerindustrie”, p. 125.
\item\textsuperscript{126}In 1928-1932 the sugarcane area in Java ranged from 171,000 to 199,000 hectares, while only from 79,500 to 88,000 in 1963-1966. Mubyarto and Hadiwigeno, \textit{et al.}, “Usaha Tani Tebu”, p. 16.
\item\textsuperscript{127}In 1950 farm sugarcane in Java grew from 70 hectares in 1950 to 21,100 hectares in 1957. Soekardjo, “Kedudukan Gula”, p. 168.
\item\textsuperscript{128}Farm sugarcane cultivation was reported to have been stimulated by the scarcity of sugar. “Keadaan Pertanian di Besuki”, \textit{Trompet Masjarakat}, 12 September 1950, p. 3; in 1953/1954 the farm sugarcane cultivation was concentrated on nine sub-districts of Bondowoso, covering an area of 108 hectares, “Besuki: Situasi Pertanian”, \textit{Trompet Masjarakat}, 11 January 1954, p. 2. In 1954/1955 the area of farm sugarcane was 300 hectares, “Tebu Rakyat Tambah Luas”, \textit{Trompet Masjarakat}, 19 July 1954, p. 2.
\end{footnotes}
1936 and 1940. The poor levels of sugar production were due to the unfavourable rates of land rent paid by the sugar industry, pushing farmers to deliver poorer lands for estate cane cultivation, as well as to old factories and few human resources. Other factors considered responsible for the poor output included the lower average rainfall which led to lower sucrose content in the cane, and the deteriorating agricultural environment including soil fertility and irrigation.

In ecological terms, the cultivation of sugarcane altered the state of irrigated land. Extra work was needed to repair the dikes and to remove sugarcane roots. Sugarcane was the most soil-exhausting crop. One sugarcane harvest drained around 325 kilograms of nitrogen per hectare, three times more than tobacco did. More soil nutrients were taken out by sugarcane than were brought into fields by irrigation. After chemical fertilisers were intensively used, fertilising residues often had unexpected effects on food crops. In the early 1900s the post-sugar cane planting of rice in Banyuwangi was reported to have yielded “beautiful stalks, but empty of rice”, a problem with indigenous rice varieties which responded to nitrogen fertiliser in this way. The sugar cane cultivation was also reported to have increased the danger of crop diseases, especially mentek which attacked rice. Unsurprisingly, the worst mentek-affected area of Besuki was the Panarukan regency, which had long been under sugarcane. Another detrimental effect of sugarcane on the environment was firewood-linked deforestation (Chapter V). In the context of the

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136 Onderzoek naar de Mindere Welvaart, 7 (14), pp. 43-44.
137 Van der Eng, Agricultural Growth, p. 110.
138 Kamerling, "Enkele Gegevens", pp. 16-17; Van Schaik, Colonial Control, pp. 52-53.
139 J. van der Vecht, "The Problem of the Mentek Disease of Rice in Java", Landbouw, 25, 1-6 (1953) p. 80; the mentek associated rice failures were 703 bau (500 hectares) in 1926, 476 bau (338 hectares) in 1927, 969 bau (688 hectares) in 1928, and 380 bau (270 hectares) in 1930. ANRI, "Memorie van Overgave van de Residentie Bondowoso (Resident C.E. Barre) 1931", p. 22.
agricultural frontier development, the effect of the cultivation of sugar cane was linked more to the intensification of land use, rather than to the expansion towards new agricultural lands converted directly from forests.

4.5.2 Tobacco

Another crop that facilitated the expansion in the agricultural frontier in Besuki from the 1860s was tobacco. When the colonial rulers invited private estates to operate, a few people tried to make their fortunes with different crops. George Burnie was convinced that tobacco could grow well in Bondowoso and Jember. Together with C. Sandenberg and A.D. van Gennep, Burnie established an estate enterprise in 1859, called De Landbouw-Maatschappij Oud-Djember (LMOD). Other pioneering figures who became involved in the tobacco business included J.D. Franssen van de Putte (De Landbouw-Maatschappij Soekowono), Ry van Beest Holle and Geertsema (De Cultuur Maatschappij Djelboek). Outside these colonial figures, a larger number of Indonesian farmers took an active part in the expansion of tobacco cultivation.

Tobacco could grow in a variety of environments from lowlands to uplands and from tropical to temperate ones. But the best area is at an altitude of between 80 and 550 metres above sea level. On higher areas tobacco grows slowly and produces low quality leaf. This crop prefers loose and fertile soil especially of volcanic origin, although it also grows well on clayey soils with intensive soil preparation. In terms of climatic requirements, tobacco prefers moderate rainfall (around 200 millimetres per year). During the soil preparation and planting periods rainfall is not expected. Only when entering the growing period, occasional and light rainfall would be beneficial to the growth of tobacco plants. Such conditions are very much expected to prevail until the harvest time is approaching. The environment of Besuki, particularly Bondowoso and Jember, with its volcanic soils formed by the Raung volcano, and sufficient rainfall during the dry months of the year, fulfils all the cultivation requirements.

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Until around 1910 there were two major types of tobacco cultivated in the Besuki region. The first type was called Kedu, grown mostly on the upland of Bondowoso. The other was called Deli type, grown primarily on the lowland of Jember. Having a special flavour and taste, Kedu type was primarily used for cigar binder and filler. Deli type served as a wrapper which should be fine and tasteless so as not to affect the taste of filler and of the cigar tobacco.\textsuperscript{143} From 1921, a new hybrid type of tobacco, a crossing of Deli and Kedu types, began to develop. This type gradually expanded and became dominant in the former Deli cultivation area, embracing the entire lowland of Jember to Arjasa, Kalisat and Mayang. Beyond these districts northward to Bondowoso the Kedu type continued to develop. From 1933 only hybrid and Kedu types were grown in Besuki.\textsuperscript{144} Meanwhile, Kanari tobacco, which grew well and became the only type grown in the Principalities of Yogyakarta and Surakarta, was minor in Besuki because it yielded only poor results.\textsuperscript{145}

Tobacco produced by European entrepreneurs can be divided into two categories. The first was that grown on lands leased from the farmers on short-term leases up to five years. From the pioneering years until around 1875 it became the only practice in tobacco cultivation.\textsuperscript{146} The leased lands were initially restricted to dry fields, but the more frequent plantings gave diminishing yields. From the mid-1870s, therefore, tobacco cultivation developed on irrigated lands as well, after initial plantings indicated good results. In 1883 LMOD leased 5,700 hectares of irrigated lands and 4,300 hectares of dry land and by 1908 the lease holdings were 16,000 hectares and 11,000 hectares respectively.\textsuperscript{147} The lease was normally for five years and renewals were possible. Under these leases, the farmers cultivated their lands with seeds provided by the European planters. On dry fields tobacco was a primary crop grown between April and July with the product called \textit{voor-oogst} tobacco, whereas on irrigated fields it was grown from October to mid-December as a secondary crop on irrigated land and the product was called \textit{na-oogst} tobacco.\textsuperscript{148}

\textsuperscript{144}J.C. s’Jacob, “De Huidige Stand van het Veredelingswerk bij Besoeki Tabak”, \textit{Verslag van de 26e Vergadering van de Vereeniging van Proefstation-Personeel Gehouden te Malang van 27 tot 29 October 1938} (Soerabaia: H. van Ingen, 1938), p. 81.
\textsuperscript{146}Broersma, \textit{Besoeki}, pp. 18-19.
\textsuperscript{147}Vermeer, \textit{1859-1909 Naamloze Vennootschap}, pp. 3-5.
As a consequence of the tight competition for obtaining land from farmers, from 1875 tobacco planters began to use land on a long lease basis (erfpacht) up to 75 years.\footnote{Schweizer, "Tabak", p. 257.} The granting of erfpacht was possible with the availability of extensive uncultivated lands in Jember and Banyuwangi.\footnote{Tennekes, "De Bevolkingsspreiding", p. 371.} On erfpacht lands tobacco was a primary crop.\footnote{Onderzoek naar de Mindere Welvaart, 5 (14), p. 27.} The use of erfpacht land extended tobacco cultivation southward from Bondowoso to Jember including Sukorejo (1875), Muktisari (1881-1882), and Ajung (1881-1883), owned by the LMOD.\footnote{Een Jubileum in de Tabak (S.L.S.H, 1909), p. 15; Broersma, Besoeki, pp. 25-26.} By 1908, the LMOD alone controlled around 11,400 hectares of erfpacht land.\footnote{Vermeer, 1859-1909 Naamloze Vennootschap, p. 5; Soegijanto Padmo, The Cultivation of Vorstenlands Tobacco in Surakarta Residency and Besuki Tobacco in Besuki Residency and Its Impact on the Peasant Economy and Society: 1860-1960 (Yogyakarta: Aditya Media, 1994), p.71.} In the early 1900s, the Amsterdam-Besoeki Tabak Maatschappij (ABTM) established tobacco estates in Jember, followed in 1912 by the N.V. Cultuur Maatschappij Zuid-Djember in Puger.\footnote{The ABTM developed tobacco estates in Rawatamtu (Rambipuji), Jubung (Mangli), Gumuksari (Kottok), Ajung (Kalisat), Balet Baru (Sukowono). Broersma, Besoeki, pp. 47-48.}

Apart from the estate tobacco, there was tobacco grown on the initiatives of the Indonesian farmers and often referred as smallholders. In terms of export share and acreage, it had great significance. In 1898, its share made up more than 60 per cent of Besuki’s tobacco exports.\footnote{J.H. Lieftinck, Productie-Staten Omvattende het in Nederland ter Markt Gebrachte van Sumatra, Java en Borneo Tabak (Amsterdam: Oblong Book, 1899), p. 44, listed under the name of krosok tabak.} The acreage of smallholder tobacco was more than 27,000 hectares in 1903 and 20,500 hectares in 1930, mostly located in Jember.\footnote{The cultivation acreage of farm tobacco in Besuki regencies was: Bondowoso (5,700 hectares), Jember (20,000 hectares), Panarukan (510 hectares), and Banyuwangi (1,100 hectares). Onderzoek naar de Mindere Welvaart, 5b, p. 24. By 1930, the cultivation of farm tobacco reached to 16,500 hectares in Jember and 4,000 hectares in Bondowoso. Kapels, Vergelijkend Onderzoek, p. 482.} The area under smallholder tobacco often surpassed that of the estates, and thousands of farmers were involved. Between 1925 and 1935 the smallholder tobacco cultivation occupied from 50 to 62 per cent of the total area under tobacco. With the promulgation of the 1935 Besuki Tobacco Regulation and the Rayoneering Stelsel, giving western planters an exclusive right in certain areas, smallholder tobacco came under restriction.\footnote{ANRI, “Memorie van Overgave (Van Romondt)”, pp. 30-34.} These measures, however, did not eliminate the existence of smallholder tobacco in the region.

The development of smallholder tobacco was stimulated by several factors. The existence of broker (bandol) and trading firms, playing the role as intermediaries between
farms and distant markets, made it easier for farmers to sell their tobacco. Brokers collected tobacco from farmers and sold it to trading firms, which acted as large wholesalers (opkooper). Newcomers interested in becoming involved in the tobacco business started as brokers, because they had insufficient capital to establish their own estates.\(^{158}\) Smallholder tobacco cultivation was also induced by the high financial returns which tobacco yields. It has been calculated that the cultivation of tobacco in upland areas in Java generated higher net returns than other crops.\(^{159}\)

Together both smallholder and estate tobacco made Besuki the largest tobacco exporting region in Java. During 1911-1915, tobacco exports through the seaport of Panarukan, the main channel for commodities from the hinterland of Besuki, accounted for approximately 20 per cent of total tobacco exports from Java. Its share was about the same as that for tobacco exports through Semarang, the main channel for exports of agricultural commodities from Central Java. From 1926 to 1930, the share of Besuki in exports of tobacco from Java rose to more than 25 per cent, surpassing that of any other region. Despite the reduced output in absolute terms in the 1930s, its share seems to have even grown bigger with the declining output in the other areas of Java. In 1938, the export share of tobacco from Panarukan was more than 30 per cent, and was still ranked the highest.\(^{160}\)

Although tobacco continued to dominate Besuki’s agricultural landscape, no expansion occurred after 1930. The 1930s depression led to a steep reduction in the area under tobacco.\(^{161}\) Some estates were closed down, following the restrictions imposed to reduce tobacco cultivation by 40 per cent for small estates and 60 per cent for large estates.\(^{162}\) Further deterioration took place when estate lands were taken over by the Japanese.\(^{163}\) Tobacco estates were shifted to rice in Kalisat and to rice and maize in


\(^{159}\)Van der Eng, *Agricultural Growth*, p. 172.


\(^{161}\)The price of tobacco from Besuki dropped from 37.5 cents per 0.5 kg in 1930 to 22.5 cents in 1931. By 1933 and the following years, the prices of tobacco fluctuated no more than 22 cents per 0.5 kg. Tobacco output dropped from 302,900 packs in 1931 to 138,000 packs in 1932. *Sumatera en Java Tabak: Statistisch Overzicht op Handel- en Financieel Gebied Jaargang 1940* (Amsterdam: Dentz & van der Breggen, 1940), pp. 51-52.

\(^{162}\)Krapels, *Vergelijkend Onderzoek*, p. 483.

\(^{163}\)The actions included 980 hectares in Kalisat district, 105 hectares in Puger district, 317 hectares in Jember district, 674 hectares in Mayang district, and 788 hectares in Tanggul district. “Memberantas Penganggoeran”, *Soecara Asia*, 17 April 2603 [1943], p. 4.
The revival in tobacco in the 1950s and the 1960s took place only in areas where it had been grown. In these two decades, the largest area under smallholder tobacco in the two decades of 27,000 hectares in 1969 was still far smaller than that of the 1915 figure of 53,000 hectares. Estate tobacco remained below the pre-war operating levels. Despite those facts, tobacco output in Besuki was always higher than those of the two prominent tobacco centres of the Principalities of Yogyakarta and Deli (Sumatra).

Like sugarcane, tobacco had a detrimental effect on the environment. Except for nitrogen, one tobacco harvest took out more nutrients from the soil than sugarcane did: 116 kilograms of potassium/ hectare and 26 kilograms of phosphorus/ hectare for tobacco compared with 68 kilograms of potassium/ hectare and 23 kilograms of phosphorous / hectare for sugarcane. On dry lands, the cultivation of tobacco easily exhausted soil fertility and the frequent plantings led to lower yields, which became the major reason for the LMOD to expand its tobacco cultivation to irrigated lands from around the 1880s. An attempt was made to handle the problem with technology (Section 4.6). Other impacts of tobacco cultivation on the environment, especially the forest, were also serious. One of the major reasons was that part of the tobacco cultivation was undertaken on newly cleared forest lands. The detrimental effect on forest was partly due to the large quantities of firewood and construction materials required by the tobacco industry, which was the primary consumer of timber products (Chapter V).

4.5.3 Coffee and Rubber

The cultivation of coffee and of rubber in the Besuki region had strikingly different times of origin. Coffee emerged as one major crop in the region much earlier, before 1870, while rubber by contrast only grew in importance from around 1900. The development of rubber in Besuki was partly stimulated by the coffee crises stemming from combined factors of low prices and disease attacks. This phenomenon was rather different from what

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166 *Laporan Tahun Pembukuan 1966-1967 Bank Negara Indonesia Unit I* (Djakarta: Pertjetakan Negara RI, 1967), p. 224. The highest quantities of tobacco produced in the 1950s and the 1960s in the three regions were in 1965. Besuki was in the first rank with an output of 3,800 tons, followed by Deli (3,300 tons) and the Principalities of Yogyakarta and Surakarta (2,100 tons).
167 Berkout, *De Koffiecultuur*, p. 11.
169 Broersma, *Besoeki*, pp. 3-4, 77-78.
happened in Sumatra, particularly in Serdang, where rubber estates developed as a response to the tobacco crisis. But in a broader context, rubber estates in both places basically responded to the growing market incentives from the rising demand for rubber from the automobile industry. Rubber was believed suitable and to offer a new alternative for the region’s mountain estates, with *Hevea brasiliensis* on most Besuki hill slopes and *Manihot glaziovii* on the drier parts. Rubber joined coffee in the expansion of the agricultural frontier towards the “empty” mountain areas.

Unlike the sugar industry, coffee developed in the remote mountainous and sparsely populated districts of the region as coffee planting required land in the first instance rather than an abundant labour force. Coffee had different environmental requirements for its growth. Coffee preferred newly cleared forest soils, which were usually still rich in organic content. On less rich soils, the crops would grow into poor stands, and would be less resistant and extremely vulnerable to diseases. Coffee had many enemies from root-, stem-, and leaf-attacking fungus, parasites, and bacteria to larvae and borers. With a preference for newly cleared soils, the coffee expansion in most cases meant conversion of more forest lands. This feature represents a classic case of Flannery’s type of frontier. Coffee was already grown in pre-1870 Besuki, but there were only a few major coffee districts, mostly in Bondowoso. They were principally run under state control, a practice that still existed until 1918, despite the replacement of the Cultivation System by the Liberal Policy from 1870.

The development of private coffee estates in Besuki was greatly stimulated by the promulgation of the liberal policy from 1870. Attracted by the extensive uncultivated lands, the Kayumas established coffee estates in the Ijen highland in 1883 and other estates

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176“De Gouvernements koffiecultuur in de Residentie Besoecki”, *Tijdschrift voor Nederlandsch Indië*, 2, 2 (1873), pp. 126-127; ANRI, Archieven Cultures, 298, “Probolinggo, Be佐eki, en Banjoewangi 1867”.
177Tennekes, “De Bevolkingsspreiding”, p. 335.
followed. Elsewhere, in 1891 E. du Bois initiated a coffee estate in the Tanggul district, which became the first private coffee estate in Jember. In the following years, Du Bois expanded his enterprise with new estates in Kalisuko (1893), Sumberayu (1895), and Sumberbulus (1897), whereas De Internationale Crediet en Handels Vereeniging Rotterdam ran Gerengrejo coffee estate, situated between Tanggul and Jember, from around 1896. The coffee estates in Besuki, however, did not stimulate the widespread development of smallholder coffee, as indicated by the fact that unlike tobacco, colonial reports say almost nothing about it. By contrast, in other places in Java such as Probolinggo, Malang, Pasuruan, Kedu, Semarang, and Yogyakarta, and also in Sumatra, such as Lampung and South Sumatra, smallholder coffee grew considerably.

Up to 1870 *Coffea arabica* (also called Java coffee) was predominant. Serious attacks of leaf disease, *Hemileia vastatrix*, on arabica crops between 1880 and 1890 stimulated an increased planting of liberia in the 1890s. *Coffea robusta* later became a better alternative. Imported first by H.H.T. van Lennep in 1901, robusta attracted growing interest among coffee planters. Apart from offering higher yields and more resistance to leaf disease, the other major attraction of robusta was its quicker maturing period compared with the arabica and liberia types. Robusta could give results after three years, whereas it took four years for arabica and five years for liberia. In addition, robusta produced higher yields than the two other types. Robusta, however, obtained lower market prices than arabica. Another disadvantage, known after the experience in 1913, was its lower ability to withstand prolonged drought. In terms of the growing environment, liberia and robusta suited lowlands with an altitude of up to 1000 metres, whereas arabica was more suitable for uplands at an altitude of 1000-1700 metres.

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All three types of coffee continued to develop in Besuki. A number of planters expected the return of golden days for coffee in Java with Liberia and Robusta.\textsuperscript{185} Liberia coffee was cultivated from 1896 in Gerengrejo estate (Jember), which was described as “the most beautiful Liberia estate in the Eastern Salient”.\textsuperscript{186} It also developed in Kalikempit and Purwojooyo estates (Banyuwangi).\textsuperscript{187} More estates, however, tried to make their fortunes with Robusta.\textsuperscript{188} But some planters still kept high expectations of Arabica, believing that its declining output resulted from improper plantings rather than crop degeneration, and that the new varieties of coffee were no better than Arabica. According to their beliefs, improving technical aspects of cultivation was the key to reviving production.\textsuperscript{189} In 1912 Besuki delivered 5,700 \textit{pico} of Liberia coffee, 88,600 \textit{pico} of Robusta coffee, and 42,000 \textit{pico} of Arabica coffee. The last sort originated largely from the Ijen estates.\textsuperscript{190}

The adoption of new varieties, however, was not the only way of overcoming the coffee problems. Some planters tried to make their fortunes with rubber. A rubber estate was first established in Tanggul district by Van Gorsel and Du Bois in 1904, and then spread to various parts of Jember.\textsuperscript{191} In 1907 the rubber estates in Jember were Sumberbulus, Rayap, Klatakan, Duryo, Sentul, Widodaren, Mumbul, Banjing Unjur, Kalimrawan, Kedaton Badean, and Sumberayu.\textsuperscript{192} Similar estates developed in Banyuwangi, where two groups of estates could be distinguished. The first group was located on the slopes of the Raung volcano, including Glenmore, Kalirejo, Kalisepanjang, Kalikempit, Purwojooyo, Kalitelepak, and Manoënmuki estates. The other group, including Jolondoro, Sawojajar, Kendenglembu, Treblasala, and Pagudangan estates, was situated in the southern hills.\textsuperscript{193} In 1910, there were 25 rubber estates in Besuki with an area of 6,200 hectares, or 18 per cent of the rubber area in Java, and ranked as the second largest area

\textsuperscript{185}Broersma, Besoeki, pp. 70-72.
\textsuperscript{186}Broersma, Besoeki, p. 10.
\textsuperscript{188}W.K. Huitema and H.V.A. van Heeteren, Economic Garden at Bogor: Guide and Outline of the Most Important Crops (Bogor-Djawa: Chuo Noozi Sikenzyoo, 2603 [1943]), p. 40.
\textsuperscript{190}Broersma, Besoeki, pp. 71-72, 76.
\textsuperscript{191}Broersma, Besoeki, p. 65.
\textsuperscript{192}“Verslag der Vergadering”, Verslag van het Caouthouc-Congres, pp. 5-8.
\textsuperscript{193}Broersma, Besoeki, p. 65; Rapport inzake de Werkvolkwwestie in Banjoewangi (Weltevreden: N.V. Boekhandel Visser, 1916), pp. 2-5.
after Pasuruan. But there was no smallholder rubber here, as found in Sumatra and Kalimantan. The dominant position of tobacco and rice discouraged farmers from trying other cash crops, and besides, the relatively small land ownership made smallholder rubber less profitable.

Rubber rejuvenated the importance of mountain land cultivation in Besuki. Together with coffee, rubber was the region’s most important crop on mountain estates, whereas cacao and tea were marginal. Apart from monocrop planting of either rubber or coffee, as observed in Bayulor estate for coffee and Bayukidul for rubber, mixed planting was common too. In Jember, this practice was first observed in Gunung Pasang estate around 1907 when rubber was grown as an interplanting on a coffee estate. A similar practice was found in the Kalikempit, Kalisepanjang, Kalirejo, and Manoenmukti estates of Banyuwangi. Other estates such as Kendenglembu and Sawojajar, grew coffee as an interplanting for rubber. The same practice was observed elsewhere in Southeast Asia and other parts of the world. In 1930, coffee and rubber estates formed closed complexes of mountain land cultivations on the southern slopes of the Hyang and Ijen mountains, in the southeastern part of Jember, and the western part of Banyuwangi. Besuki’s rubber and coffee estates made up around 44 per cent and 49 per cent of the respective estates in East Java, exceeding the other mountain estate centre of the Malang residency.

As with other estate crops, rubber and coffee were on the decline from the 1930s. Due to the depression and rubber restriction, the rubber output dropped from 913,000 lbs in

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196 “Banjuwangi Uitvoerhaven, Boven Formasi dan Pasir Putih”, Trompet Masjarakat, 12 March 1951, p. 3.
199 In 1942 the rubber and coffee estates in Besuki were 35,300 hectares and 31,700 hectares. In the Malang residency, the figures were 25,200 hectares and 15,000 hectares respectively. The distribution of the rubber estates in Besuki was as follows: 247 hectares in Bondowoso, 19,717 hectares in Jember, and 15,376 hectares in Banyuwangi. The coffee estates the distribution was: 1,597 in Bondowoso, 13,647 in Jember, and 16,499 in Banyuwangi. Kementerian Penerangan, Republik Indonesia, p. 339.
1929 to 748,000 lbs in 1931. A number of rubber trees were temporarily untapped and a new tapping system requiring the resting of one-third of the productive rubber plants each year was applied. A further decline occurred in the 1940s, although the scale was probably smaller than in Sukabumi and Priangan (West Java), which were described as the worst. In Jember, part of the Kotablater rubber estates was shifted into food crop production. A similar conversion happened to part of the Purwojoyo estates of Banyuwangi. The rubber estates declined from 35,300 hectares in 1942 to 30,100 hectares in 1948. The same trend likely applied to the region’s coffee estates, as observed in Malang. In Banyuwangi, for example, 800 hectares of the Sarongan turned into alang-alang fields.

In the 1950s and the 1960s, there seems to have been little improvement in the mountain estates in Besuki. General observations in Indonesia suggested that in the 1950s coffee production was only between 12-13 per cent of the pre-war production level. The rising output in the 1960s originated primarily from the expanding smallholder coffee, particularly in Sumatra, whereas estate coffee continued to decline up to 1969. In Besuki patchy information indicates the plans for developing smallholder coffee in Wringin (Bondowoso) and Ketajek (Jember). The coffee estates, by contrast, faced some problems. In the early 1940s degradation was observed in some coffee estates. In 1958, part of the Kalijompo coffee estates (Jember) was reported to have turned to uncultivable lands. To rejuvenate coffee estates, it was recommended arabica coffee be planted on

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207 “Production Possibilities of the Estates within the Demarcation Lines in Java and Sumatra”, The Economic Review of Indonesia, 2, 3 (1948), p. 34.
210 Retnandari and Tjokrowinoto, Kopi, p. 16.
211 Spillane, Komoditi Kopi, p. 46.
212 “Rentjana Kebon Kopi Rakjat”, Trompet Masjarakat, 12 March 1951, p. 4; “Djember: Kaum Tani Panti Akan Taman Kopi Sendiri”, Trompet Masjarakat, 27 May 1958, p. 4; different news reported that 72 former militia personnel were granted a coffee garden in the Ijen Highland to manage. “Kebun Kopi dan Bekas Pejuang”, Trompet Masjarakat, 24 September 1951, p. 3.
former coffee areas by employing better cultivation techniques and technological advances. The major reasons for this were the higher prices of arabica, and the closing of coffee frontier expansion towards higher hill slopes. The next section will show how the agricultural technologies developed and facilitated the expansion of the agricultural frontier, thus transforming the environment of Besuki.

4.6 Agricultural Technologies

4.6.1 Irrigation

One major element of the agricultural technologies was irrigation. For the growth of crops water is vital although the water requirement varies from one crop to another. There had been simple irrigation built by Indonesians, but lack of capital, less developed technology, and poor construction materials inhibited them from making extensive and long-lasting investments in this field. A plea for an improved irrigation network was voiced from the Eastern Salient of Java in the 1870s, following the dire consequences of the prolonged drought on agricultural crops. The plea also highlighted contrasting facts: during the rainy season huge amounts of water flowed to the seas, while extensive agricultural fields frequently suffered from a scarcity of irrigation water. Crop failures due to water shortages and drought were part of Besuki’s agriculture.

In response to the pleas, the colonial authorities embarked upon a series of extensive irrigation projects. Such projects basically had two main objectives, namely irrigation and flood control. The major development of the Sampean irrigation project started in 1875 and was completed in 1901, providing irrigation for around 11,000 hectares of agricultural fields. This project brought about a permanent dam, three primary canals and sluice gates in

Another major project was the Bedadung irrigation network in Jember carried out from 1908 to 1919, providing supplies of water for 26,000 hectares of irrigated fields. This project included Bedadung dam near Rawatamtu, three primary canals, two drainage canals and secondary distribution canals. The irrigation projects carried out from 1870 to 1920 supplied water for 51,000 hectares of irrigated fields.

The development of irrigation facilities continued in the 1920s and 1930s. In Jember, the Bedadung irrigation network was perfected with the construction of Bago dam and secondary canals such as Glundengan, Lojejer and Nogosari. Still in the same regency, the West Bondoyudo irrigation network was undertaken between 1922 and 1925, supplying water for almost 5,000 hectares of irrigated fields. This project included the construction of Bondoyudo watervang near Umbul, aquaduct at Tanggul river, Bondoyudo main canal, and a number of primary and secondary canals in various places. A similar development was observed in the Mayang irrigation network undertaken from 1919 to

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221 Verslag over de Burgelijke Openbare Werken in Nederlandsch-Indië over het Jaar 1916 (Batavia: G. Kolff, 1920), pp. 77-79.
222 Verslag over de Burgelijke Openbare Werken in Nederlandsch-Indië over het Jaar 1919 (Weltvreden: Landsdrukkerij, 1922), p. 6.
223 Verslag over de Burgelijke Openbare Werken in Nederlandsch-Indië over het Jaar 1923 (Weltvreden: Landsdrukkerij, 1926), pp. 116-117.
224 Verslag over de Burgelijke Openbare Werken in Nederlandsch-Indië over het Jaar 1925 (Weltvreden: Landsdrukkerij, 1927), pp. 112-119.
1925, providing irrigation for another 11,400 hectares of irrigated fields in Jember.\textsuperscript{225} The projects were partly executed with the help of prison labour.\textsuperscript{226} In Banyuwangi, the development of irrigation facilities included the main Setail canal and secondary canals of Genteng, Wringinrejo, and Pulosari.\textsuperscript{227} Due to the depression, new irrigation projects in the 1930s were fewer and the only major project was the Karangdoro dam in Banyuwangi.\textsuperscript{228} No major project was carried out across the region except maintenance works.\textsuperscript{229}

The development of the irrigation network expanded irrigated fields in Besuki. As shown in Figure 4.3, in a century the irrigated lands in Besuki grew by more than 400 per cent. The expansion was mainly made by converting dry lands, and partly by converting swamps.\textsuperscript{230} From 1870 to 1910 the irrigated lands expanded gradually. A rapid expansion

\textsuperscript{225}\textit{Verslag over de Burgelijke Openbare Werken}, 1925, pp. 122-123..
\textsuperscript{226}The prisoners were recruited from the \textit{afdeeling} prisons in Kasihan and Jember and the district prisons in Karuk, Kapuran, Glundengan, Pondokwaluh, Talang, Wuluhan. In 1922 2,750 prisoners were employed in the construction of irrigation projects, ANRI, "Memorie van Overgave (Voet)", pp. 28, 38-40; ANRI, \textit{Memori Serah Jabatan}, pp. cxxxv-cxxxvi; A. Angloedi, \textit{Sejarah Irigassi [sic] di Indonesia} (Jakarta: International Commission on Irrigation and Drainage, 1984), p. 144.
\textsuperscript{227}\textit{Verslag over de Burgelijke Openbare Werken in Nederlandsch-Indië over het Jaar 1926} (Weltevreden: Landsdrukkerij, 1928), pp. 141-143.
\textsuperscript{228}ANRI, "Memorie van Overgave, 1931-1934", p. 47.
\textsuperscript{229}ANRI, "Memorie van Overgave, Van Romondt", pp. 145-149.
\textsuperscript{230}Illustrations from Jember were Jadukan swamp of Puger drained in 1950-1953, the Tanggal swamp of Kencong drained in 1953. The draining of Jadukan swamp in Puger resulted in 470 hectares of sawah. "Mysterie Rawa Djadukan: Sekitar 245 Keluarga Kehilangan Sumber Hidup", \textit{Trompet Masjarakat}, 27
occurred between 1910 and 1920, when in a decade the irrigated fields increased by more than 40,000 hectares. This decade marked the growing relative proportion of sawah to total cultivated lands after sawah experienced a declining trend from 1870 due to the more rapid expansion in dry fields. The irrigated lands continued to increase by 60,000 hectares during the 1920s and 1930s. This development contributed to boost the proportion of irrigated lands under the colonial irrigation scheme from 16 per cent in 1910 to 52 per cent in 1925, which was relatively high compared with the rest of Java.231

During the Japanese occupation (1942-1945) and the revolution war (1945-1949), however, little effort was made to improve the irrigation system. The only initiative taken in the irrigation sector during the Japanese period, but which failed to be completed, was called the “Sampejan Baru Irrigation Project”.232 During the 1950s and 1960s the irrigation improvements remained limited.233 The real situation might have been somewhat gloomy. It was reported in 1971 that the region’s irrigation network could not serve its maximum capacity due to sediment build-up, poor network maintenance, and decreasing water discharges, besides illegal tapping by farmers from main channels. During the rainy season the network could supply only 60-70 per cent of the irrigated lands in Situbondo and Banyuwangi, and 80-90 per cent of the irrigated lands in Bondowoso. However, during the dry season the capacity dropped to only about 5-20 per cent.234

Despite the fluctuating pace of expansion, it is clear that between 1870 and 1970 irrigation technology played an important role in transforming the environmental realities of Besuki. More irrigated lands were brought into existence and it became possible to use agricultural lands more intensively with a new pattern of crops differing from that of dry

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231 Van der Eng, Agricultural Growth, p. 53.

232 According to the plan designed on August 1944, the government would allocate a total fund of f 700,000 for financing its execution. The construction began on August 1944 and was to be finished in one year. “Pembikinan Pengairan Sampejan Baru”, Soeara Asia, 17 August 2604 [1944], p. 2.


agriculture. The use of irrigation reduced the crop failures stemming from poor supplies of water and prolonged droughts. Van der Elst indicated that the proportion of rice harvest failures in Besuki was 1.10 per cent for 1914-1923, whereas the figure for Java overall was 7.23 per cent.\footnote{Van der Elst, “Krisis Budidaya Padi”, pp. 158-159.} This confirms the suggestion that the region offered good soils for agriculture as long as irrigation was available. From an environmental perspective, the establishment of the irrigation networks modified the natural environment, creating a different habitat for wildlife. This changing environment brought notable consequences for pest and disease environments and the lives of the region’s inhabitants (Chapter VII).

4.6.2 New Crop Varieties and Agricultural Techniques

Besides irrigation, the adoption of new crop varieties was part of the agricultural technologies. In food crops, the best illustration is rice. A 1907 report revealed that farmers in Banyuwangi grew rice varieties imported from Java in the last decade, which was locally called \textit{pèlăng pitoelang} in Banyuwangi district and \textit{mambang} in Rogojampi district\footnote{Onderzoek naar de Mindere Welvaart, 7 (14), p. 21.}. In the 1920s it was reported that the region’s agricultural service supplied better rice seedlings required by farmers\footnote{ANRI, \textit{Memori Serah Jabatan}, pp. cxxvi-cxxvii.}. Apart from providing higher yields, the acceptance of new rice seedlings by farmers was partly made in the context of fighting diseases. Around 1930 there were four popular rice varieties in the region\footnote{They were \textit{sarkuning}, \textit{ketumbar}, \textit{jarbatu}, and \textit{darmayu}. “Pertjoba’an Pantoen ing Doesoen Nangkaan (Bondowoso)”, \textit{Sinar Tani}, 5, 1 (1930), p. 1.}. In the late 1960s, higher yielding and disease resistant varieties became one key component of the Green Revolution designed to promote rice production.

The most widely reported case of the adoption of a new rice variety in the pre-Green Revolution era was \textit{Bengawan}. This variety was a crossbreeding of Chinese rice varieties with Latisail rice from India, and Benong rice from Indonesia. In the 1950s, farmers in Besuki were reported to have enthusiastically adopted this variety after the then major variety called Hoing suffered badly from the \textit{mentek} disease. From Panarukan the cultivation of \textit{bengawan} rice expanded through all regencies in Besuki\footnote{“Dari Nihil Menjadi 5,000 Hektare”, \textit{Trompet Masjarakat}, 1 August 1951, p. 4; “Bengawan akan Mengganti Ho Ing”, \textit{Trompet Masjarakat}, 11 January 1952, p. 3; “Besuki Pusat Persediaan Bibit Bengawan”, \textit{Trompet Masjarakat}, 31 May 1952, p. 3.}. In 1950 the variety was grown in two regencies only: Panarukan (800 hectares) and Banyuwangi (600 hectares). By 1953, it was found in Bondowoso (1,500 hectares), Panarukan (8,000 hectares).
hectares), Jember (3,700 hectares), and Banyuwangi (6,500 hectares). In 1955, in Jember alone the cultivation of bengawan rice reached more than 55,000 hectares. With its superiority against mentek-disease and higher yields, bengawan immediately became the major rice variety grown in the residency.

Trials with new crop varieties also applied to estate crops. In response to growing attacks by leaf diseases on arabica coffee, planters in Besuki experimented with liberia coffee from around 1890 and robusta coffee from the early 1900s. Robusta coffee included several varieties such as Quillou, Canephora, and Uganda: among the planters in Besuki, Quillou and Uganda varieties obtained special attention. Meanwhile, the rubber of Hevea brasiliensis type was adopted to replace the low yielding varieties of rubber such as Castilloa elastica and Ficus elastica. From around 1920 rubber plants obtained through inoculation, combining young seedlings with twigs taken from mature trees, were increasingly in use in Java, including Besuki, as also observed in Sumatra, Malaysia, and Sri Lanka. The establishment of the Besuki Research Station in Jember in 1911 played a vital role in the selection of better seedlings and cultivation techniques for estate crops.

Besides coffee and rubber, the Besuki Research Station made great achievements in tobacco technology. Among them was hybrid tobacco, a crossing of Kedu and Deli types. The hybrid 362 developed in 1931 and hybrid 382 developed in 1934 became the major varieties grown in Besuki in the 1960s. The adoption of the hybrid tobacco, however, also led to biodiversity loss. One observer notes in the early 1970s that a variety of local tobacco was no longer found, including krungsung tobacco in Lumajang, west of Jember.

In the case of sugar, from the 1920s more areas in Besuki as elsewhere in Java

241 "Tanaman Padi Rendeng Turun 0.16 \%, Trompet Masjarakat, 28 April 1954, p. 2.
242 Broersma, Besoeki, pp. 74-75.
243 Broersma, Besoeki, p. 77; it is believed that Ficus elastica was indigenous to Java and several places in Southeast Asia. Ottolander, “Plantensoorten”, pp. 17-19.
245 Broersma, Besoeki, pp. 49-52.
248 The loss of local tobacco was also observed in other places: Chlorina tobacco in the Principalities of Surakarta and Yogyakarta, tobacco varieties of Jeki, Gagang Cantel, Sembung Lenga in Jombang, and Siluk and Gagayam varieties in the other parts of Java. Auzay Hamid, “Inventarisasi Tembakau Asli Indonesia”, Pemberitaan Lembaga Penelitian Tanaman Industri No. 14 (Bogor: 1974), p. 6.
were planted with POJ 2878, popularly known as a wonderful cane with its high yields and resistance to *sereh* and other diseases.²⁴⁹

Apart from the use of seedlings, technical aspects of crop cultivation also improved. Deep tillage gradually replaced shallow tillage, the only kind possible with Javanese style ploughs. The deep tillage was regarded as beneficial to crops by alleviating soil compaction, creating broader space for root systems and by incorporating nutrients into the soils, and thereby promoting increases in output.²⁵⁰ The danger was that it could break the pan layer, boosting soil leaching.²⁵¹ This kind of soil preparation became possible with the growing adoption of European-style ploughs from around 1900. As reported elsewhere in Java, where deep tillage increased rice output, in Besuki Resident van den Bergh van Heinenoord also remarked in 1907 that deep tillage was good for tobacco and had advantages for rice crops.²⁵² A 1923 report revealed the distribution and the growing use of European ploughs and hoes among farmers and western estates in Jember, Banyuwangi and Bondowoso.²⁵³ The use of tractors for sugarcane soil preparation was also observed in 1927.²⁵⁴ In smallholder agriculture, the use of tractors began from 1952 in Kotablater (Jember) and later developed in Wongsorejo (Banyuwangi) and Asembagus (Panarukan), where dry land preparation with manual labour was very difficult.²⁵⁵

A similar progress had taken place in planting techniques. Major advances were particularly observed in estate agriculture. The sugar estates spent much effort in this field to boost sugar yields due to the constraints of the soil. In the early twentieth century the

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²⁵³*Jaarverslag van den Landbouwvoorlichtingsdienst over 1923* (Weltevreden: Landsdrukkerij, 1924), p. 126.


Cuban Reynoso system was adopted. This system was combined with clean weeding and in Java the use of herbicides was already on trial from 1948. More tests, including in Jatiroto, west of Jember, were undertaken in the 1950s and further intensified from 1964. In East Java the application of herbicides was recommended both for pre-and post-cane planting. On mountain estates, however, clean weeding, which was initially considered good for reducing root competition, was abandoned. In the 1930s clean weeding was believed disastrous because it led to soil degradation through humus burning and poor roots from direct sun exposure, and also to soil and nutrients washing away with rainwater. Like clean weeding, the use of herbicides also had detrimental effects on the environment. Their application led to the untargetted plant and weed removal needed by other herbivores, and other problems including erosion, pollution, and contamination. But until around 1970 such consequences apparently remained a marginal issue in the region.

In food crop agriculture, new agricultural techniques also emerged. Introduced by officers of the Agricultural Extension Service not long before the Japanese invasion, the larikan (checkrow) system was encouraged in the 1940s and after, to replace random planting. With the new system, paddy was grown in a prescribed line spacing kept with a marked rope or bamboo pole. Besides allowing paddy crops to obtain enough sunlight, the larikan planting made weeding faster and easier, especially with the adoption of the

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weeding implement called *landak* model. Before this development, early weeding practice in Java as a whole was poor. In 1953/1954, rice cultivation employing the *larikan* system was reported to cover 4,300 hectares and in the following year, it grew to 10,700 hectares. The system seems to have been more common in the 1960s.

Soil management also called for growing attention, as in many parts of the region the agriculture operations entered what Boserup called the multi-cropping stage. The soils became more vulnerable to exhaustion with the more frequent plantings. It is difficult to ascertain when manurial techniques were first adopted, but fertilizing technique with manure and compost in the region’s coffee gardens was already observed in the mid-1880s. A number of plants grown as shade trees for windbreaks and erosion prevention also increasingly served a fertilising function. In Besuki, C.A. Was, an administrator of the Taman Glugah estate, Banyuwangi, noted that *Tephrosia* was among the best green fertilizers of its kind. Like *Leucaena glauca*, *Tephrosia* served well as a nitrogen-binding agent. According to the administrator of the Bayulor estate, G.G. Schrieke, *Tephrosia* had other major advantages: less pruning was required and it was less demanding in terms of soil requirements.

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265 In April 1955 the rice area adopting the *larikan* planting system was 4,500 hectares in Bondowoso, 3,100 hectares in Jember, and 3,100 hectares in Panarukan. “Pertanian Daerah Besuki”, Trompet Masjarakat, 13 April 1955, p. 2.
267 Around 1900 all irrigated fields in Jember were reported to have been utilized for dry season cultivation; only few dry lands especially in Puger and also most irrigated lands in Banyuwangi were left fallow. In Bondowoso dry fields were more intensively utilized without a fallow period among two plantings, whereas in Panarukan secondary crop cultivation on dry lands was reported to have immediately followed the first crop. *Onderzoek naar de Mindere Welvaart*, 5 (14), pp. 7, 9, 37.
269 Among the plants were *Erythrina lithosperma* (dadap), *Albizia molucana* and *A. stipulata*, and *Leucaena glauca*. Hagen, *De Koffiecultuur*, pp. 43-46, 52-53; except *L. glauca*, these plants together with several others were also mentioned by Van Gorkom, *De Oost-Indische Cultures*, pp. 284-288.
In the 1920s the rubber estates in the region also adopted *Centrosema pubescens* as ground cover and so did the coffee estates.\(^{272}\) This plant sustained longer and better growth under the shade of the increasingly old estate trees.\(^{273}\) In smallholder agriculture, around 1900 the planting of *Phaseolus lunatis* (kratok) for improving *tegalan* soils was observed in Panarukan, Jember, and Banyuwangi. Similarly, the European planters in Jember adopted the plant to rejuvenate the soils used for tobacco nursery beds.\(^{274}\) Resident Neys in 1929 stated that compost was used by the Madurese farmers for fertilizing *tegalan* and some of the farmers also began adopting *Crotalaria juncea*.\(^{275}\) The latter plant was reported to have been increasingly popular in Bondowoso and Jember regencies.\(^{276}\) The application of manure and compost was further encouraged by the Japanese (1942-1945).\(^{277}\)

One major advance in the fertilizing technique, however, was the application of chemical fertilizers. The intensive nature of the sugar estates, resulting from sugarcane’s integration with food crop production, made them the first party to have serious concerns on those issues. The application of nitrogen, phosphate and potassium fertilizers on sugar estates in Java had been observed from around 1900.\(^{278}\) In the 1960s, sulphate of ammonia (ZA) was applied in all sugar estates in Java and some of them even added phosphate.\(^{279}\) Trials with ZA and sulphate of potassium (ZK) were found in Lijen and Sri Wuling estates in 1928.\(^{280}\) Similar trials subsequently took place in other rubber estates in Jember and Banyuwangi, such as Bandjarsari, Kalibaru, Kalimrawan, Widodaren, Glenmore, Sukokulon, Kalitelepak, Pagger Gunung, and Kalirejo.\(^{281}\) From the mid-1930s,

\(^{272}\) The plant was reported to have been found in the estates of Banjarsari, Kalibaru, Kalimrawan, Widodaren, Glenmore, Zeelandia, and Kalitelepak. L.R. van Dillen and W. Snoep, *Heveabemestingsproeven in het Ressort van het Besoekisch Proefstation* (Buitenzorg: Archipel, 1931), pp. 311-323; Uiltée, “De Proeftuin”, p. 8.


\(^{277}\) “Rabuk Kompos”, *Soeara Asia*, December 6, 2602 [1942], p. 4; “Wadah Larahan”, *Warta Besoeoki-Shuu*, 8 November 2604 [1944].


\(^{281}\) Van Dillen and Snoep, “Heveabemestingsproeven”, pp. 311-326.
the tobacco estates extended the application of potash saltpetre for crops on fields, not only on nursery beds.282

Some of the Indonesian farmers in the region as elsewhere in Java seem to have started applying chemical fertilizers, following the campaigns launched in the 1920s to promote its application for rice planting after sugarcane.283 In the late 1950s more farmers became familiar with chemical fertilizers, resulting from the campaign of fertilizer application encouraged through a series of agricultural contests.284 A survey carried out in the early 1970s found that in Bondowoso and Panarukan, 57 per cent of farmers already made use of chemical fertilizers for rice planting.285 Attention had also been paid to various aspects of fertilization, including type, dosage, timing, and method in their connection with different localities and crops.286

There were also changes in ways of fighting crop pests and diseases. The mechanical method was gradually combined with chemical ones. In the early 1900s, phosphorous poison was applied by the estate planters of Banyuwangi to exterminate wild boar.287 In 1927, the coffee estates used calcium cyanide for eradicating ants and worms.288 From 1933 a poisoning campaign with phosphorous paste was launched in the fight against rats. The measure was widely adopted by the sugar estates during the independence time. From 1965 the use of helicopters in the chemical campaigns against sugar cane pests was on trial.289 Among the Indonesian farmers, the chemical method was also adopted although remained limited due to financial consideration.290 In Besuki, farmers became increasingly familiar with pesticides in the fight against crop pests and diseases, in spite of the

287“Ziekten en Plagen”, p. 67; Onderzoek naar de Mindere Welvaart, 5 (14), p. 43.
sustaining mechanical method (gropyokan) in the 1950s and the 1960s.\textsuperscript{291} In 1971, 54 per cent of farmers in the Pekalen-Sampean irrigation area were reported to have applied pesticides when planting rice.\textsuperscript{292}

Besides the benefits in terms of crop output increases, the use of chemical fertilizer and pesticides must have had negative impacts on the environment of Besuki. Unfortunately, these problems have gone unnoticed in most of the region’s historical accounts, probably indicating the limited scale of such impacts or poor concern with the problems among the regional officials. But observations by J.W. van Dijk in 1948 indicated that in Java the application of ammonia fertilizer to irrigated rice had disastrous impact on fish populations.\textsuperscript{293} Only from the early 1970s were the detrimental effects of the use of chemicals on the region’s agricultural environment reported.\textsuperscript{294} This development was part of the growing concerns among the conservationists about the environmental impacts resulting from the increased use of chemicals under Indonesia’s Green Revolution program.

4.7 Conclusion

This chapter has shown that during 1870-1970 the development of smallholder agriculture and estate agriculture, together with the raising of livestock, altered the environmental realities of Besuki. The early form of natural vegetation was removed and permanently replaced by a human-made agricultural landscape. Both the Indonesian farmers and the European estates played a role in the process. The environmental transformation took place in many areas of the region, but most remarkably during the time period under consideration in Jember and Banyuwangi. In a century over 330,000 hectares of farm fields were newly established, while until 1942 the mountain estates in Besuki covered almost 70,000 hectares.\textsuperscript{295} Assuming that there was no expansion of plantation agriculture after 1942, around 1970 the human-made agricultural landscape had grown by 400,000 hectares.

Not only did the human-made agricultural landscape expand considerably, a greater diversity of crops was grown as well. These crops equipped both the Indonesian farmers and the western planters in their advance towards a new agricultural frontier and in their

\textsuperscript{291}Onderzoek naar de Mindere Welvaart, 5 (14), p. 43; “Djawatan Pertanian Kekurangan Rabuk”, Trompet Masjarakat, 19 October 1955, p. 4.

\textsuperscript{292}Harza Engineering Company International, “Proyek Irigasi Sampean Baru”, p. D-35. Some farmers continued to apply their own pesticides made from mixing petroleum and herbal poisons.


\textsuperscript{294}Hadi, “Gelora Pembangunan”, Appendix II; Suparmoko, “The Impact of Irrigation”, p. 252.

\textsuperscript{295}Kementerian Penerangan, Republik Indonesia, p. 339.
adaptation to the changing environment. The role of tobacco in facilitating the expansion of
the agricultural frontier to the “nearly empty” areas of Jember from around 1870, was
followed by rubber from the 1900s, which extended cultivated land to the ‘nearly empty’
areas of Banyuwangi. The earlier crops, coffee and sugar, were part of the advances too.
Together with rubber, coffee moved towards the higher slopes of the mountains and altered
the natural vegetation into a human-made mountain estate landscape. Meanwhile,
sugarcane joined tobacco and rice in transforming the lowlands of Jember from the 1920s.
Maize equipped the Madurese in their advances towards dry lands and aided the irrigated
land farmers as an alternative crop in their seasonal adaptation to the dry season, while
cassava provided a means of adaptation to the degraded soils. The adoption of diverse crops
was one of the major factors that increased the people’s ability to adapt with the new
agricultural environments, to create diverse frontiers within agricultural frontier, and to
become a prime mover of environment change.

The agricultural development in Besuki shows several frontier characteristics such
as “empty” lands, expansion for natural resource use, waves of migration, and international
market involvement. These characteristics applied to both estate and smallholder crops
especially tobacco, sugar, rubber and coffee, and partly to maize and rice. With decades of
expansion and diverse crop cultivation taking place from 1870, the opportunity for
expansion in the agricultural land frontier in Besuki was practically closed in the 1950s.
This development had various detrimental effects on the environment such as soil
exhaustion and deforestation. However, it did not necessarily mean that frontier expansion
was always identical with “wasteful production methods” and “an exploit-and-move-on
mentality”. The case of the estates and to a certain degree the Indonesian farmers in
Besuki indicates that they also had an interest in environmental sustainability through
adopting environment-saving technologies. Moreover, unlike in the case of America, in
Besuki there were no successive frontiers. Most migrants were primarily attracted to exploit
the region’s uncultivated lands. The next chapter will show that forest exploitation was also
closely linked to the demands from the agriculture sector.

296 Freerk Colombijn, “The Ecological Sustainability of Frontier Societies in Eastern Sumatra”, in Peter
Boomgaard, Freerk Colombijn, and David Henley (eds), Paper Landscapes: Explorations in the
5.1. Introduction

The pre-1870 Besuki region seems to have been overwhelmingly a forested landscape. Even in Banyuwangi, until the 1890s only about 4 per cent of the arable lands had been brought under cultivation. Despite this fact, from circa 1870 the region’s forest frontier was pushed back at an increasingly greater rate. As shown in the earlier chapters, the expanding settlement and agricultural frontiers had become major forces behind the process. By 1930 only 39 per cent of the land surface of Besuki remained under forest cover, even though the region was still ranked as the largest forested area in Java (Map 5a). The two factors, however, were not the only causes of the shrinkage in forest cover and the changing environmental realities.

Map 5a. Land Use in Besuki around 1930 (Tennekes, 1963: 402)

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2In 1930 the acreage of forest in Besuki was 396,00 hectares, followed by Priangan with 280,300 hectares. W. Zwart, "De Boschoppervlakte van Java en Madoera", *Koloniale Studien*, 23 (1939), Table Appendix.
This chapter argues that the extraction of forest resources exerted significant influence on the forest environment of Besuki. Its significance as an environment-changing force, however, had often been overlooked or only implicitly recognised in the existing studies, which focus mostly on political and socio-economic aspects of Indonesian forest exploitation. There are a few exceptions, including articles by Peter Boomgaard, Lesley Potter, Bernice de Jong Boers, and recently published works by Han Knapen and David Henley. Knapen shows that in Southeast Borneo, increased extraction of timber, especially ironwood, led to its depletion in accessible areas, and hunting activities played a decisive role in bringing several animal species to extinction. On North and Central Sulawesi, Henley argues that supplies of ebony and sandalwood in the natural forest were depleted from commercial logging. All of these studies, however, focus on the outer islands of Indonesia and none have focused on Java, Besuki in particular.

The present chapter elaborates the expansion in and closure of Besuki’s forest exploitation frontiers. The extraction of forest resources in the region had long taken place, but from circa 1870 it grew on an increasingly large scale. There were diverse products exploited both in the teak and jungle wood forests, induced by the rising market demands for forest products and the gradually improved extraction technologies. As shall also be shown, the extractions not only radically impacted on the resource supplies, but also left their strong mark in the region’s forest environment, both in its vegetation and wild animal populations. Before examining the issues, a description of the forest environment of Besuki is presented. This section is followed by a discussion of teak and jungle wood exploitations, including responses to the depletion of resources, and also hunting activities. Special attention is also paid to the human impact on both flora and fauna of the region.

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1 For a good example of socio-political study on the forest of Java, see Nancy Lee Peluso, Rich Forest, Poor People: Resource Control and Resistance in Java (Berkeley: University California Press, 1992); regional studies focusing on socio-economic aspects of the forest exploitation in Java are for example, Warto, Blandong: Kerja Wajib Eksploitasi Hutan di Karesidenan Rembang Abad ke-19 (Surakarta: Pustaka Cakra, 2001); Desak Made Oka Purnawati, Hutan Jati Madiun: Silvikultur di Karesidenan Madiun 1830-1913 (Semarang: Intra Pustaka Utama, 2004).


5.2 The Forest Environment

The forest of Besuki is quite distinctive compared with the western parts of Java with their tropical rainforest vegetation. The Besuki region has a predominantly monsoon vegetation. This type of forest naturally develops in areas with seasonal rainfall and a prolonged dry season. The number of flora species in Besuki was smaller than that of the western parts of Java, resulting from the fewer rain-forest species parallel with a trend of decreasing rainfall from west to east across the island of Java. But the region is richer in terms of vegetation types than many other parts of Java, as represented in the Meru Betiri complex. There are also floristic species native only to the region, including *Rafflesia zollingeriana* and *Duabanga moluccana*.

One characteristic of the monsoon forest is the strong climatic influence on its growth. During rainy seasons, the forest is green, whereas the whole or part of it loses its leaves during dry seasons. According to Tony Whitten *et al.*, dry monsoon vegetation covers the northern littoral of the region, while moist monsoon vegetation stretches from the south of the northern littoral to the south coast, including the Purwo-Blambangan region. In West Blambangan, M. Jacobs found 13 of the 24 species typical of monsoon forest. Teak (*Tectona grandis*) had been the most highly valued and it was said to occur naturally only in Baluran.

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Due to the dryness and regular burnings, vast areas of the “forest” resemble a savannah landscape with some scattered shrubs and tree stands. Such a feature is found in the Baluran area. 14 It was also found in south Banyuwangi and the Ijen highland,15 and in the Hyang highland, which with its surroundings were depicted by J. Loogen as “a paradise”.16 In north-west Baluran, the major grass was Andropogon species, but in other places Imperata cylindrica was present.17 In addition, there were bulb, tuber, and rhizome-producing plants, including the popularly valued famine food, Dioscorea hispida (gadung).18 The major stands were Acacia leucophloea, Borassus flabellifer, T. grandis, and other stands as listed by F.J. Appelman and A. Hoogerwerf.19

Parts of the forest took the forms of evergreen and semi-evergreen rain-forest, as observed in the Ijen and partly the Hyang mountain complexes.20 The soaring volcanoes created what C.G.G.J. van Steenis called “wet pockets”, in contrast to the drier northern slopes.21 In these pockets evergreen and semi-evergreen vegetations developed, with big trees which were evergreen, including the highly valued Pterospermum sp., Artocarpus elastica, Anthocephalus cadamba, and Tetrameles nudiflora.22 Bamboo was abundant, forming comparatively dense clusters on plains and mountain slopes.23 Smaller parts of the

14P. Bleeker, “Fragmenten eenen Reis over Java: Reis door Oostelijk Java”, *Tijdschrift voor Nederlandsch Indië*, 2, 2 (1849), p. 133.
forest were composed of coastal, mangrove and swamp vegetation. The coastal vegetation was observed in Baluran and along the south coast of Banyuwangi and Jember.\(^{24}\) The mangrove vegetation occurred especially in Grajagan and Pampang, with minor occurrences in other bays and estuaries.\(^{25}\) Stretches of mangrove covered the Baluran complex, from southeast to northwest.\(^{26}\) Meanwhile, swamp forest occurred in south-west Jember, with spots observed in the Baluran area too.\(^{27}\)

In terms of fauna, Besuki was part of the Sunda sub-region together with other parts of Java, Kalimantan, Sumatra, and the Malay Peninsula.\(^{28}\) The large herbivores were wild oxen (\textit{Bos javanicus}), deer (\textit{Cervus timorensis}), and wild boar (\textit{Sus scrofa}). Wild oxen were found in the Baluran and Meru Betiri areas.\(^{29}\) J. Beete Jukes described the extreme corner of East Java as abounding in wild boar, while Franz Junghuhn called the region’s forests home to wild boar.\(^{30}\) J. Hageman found the same features in Puger as P. Bleeker did for Baluran.\(^{31}\) Part of the region’s deer paradise was the Hyang highland.\(^{32}\) The major carnivores were Javan tiger (\textit{Panthera tigris}), leopard (\textit{Panthera pardus}), and wild dog (\textit{Cuon alpinus}). Savannah was the favourite place where these predators searched for prey. The abundance of tigers was widely reported. The forest of Banyuwangi was depicted as

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\(^{26}\)They were found in Tanjung Bedi, Seruntuh, Popongan, Bama, Balanan, Masigit, Labuhan Merak, Bilik, and Gatal. Soedarmadji, “\textit{Analisis Vegetasi Hutan Mangrove di Taman Nasional Baluran}”, Research Report (Jember: Pusat Penelitian Universitas Jember, 1994), p. 13.

\(^{27}\)Backer and Van den Brink, \textit{Flora}, 2, p. 10.


housing many tigers and so was the Tanjung Jangkar (Panarukan). P.P. Roorda van Eysinga stated in 1850 that tigers often appeared in the villages of Jember. The region’s swamps were the habitat of crocodiles. Crocodiles were present in the swamp forest of Puger, and used to be found in the mangrove areas of Baluran and the swamps and estuaries of Banyuwangi. In general, J.C. Koningsberger noted many crocodiles inhabiting river estuaries of Java. There was a great variety of birds too. Franz Junghuhn and F. Epp mentioned the occurrence of the hornbill in separate places, while Hageman noted that the forest of Puger housed peacock and jungle fowl. Later reports provided details of more bird species in various parts of the region. An estimate suggested at least 180 bird species living in the Meru-Betiri complex and 147 species in the Baluran complex. The next sections will elaborate the ways in which the extraction of forest resources developed and altered the state of the forest in the Besuki region.

5.3 The Exploitation of Teak

Teak had long been the most valuable timber, its remarkable strength, flexibility, and durability under changing weather conditions being highly valued. For ship-building, for example, teak was considered excellent with its high salt water resistant quality. For construction and fuel wood, teak was also considered very valuable. The quest for teak had been an integral part of the Dutch colonial expansion. Timber was required by the

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Dutch for multiple purposes such as ship-building, construction, and fuel. Across the Indonesian archipelago, it was only on the island of Java, especially Central and East Java, that the teak forest grew at its best.

Natural teak forest was also found in Besuki. Around 1800, Resident W.H. van Ysseldyk mentioned the teak forest of Sumberwaru. Hageman reported hundreds of hectares of teak forest in Puger (Jember), while Epp mentioned its occurrence in Banyuwangi. In 1871 there were around 1,500 hectares of teak forest in the Besuki residency, excluding Banyuwangi which remained unknown due primarily to economizing measures and lack of personnel. J.W.H. Cordes in 1881 estimated a further 1,500 hectares of teak forest in Banyuwangi. The region’s forest was managed as one forest district together with Probolinggo. In 1897 the Besuki forest district was formed as one of the 33 forest districts of Java and its coverage area was stipulated in 1907.

Based on the 1865 Forest Ordinance, the teak forest in Besuki as elsewhere in Java was exploited under the regulated felling block system. The exploitation was run by private contractors with paid workers who replaced the earlier state logging carried out with forced workers (blandongstelsel). The exploitation right was granted by the colonial authority and designated through public bid. Once granted the rights, the holders had an obligation to make payment for the contract value of the logging block and retribution determined on a volume basis. Under the 1897 Forest Ordinance, other logging operations were

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43Soepardi Poerwokoesoemo, Jati Jawa (Tectona grandis Linn) (Jakarta: 1956), pp. 43, 46.


47Cordes, Hutan Jati, pp. 222.

48Poerwokoesoemo, Jati Jawa, p. 37; “Besluit van de Gouverneur Generaal van Nederlandsch-Indië van 22 July 1907, no. 10”, Staatblad van Nederlands-Indië over het Jaar 1907 (Batavia: Landsdrukkerij, 1908). It was stated that the forest district of Besuki covered all forest in this residency, and also included forest of Kangean District, Sumenep regency, Madura.


introduced, broadly grouped under unregulated logging (that included logging on license and logging on instruction), together with self-managed logging by the Forestry Service.\textsuperscript{52}

The early teak exploitation areas in Besuki were in the region’s northern districts, such as Bungatan, Binor, Besuki, Panarukan and Sumberwaru. In 1881 Cordes noted that across these districts there were only small remnants of the natural teak forest, while the neglected teak forest growing on the hills hardly contained valuable construction timber. Although it contained bigger and better quality timber, the teak forest of Puger remained unexploited due to the problem of transportation.\textsuperscript{53} It was reported in 1876 that due to the shortage of teak, bridge construction in Besuki needed to import teak from other places and partly replaced it with coconut stems.\textsuperscript{54} With the improvement of transport facilities, the teak forest of Puger was only exploited from around 1896, run by the Kepel-Serut firm. Another teak exploitation venture in the region was the Bungatan firm.\textsuperscript{55}

Around the same time the teak forest of Banyuwangi remained unexploited. Major obstacles for its exploitation were poor transport and small population size.\textsuperscript{56} The mountainous and forested landscape caused the area to remain relatively isolated. It was only after the completion of the railway from Jember to Banyuwangi in the early 1900s and the subsequent secondary lines in the 1910s that the exploitation of teak became feasible. Parallel with the transport development, there emerged optimism about the possibilities of expanding teak exploitation and of converting the jungles and grass-covered lands of the Rogojampi district into teak plantations.\textsuperscript{57} From around the 1910s the teak in Banyuwangi began to be cut down.\textsuperscript{58} In the 1930s the logging of teak was reported to have run at a greater pace, with an average annual felling of 9,000 m\textsuperscript{3}.\textsuperscript{59}

The felling of teak in the Besuki region seems to have been similar to that adopted by the Dutch colonial authorities in Java in general. Teak was exploited with a clear felled-block system. The clear felling method had been commonly employed in teak exploitation

\textsuperscript{52}Verslag van den Dienst van het Boschwezen, 1900, p. 135, 138; Hardjodarsono and Pramoedibyo, Sejarah Kehutanan, 1, pp. 80-81.
\textsuperscript{53}Cordes, Hutan Jati, pp. 221-222.
\textsuperscript{54}ANRI, Arsip Residensi, Besuki 9.7, “Algemeen Verslag van Residentie Besoeki, 1876”.
\textsuperscript{55}W.H. van der Haas, “Het Nieuwe Boschreglement”, De Indische Gids, 12, 1 (1903), p. 877; in 1900 it was reported that they paid f 14,352 for the contract values and f 2,188 for plot retributions Verslag van den Dienst van het Boschwezen, 1900, p. 135.
\textsuperscript{56}Verslag van den Dienst van het Boschwezen, 1900, pp. 133, 136-137.
\textsuperscript{57}Verslag van den Dienst van het Boschwezen, 1900, pp. 136-137.
\textsuperscript{58}The exploitation was indicated by an auction for the teak stored in Benculuk depot (Rogojampi). “Lelang Kajoe Djati”, Pewarta Soerabaia, 22 December 1914, p. 3.
\textsuperscript{59}ANRI, “Memorie van Overgave van den Resident van Besoeki, Ch. A. van Romondt over de periode 30 Januari 1935-26 Februari 1938”, p. 181.
after 1865, replacing the earlier selective felling. The felling normally took place during the dry season due to transport considerations. Moreover, the felling was a lot easier when the teak was dry. When it had a high water content, teak was harder to cut down and an ax would easily lose its sharpness. At least six months before being felled, the teak was ring-barked to release its liquid contents. This practice was done at the beginning of the rainy season, which was the right time to accelerate the dryness of the teak. The ringbarking of the teak was also useful to obtain more stable and durable timber.

The loggers employed in the Besuki region were in part locally recruited, particularly in its more densely populated parts. But in Banyuwangi they mostly came from outside, especially from Kediri and Madura. The small population size and relatively large average land ownership were reported to have discouraged the local people from searching for additional employment outside their own farms. In the felling sites, loggers lived in temporary cottages, which were usually fenced to protect them at night from attacks by tigers and other wild animals. The transport of teak in Besuki was probably similar to the practice found elsewhere in Java (discussed in Section 5.7).

The teak product was broadly divided into two categories, construction wood and fuel wood. The demands for teak came from different parties. The major users of teak and other timber products were the tobacco and sugar industries in the region. The other party was the railway service, demanding large quantities of teak for sleepers. Resident Ch. A. van Romondt stated that the annual teak deliveries were about 2000 m³ to the Surabaya-Gubeng state railway workshop, and 2,000 m³ of sleepers to the Staatspoor Magazijn in Madiun. The demands for teak occasionally came from other government agencies.

The depletion of the natural teak forest stemming from the continuing exploitation already raised concerns before 1870. Attempts were made by the Dutch to overcome the dwindling teak supplies. Recorded as early as 1839, the plantings of teak in Besuki together

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61 Cordes, Hutan Jati, pp. 57-58.
64 By 1938 the teak exploitation in the region delivered 12,923 m³ construction wood and 23,880 m² firewood, Verslag van den Dienst van het Boschwezen in Nederlandsch Indië over het Jaar 1938 (Buitenzorg: Archipel, 1939), Bijlage 23.
65 Hardjodarsono and Pramoedibyo, et al., Sejarah Kehutanan, 1, p. 133.
66 ANRI, "Memorie van Overgave (Van Romondt)", p. 181.
67 Verslag van den Dienst van het Boschwezen, 1900, pp. 136. In 1900, for example, the Forestry Service in Besuki supplied 113 m³ of teak to the Department of Public Works.
68 Cordes, Hutan Jati, pp. 221, 262.
with Probolinggo, area ranged from 76,000 to 931,000 trees in the early 1860s.\textsuperscript{69} From around 1870, a contractor obtaining the right of felling was obliged to clear tree stumps left on the sites before returning the felling block to the head of the forest district, had the responsibility of organizing its replanting. In Puger the replanting was done through natural regeneration (\textit{natuurlijke verjonging}), which was considered by Cordes less costly.\textsuperscript{70} This method meant “to create teak forests by saving and stimulating the maximum amount of young growth before and after the clear felling of a parcel of land”.\textsuperscript{71} There were also new teak plantings, for example in the districts of Wringin, Jember, and Sukowono.\textsuperscript{72} In the newly established teak areas, artificial regeneration (\textit{kunstmatige verjonging}) was applied.\textsuperscript{73} Between 1870 and 1929 the plantings of teak in Besuki reached around 3,600 hectares. Table 5.1 shows varying sizes of teak planted across the region.

Table 5.1 The Planting of Teak in the Residency of Besuki, 1891-1929 (hectares)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bondowoso</th>
<th>Jember</th>
<th>Banyuwangi</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Until 1891</td>
<td>578</td>
<td>118</td>
<td>0</td>
<td>696</td>
</tr>
<tr>
<td>1891-1900</td>
<td>130</td>
<td>77</td>
<td>0</td>
<td>207</td>
</tr>
<tr>
<td>1901-1910</td>
<td>147</td>
<td>215</td>
<td>109</td>
<td>471</td>
</tr>
<tr>
<td>1911-1920</td>
<td>1,276</td>
<td>195</td>
<td>125</td>
<td>1,596</td>
</tr>
<tr>
<td>1921-1929</td>
<td>429</td>
<td>160</td>
<td>74</td>
<td>664</td>
</tr>
<tr>
<td>Total</td>
<td>2,560</td>
<td>765</td>
<td>308</td>
<td>3,634</td>
</tr>
</tbody>
</table>

Source: \textit{Verslag van den Dienst van het Boschwezen in Nederlandsch-Indië} (Batavia: Landsdrukkerij, 1931), pp. 185-191.

The plantings of teak faced some problems. One of them was \textit{Imperata} grass. In Java this sort of grass often caused deaths and stunted the growth of young teak plants because of root competition for soil nutrients.\textsuperscript{74} Such a problem also prevailed in Besuki, and can be seen in the case of Banyuwangi, where teak planting was extended to an \textit{Imperata} grass area. The adoption of the \textit{tumpangsari} system, allowing the planting of food

\textsuperscript{70}\textit{Verslag van den Dienst van het Boschwezen}, 1900, pp. 133-134. The report mentions that in the 1899/1900 rainy season teak replanting reached 32 hectares and the caring of the earlier plants costed f 2,298; Van der Haas, “Het Nieuwe Boschreglement”, p. 878; Cordes, \textit{Hutan Jati}, pp. 340-341.
\textsuperscript{71}Boomgaard, \textit{Changing Economy in Indonesia}, 16, p. 20.
\textsuperscript{72}Cordes, \textit{Hutan Jati}, p. 222.
crops among teak rows, introduced by Buurman in 1883 and the use of leguminous interplants advocated by Jaski in 1907, were reasonably effective in containing the *Imperata* problem elsewhere in Java. But in Banyuwangi *Imperata* control remained difficult, even when mechanisation was set in place in the 1950s. Part of the tilled fields was soon back under *Imperata* because of the lack of workers to plant the seedlings. A. Reilingh noted another problem: the planting of teak on former bamboo fields required repeated clearings of bamboo shoots.

Partly because of the *Imperata*, teak in Besuki was also prone to fire. During the droughts this grass provided flammable material and compounded the fire danger. Although teak was a fire resistant plant, this was only after it reached a certain age. The damage inflicted by fires on young teak plants appears to have been serious, but even without fires abnormal droughts also inflicted notable damage. Evidence for Java suggests that fires struck teak forest in Java almost every year between 1911 and 1941, with large fires during 1911-1914, 1918-1919, and 1929. The absence of data makes it hard to suggest the loss from fires in Besuki, but a number of reports suggested frequent forest fires in the region. Severe damage was reported to occur in 1902. This year was exceptionally dry due to the El Niño event. Other reports revealed fire damaged 3000 hectares of forest in Baluran in 1930 and 2,200 hectares in Baluran, Kendeng and Ijen highland in 1935. Several measures were taken to contain the danger of fires (discussed in Section 5.6.1).
Another problem was attacks by pests and diseases. As elsewhere in Java, the teak plant in Besuki often suffered from stem borers, *Xyleborus destruens*, which downgraded its timber. The attacks, identified first in 1920 by Kalshoven’s observations on teak forests of Pekalongan and Malang, were reported to have occurred in Bondowoso before the Second World War, North Banyuwangi in 1943, and Jember in 1945. By 1970 the teak stands in North Banyuwangi suffered seriously from the attacks of *X. destruens*, reaching 70 per cent of trees. Several observations linked the severity of the attacks to that area’s high rainfall, which made it too wet for teak.

Mixed planting and plant species replacement were the major responses to the problems. E.W. Clason reported the mixed planting of teak with red-flower bearing *Blutea monosperma* in Baluran. In a few places where a mixed planting was unsatisfactory, teak was replaced with other species. In Jember, the *Livistona rotundifolia* (sadeng palm) replaced the poorly growing teak plants. The teak forest of Gombeng was replanted with *A. damara*, while in South Banyuwangi beetle attacks led to the replacement of teak with mahogany. Native to South America, mahogany was regarded as delivering good results on poor soils where teak could hardly grow. Other methods were employed too, including the manual capture of beetles in the beginning of the rainy seasons when they emerged from the soil and the application of chemicals.
Despite the difficulties, expanding teak cultivation was considered a vital measure to deal with the problem of teak shortages during post-colonial times. In 1950 there was a plan for converting jungle wood forest into teak in West Kalibaru.\textsuperscript{95} In 1954 around 19,000 hectares of the Banyuwangi nature reserve were taken out for conversion into teak in order to increase its supplies in Java.\textsuperscript{96} Mechanized soil preparation helped to execute the plan. Assuming no new area was brought under teak in the 1940s, in twenty years the area of teak in Besuki had almost doubled, from 16,600 hectares in 1938 to 31,500 in 1968. The major expansion occurred in Banyuwangi where there was an increase by almost 300 per cent, from 5,900 hectares in 1938 to more than 17,000 hectares in 1968.\textsuperscript{97} This process radically altered the original form of vegetation and reduced the area broadly categorised as jungle wood forest. But within the jungle woods itself there were also other environment-changing human activities at work.

5.4 The Exploitation of the Jungle Wood Forest

Unlike teak exploitation, the Dutch interest in jungle wood forest grew relatively slowly. The jungle woods forest as a separate category, distinguished from teak forest, was legally stipulated in the 1874 Forest Ordinance. The position of jungle forest was improved in the subsequent forest ordinances of 1897, 1913, 1927 and its follow-up regulations, containing further stipulations and details on the aspects of management and exploitation.\textsuperscript{98} Apart from the continuing pressure on teak supplies, the exploration of the jungle wood forests in the outer islands of Indonesia contributed to the growing interest in non-teak tree species.\textsuperscript{99} Although until around 1900 its size remained unknown, the jungle woods made up a major proportion of the forest of Besuki.\textsuperscript{100}

\textsuperscript{98}Hardjodarsono and Pramoedibyo, \textit{et al.}, \textit{Sejarah Kehutanan}, 1, pp. 80-84.
The local people of Besuki had long extracted products from jungle wood forests. With a special reference to Banyuwangi, R.J.L. Kussendrager in 1841 noted some highly valued tree species, including tengulung, laban, sonokeling, sonokembang, and pronosodo. Referring to Puger, Hageman in 1862 mentioned non-timber products like bamboo, rattan, hardy grass (alang-alang) and several others. The forest also provided important source of foodstuffs. If recent evidence is any guide, they included tubers, herbs, sprouts, kernels, and fruits. Two explicit cases from Jember were bamboo and rattan shoots. Also significant were meat products obtained from hunting (discussed in Section 5.4.2). In addition, the forest provided grazing fields for livestock. Epp reported that in mid-nineteenth century Banyuwangi the Osingers released their livestock to graze freely in a nearby forest and collected them when needed.

The longstanding practice by the local people of collecting forest products continued during the period under consideration. Reports of Besuki in the 1880s cursorily mentioned bamboo, rattan, agel (Corypha utan), and food products such as gadung (D. hispida), palm sugar (aren), siwalan (B. flabellifer), and wild honey. A 1907 report stated that alang-alang was among trade articles used for roofs and was collected in significant quantities from the forest of Puger. Rattan exports from the forest-adjoining districts of Puger, Mayang, and Tanggul were also mentioned. Other products were firewood and charcoal for lime-kilns and smithies, as reported by Forester Spaan in the early twentieth century. The favourite wood was S. trijuga (kesambi), with its heavy, hard, and firm wood offering a much better charcoal quality, even compared with teak. Other woods seem to have been used too. Resident A.H. Neys reported in 1929 that the forest of Prajekan slowly but steadily diminished as a consequence of charcoal production. In 1938, Resident Van Romondt suspected the links between the stealing of

102 Hageman, “Over de Nijverheid”, p. 34.
107 *Onderzoek naar de Mindere Welvaart, 6* (14), p. 60.
108 Cordes, *Hutan Jati*, p. 82.
forest wood by the locals and Chinese charcoal buyers. The collection of firewood from forests by the inhabitants never ceased during post-colonial times.

Grazing livestock on forest lands continued. In 1905, G.D. Birnie recalled the practice of herding buffalo on forest lands in Jember around 1870. Similarly, the report of the Prosperity Investigation Commission revealed that during the dry season, a time when grasses were usually scarce, in some areas of Jember and Bondowoso people herded their livestock on forest lands. A newspaper report in 1954 still indicated the practice of herding livestock in the Lembean forest. A number of recent reports confirmed the continuation of such a practice even after the 1970s, without exception in the region’s conservation areas.

But the Indonesians of Besuki were not the only parties who had interests in the jungle wood forest. From around the 1870s state and private enterprises expressed an increasingly growing interest due to the rising demand for woods from the development of export agriculture. The ways in which the jungle wood forest were exploited appear to have been similar to those of teak forest, involving both private contractors and self-managed exploitation by the Forestry Service. Private exploitation was given, for example, to the Bosch- en Exploitatiebedrijf Jansen en Liem. The colonial authorities also made an attempt at improving the management of the jungle wood forest. By 1909, for example, a regulation determining the non-teak forest boundaries in the Panarukan regency was promulgated. In the 1920s, the Forestry Service redrew the borders of the jungle wood

110 ANRI, “Memorie van Overgave (Van Romondt)”, p. 166.
113 Onderzoek naar de Mindere Welvaart, 3 (14), pp. 3-4.
114 149.05 Ha Dihutankan Kembali”, Trompet Masjarakat, 1 January 1954, p. 2.
115 A 1981 report reveals that about 4000 cows, 1,500 sheep, and 1,500 goats were illegally herded in the Karangteko resort of the Baluran National Park. A similar practice was reported to be found in the villages of the Banyuputih sub-district (Situbondo), and some villages of the Wongsorejo sub-district (Banyuwangi). Menteri Negara Kependudukan dan Lingkungan Hidup, “Penelitian Pengembangan Wilayah Penyangga Kawasan Hutan Konservasi: Pengembangan Daerah Penyangga Taman Nasional Baluran”, Unpublished Research Report (Bogor: Fakultas Kehutanan Institut Pertanian Bogor and Proyek Pengembangan Efisiensi Penggunaan Sumber-umber Kehutanan, 1986), pp. IV.2-IV.3.
116 In 1930 this firm obtained a 2-year exploitation right in the Alas Muning complex of Puger, covering around 1,000 hectares. ANRI, “Memorie van Overgave (Van Romondt), pp. 53-54.
The mapping of borders had two strategic functions, establishing clearer state control, and restricting the traditional rights of the inhabitants to access forest resources.

The exploitation of jungle wood forest delivered both construction timber and fuel woods. Unlike teak forest, the jungle woods forest produced a variety of timber with extremely different qualities. A few of them did provide good building materials, but some woods were only useful for firewood. This fact seems to be one major reason why Resident B. Schagen van Soelen in 1918 urged the Forestry Service to convert the region’s jungle woods into a more profitable silviculture-based planted forest. In 1917, the volume of construction timber obtained from the exploitation of the jungle woods was 2,900 m$^3$. It grew to 7,700 m$^3$ in 1918 and dropped down to 2,600 m$^3$ in 1919. No further information is available on why there was a steep decrease in 1919. The decrease was not due to depletion because the movement to new jungle forest areas, probably the last one, took place in the 1960s. The reason was probably a change in the number of logging workers or simply because small stands were left in the currently exploited blocks, while new plots were still being prepared.

One of the construction timbers from the jungle wood forest was sadeng palm (*L. rotundifolia*). In the 1860s millions of sadeng trees grew in the forest of Jember and there was sporadic occurrence of sadeng in Rogojampi (Banyuwangi). This palm had something in common with bamboo, but it offered a more durable use and was stronger. Rumphius described sadeng as one of the best palm woods and it had been popularly used as pillars and beams in tobacco drying sheds. Extensive logging of sadeng occurred from the 1880s. The high demand and the long maturing period of about 50 years immediately caused the sadeng in the region’s forest to be in short supply. At the turn of the twentieth

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119 ANRI, “Memorie van Overgave van den aftredenden Resident van Besoeiki B. Schagen van Soelen, 1918”, p. 12.
century, the plantings of sadeng were undertaken both on forest and erfpacht plots. In Jember alone until 1912 the plantings reached 80,000 trees. \textsuperscript{125}

Large quantities of the jungle wood products were used as firewood. With the need for firewood for drying tobacco in smokehouses, the expanding tobacco industry created strong demand. In the 1933-1936 period, between 22 and 32 per cent of the total firewood required by the tobacco estates was provided by the Forestry Service and their absolute quantities and values are presented in Table 5.2. The rest of the firewood was from diverse origins, such as rubber estates, fruit trees, dry fields and gardens, but some were suspected to have been stolen from the state forests. \textsuperscript{126} Another major user was the sugar industry. The demand appears to have grown with the increasing scale of operations and rising number of sugar factories in Besuki, from four in the 1870s to ten before the 1930s depression. \textsuperscript{127} The scarcity of data makes it hard to look more systematically at how the extractions affected the supply and what kind of responses were made to adjust to the changing realities. The case of bamboo, on which more historical data are available, will illuminate these issues.

Table 5.2 Firewood Sales by the Forestry Service to the Tobacco Industry in Jember and Bondowoso, 1933-1937

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity (m\textsuperscript{3})</th>
<th>Value (guilders)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1933</td>
<td>36,874</td>
<td>48,366</td>
</tr>
<tr>
<td>1934</td>
<td>34,509</td>
<td>45,041</td>
</tr>
<tr>
<td>1935</td>
<td>37,081</td>
<td>55,048</td>
</tr>
<tr>
<td>1936</td>
<td>50,623</td>
<td>50,983</td>
</tr>
<tr>
<td>1937</td>
<td>62,732</td>
<td>62,202</td>
</tr>
<tr>
<td>1938</td>
<td>42,296</td>
<td>n.a.</td>
</tr>
</tbody>
</table>


5.4.1 The Case of Bamboo

Extensive bamboo areas were found in three regencies of Besuki: Jember, Bondowoso, and Banyuwangi. \textsuperscript{128} Bamboo as pure and mixed stands was widely found in the Besuki region,

\textsuperscript{125} Verslag van den Dienst van het Boschwezen, 1900, p. 134; Broersma, Besoeki, p. 15.
\textsuperscript{126} Fluyt, "De Houtvoorziening", pp. 293, 295; Verslag van den Dienst van het Boschwezen, 1927, p. 100.
except in the swampy areas in the south part of Jember and the very dry northern littoral. On the eastern slopes of the Hyang mountains, the complexes of bamboo reached about 900 hectares. Another bamboo complex of about 1400 hectares was found on its southern slopes. A smaller bamboo complex reaching 500 hectares was situated on the western and northwestern slopes of the Ijen plateau. In Banyuwangi on the southern slopes of Raung, Rante and Merapi mountains there existed interconnected complexes of bamboo reaching together about 1,200 hectares. In addition, spreading bamboo stands of about 1,500 hectares grew on the valley and hilly areas of South Banyuwangi and South West of Jember.129

Bamboo had long been known as a useful plant in the Besuki residency. From the 1870s, however, it gained an increasingly important position in the region. This development was induced by the tobacco estates.130 P.C.M. Fluyt noted that bamboo had been widely used for smokehouse constructions. In 1938 there were about 1,500 smokehouses, with a total length of about 100 km. Each smokehouse had large quantities of bamboo gallows, upon which tobacco was hung during drying.131 Meanwhile, among the local people of Besuki, bamboo was used in various constructions, for example houses, stables, fences, bridges, and rafts. The same material was used for many other things: benches, cages, baskets, kitchen utensils, ropes, and a great variety of plaited works.132 So valuable was the bamboo that Heyne estimated nine of ten house parts and house utensils were made from bamboo.133 Such features seem to have been common not only in Besuki and Java, but in many other places across the archipelago as well.134

Before the promulgation of the 1897 Forest Ordinance, bamboo was considered a byproduct. With this category the local inhabitants had free access to collect bamboo from the forest,135 despite the fact that from 1865 the forest was placed under state control and

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133Heyne, Tumbuhan Berguna, 1, p. 326.
the rights of the people were substantially curtailed.136 Parts of the bamboo were used to serve their own needs, but large quantities went to the estate companies. They could obtain delivery contracts of determined quantities of bamboo from contractors who channeled their bamboo to them. In Jember region, where the tobacco estates were largely found, there were thirty bamboo depots.137 Some of the delivered bamboo came from gardens, but the largest proportion was often obtained from the forest. The free felling practices caused extensive damage to the bamboo forest due to the widely-scattered felling sites and reckless cutting techniques adopted at the expense of young stands for short term gains of good quality bamboo.138

As the result of consultation between the Resident of Besuki and W.J. Spaan, former forester of the Besuki-Probolinggo forest district, the free felling system was replaced by felling on license. Starting from Bondowoso in 1901, the system was set in place in Jember and Banyuwangi in 1902. Felling was undertaken by estate companies and indigenous license holders.139 From 1907 the felling of bamboo for tobacco estates was replaced with self-managed felling by the Forestry Service. Despite the complaints raised by tobacco growers, Reilingh claimed it was a system that worked better in creating a balance between bamboo protection and fiscal interests. The system was improved with the adoption of block felling, which was regarded as bringing notable progress in bamboo stand protection and supervision against malpractices.140

Demand from the tobacco industry constituted the largest proportion of the bamboo market. Reilingh estimated that about 90 per cent of the bamboo production went to tobacco estates. The annual demand normally ranged from 6 to 7 million bamboo canes. Between 2 and 5 million were supplied by the Forestry Service, while the rest originated from the local inhabitants.141 The most highly valued bamboo was said to originate especially from the slopes of the Hyang mountain complex.142 Table 5.3 shows the quantities and values of bamboo sold by the Forestry Service to the tobacco estates during

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136 The villagers were only allowed to collect branches, fallen wood, and the wood from the forest thinning for domestic uses, but under conditions including close supervision and only in limited forest areas, Peluso, *Rich Forests*, p. 52.
137 Broersma, *Besoeki*, p. 15.
the depression years. It is reasonable to suggest that the exploitation of bamboo was one major part of the forest resource exploitation.

Table 5.3 Bamboo Sales by the Forestry Service to the Tobacco Industry in Jember and Bondowoso, 1925-1927 and 1933-1937

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of canes</th>
<th>Value (guilders)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>2,350,000</td>
<td>n.a.</td>
</tr>
<tr>
<td>1926</td>
<td>1,900,000</td>
<td>n.a.</td>
</tr>
<tr>
<td>1927</td>
<td>4,790,000</td>
<td>n.a.</td>
</tr>
<tr>
<td>1933</td>
<td>4,321,000</td>
<td>31,774</td>
</tr>
<tr>
<td>1934</td>
<td>1,702,000</td>
<td>12,993</td>
</tr>
<tr>
<td>1935</td>
<td>784,000</td>
<td>6,862</td>
</tr>
<tr>
<td>1936</td>
<td>2,067,000</td>
<td>14,615</td>
</tr>
<tr>
<td>1937</td>
<td>5,043,000</td>
<td>33,951</td>
</tr>
</tbody>
</table>


In the 1900s, there had been growing concerns about the depletion of bamboo. Supply was unable to keep up with demand. The pressure on bamboo supplies was exacerbated by the fact that about one-third of the bamboo stands could not be exploited because of being situated in remote locations, and that some of them were of inferior qualities and sorts. Although containing highly valued bamboo, in many areas the number of stands were limited and consisted of different varieties, and even often in a mix with wild trees. There were trials of substituting bamboo with woods from Kalimantan and with galvanized wire, but the two options were regarded as costly. It was believed that the most feasible solution was bamboo planting. Such a measure was immediately needed because sustaining the bamboo supply was a “matter of life and death” (levenskwestie) for the tobacco industry in Besuki.

The first planting was in 1903, but more were undertaken from 1910. They included several complexes such as Sumberkeneng (1903, 1910), Penanggungan (1912, 1925, 1927), Kupang (1927), Curahcabe (1911-1912), Nogosaren (1911-1912, 1916) Kabuaran (1921-1922), Pakis (1921), Badean (1921, 1925-1927), Pakuniran (1925-1927), Sumberklopo

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(1926-1927), Mumbul (1926-1927) and Curahmanis (1927).\textsuperscript{146} In 1929 Resident Neys reported the conversion of around 100 hectares of the Hyang jungle woods into a bamboo area.\textsuperscript{147} Another planting in Jember was reported in 1932.\textsuperscript{148} Most areas were planted with the highly valued bamboo, \textit{Gigantochloa apus} (tali) and a few areas were devoted to \textit{Dendrocalamus asper} (petung) and \textit{Schizostachyum blumei} (mluwo).\textsuperscript{149} In Jember alone there were 300 hectares of bamboo complex under \textit{G. apus}, a variety that was also common in the gardens of the local inhabitants.\textsuperscript{150}

Bamboo could be planted with seeds, grafting, and rhizomes.\textsuperscript{151} The use of seeds was absent because in Java bamboo hardly produced seeds. In Besuki the Forestry Service adopted planting with rhizomes, which had lower sprout failure than other techniques.\textsuperscript{152} The best planting time was the beginning of the rainy season, offering a better chance to grow and reducing termite attacks.\textsuperscript{153} Bamboo had no special requirement to grow. The plant was quite tolerant of any kind of soil and climate, at an elevation ranging from 0 to 1500 m and even to 2000 m above sea level for particular sorts. Most bamboo could grow well on less fertile soils, but not too wet, dry, or stony soils.\textsuperscript{154} Unlike teak, bamboo required little nurture. The only necessary treatment was to clear the fields from disturbing shrubs and fire stimulating grass.\textsuperscript{155} \textit{Tephrosia maxima} was often planted as an interplant during the early stage of bamboo growth to avoid the spread of \textit{alang-alang}.\textsuperscript{156} Another interplant was \textit{Leuceana glauca} as found in Songgon and the slopes of Raung.\textsuperscript{157}

The need for bamboo cultivation grew bigger in the late 1950s with the ongoing plan of establishing a Banyuwangi-based paper industry, Basuki Rachmat, which used

\begin{flushright}
\textsuperscript{147}ANRI, \textit{Memori Serah Jabatan}, p. cxxxiv.
\textsuperscript{151}Verhoef, \textit{Bamboecultuur}, pp. 8-12; Sindoesoewarno, “Penanaman”, pp. 7-8.
\textsuperscript{152}Reilingh, “De Bamboebosschen”, p. 622.
\textsuperscript{153}Verhoef, “Tanaman Bambu”, p. 16.
\textsuperscript{154}Sindoesoewarno, “Penanaman”, p. 7.
\textsuperscript{155}Verhoef, “Tanaman Bambu”, p. 17.
\textsuperscript{156}Soerachmat, “De Cultuur van Bamboo”, p. 195.
\textsuperscript{157}Sindoesoewarno, “Penanaman”, pp. 27-34.
\end{flushright}
bamboo as its raw material. Bamboo produced a long fiber plant, which could be processed for a variety of quality papers. The construction of the factory started in 1963 and was completed in 1968 with a total capital of US $8.5 million from the Japanese government. Besides forest bamboo, the raw materials would largely be supplied from the planted bamboo, whose development was studied in the late 1950s. This research was soon followed up by bringing parts of the Banyuwangi forest into bamboo cultivation. But problems of supply immediately emerged as the production levels were below expectations. The forest bamboo could only meet 60-75 per cent of the estimated annual output, whereas the planted bamboo could only deliver 30 per cent of the initial estimation. The supply which had been estimated to last for up to 10 years, in fact would only meet the requirement for 3.5 years.

Realizing the problem, a decision was made to gradually shift the raw materials of the paper industry in Banyuwangi from bamboo to pine (Pinus merkusii). This shift was part of a new trend in the paper industry in Indonesia. Pine offered several advantages. With a smaller requirement of annual clearing, it provided more sustainable supplies than bamboo, which required a daily clearing of 3 hectares to support the factory operation. Moreover, a lot of areas were available for pine because of its ability to grow even on degraded soils, either lowlands or uplands, and to compete with Imperata grass. Pine not only produced high quality fibers for paper and pulp, but also delivered resins.

159 Sindoesoewarno, “Penanaman”, p. 5.
160 With a production capacity of 30 tones per day, the factory was officially opened in 1969 by M. Jusuf, the Indonesian Minister of Industry. M. Rs. “Peresmian Fabrik Kertas Basuki Rachmat Banjuwangi”, Berita Selulosa, 5, 2 (1969), p. 60.
Consequently, some areas planned and used for bamboo were brought under pine. The conversion occurred in East and West Banyuwangi and West Raung (Jember), whereas in Sumberingin (Bondowoso) the pine took over part of the areas previously under *A. decurrens*. The reasons behind the replacement of *A. decurrens* were its short rotation, clear felling, and fast soil exhaustion. In 1970 the area of pine cultivation reached 3,300 hectares and within ten years all the region’s bamboo areas devoted to the paper industry would be replaced with pine. Despite the conversion, the plantings of bamboo remained important as the need for bamboo from other parties never ceased. The next section will look at the exploitation of the faunal resources in the region.

### 5.4.2 Hunting

Hunting had long been pursued in the region. The activity was initially undertaken by some Indonesians. The so-called Osing people of Banyuwangi were well-known to be good hunters. In the course of time, more people engaged in hunting, not only the Madurese and Javanese but also other groups such as Europeans, Chinese and for a few years, Japanese. Hunting was normally carried out in groups, which could consist of 8 to 10 people. Prey were captured or killed either by trapping or hunting. The traditional hunting implements included spears, arrows, knives, and snares. The use of horses and dogs in hunting was also known among the local population. Another part of the hunting strategy was forest burning to promote young grass, which would attract wild animals to graze and thereby created hunting grounds.

There were broadly two categories of hunter, amateur hunters (*luxe jagers*) and professional hunters (*beroepsjagers*). The first category embraced civil servants, well-established individuals, retired figures, traders and planters, who went hunting as a leisure
time activity.\textsuperscript{175} They were mostly people with a European background; Boomgaard labels their hunting activities as part of the Indo-cultural identity.\textsuperscript{176} Only a few Indonesians engaged in leisure hunting.\textsuperscript{177} The second category, professional hunters, included people who hunted for their livelihood. Apart from hunting, they often earned major or additional income from other avenues, for example small-scale agriculture.\textsuperscript{178}

As in the early periods, hunting for food was one major activity after 1870, with wild oxen as the major prey species.\textsuperscript{179} Both deer and wild oxen were said to occupy the top preference among the Osing people of Banyuwangi, who were depicted by Appleman as “born hunters” (geboren jager).\textsuperscript{180} The hunting activities normally increased in frequency and scale in the periods when traditional festivities approached as the demands for meats grew substantially.\textsuperscript{181} Hunting for food never ceased during the period under consideration, including in the conservation areas.\textsuperscript{182}

The increased presence of the Europeans in Besuki strengthened new trends in hunting. Apart from hunting for food, there was a growing amount of hunting undertaken to get rid of noxious wild animals (discussed in Chapter VII). Another trend was the use of firearms for hunting. This trend marked a notable progress although the traditional implements did not totally disappear. The early type was a long-barrelled, archaic frontloaded gun, with a shoot deviation at 15 metres distance amounting to two metres. It was already regarded as a good result if four of ten shots could hit the target. One shot was often not enough to paralyze big game and another one or two extra shots were needed.\textsuperscript{183} Although they were impractical and of limited precision, the adoption of firearms was significant a factor in boosting the potential to kill prey in Besuki as elsewhere in Southeast

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\textsuperscript{175} "Is Banjoewangi Nog Een Jachtdorado?", pp. 256-257.
\textsuperscript{177} R. Wondosoebroto, “Babad Besoeki-Bondowoso”, Handwritten manuscript, p. 53.
\textsuperscript{178} "Is Banjoewangi Nog Een Jachtdorado?", pp. 256-257.
\textsuperscript{179} I Made Sudjana, \textit{Nagari Tawon Madu} (Denpasar: Lesehan Sejarah, 2001), p. 22.
\textsuperscript{181} "Is Banjoewangi Nog Een Jachtdorado?", p. 254.
\textsuperscript{182} In Baluran where hunting operations were officially banned with its 1962 declaration as a nature park, the hunting of wild game could never be stopped. It was reported that army members killed 3 wild oxen, 4 wild buffalos, and 4 deer between May and October 1964, and such cases apparently never ceased. Sedhana, “Kondisi Ekologik”, pp. 21-22; Ammar S. Wirioseopartho, “Daya Dukung Lapangan Perumputan Satwa Liar Herbivora dan Aspek Konservasinya di Taman Nasional Baluran, Jawa Timur”, \textit{Laporan No. 428} (Bogor: Pusat Penelitian dan Pengembangan Hutan, 1984), p. 14.
\textsuperscript{183} "Is Banjoewangi Nog Een Jachtdorado?", pp. 254-255.
Asia.\textsuperscript{184} The ability of the local hunters to afford firearms increased with the bounties and benefited from the absence of official bans on gun possession.\textsuperscript{185} 

A more important trend was commercial hunting. The development of circuses, zoological gardens, medical laboratories, and the fashion industry in the late nineteenth and early twentieth centuries in Europe and America created demand for live wild animals and their specimens.\textsuperscript{186} There are no figures on wild animals and specimens exported from Besuki for the above ends, but partial evidence does suggest that some tigers were captured alive. A newspaper report mentioned in 1914 that a tiger was trapped in the Argapura forest and was sold to the Surabaya Zoo.\textsuperscript{187} In 1952, a village head in Lumajang, west of Jember, was reported to have captured 13 tigers by setting traps.\textsuperscript{188} No further information is available on what happened to them, but they were most likely sold.

Another target of commercial hunting was the crocodile. C.N.A. de Voogd and G.F.H.W. Rengers Hora Siccama noted crocodile hunting along the east coast of Banyuwangi, whereas other reports revealed the same activity in Grajagan.\textsuperscript{189} The commercial hunting partly applied to wild boar. A Chinese entrepreneur in South Banyuwangi was reported to have run a business of making wild boar jerky (dendeng) for export markets, especially to the Chinese mainland. Around 1,800 wild boar were annually hunted in the forest of Banyuwangi.\textsuperscript{190} Birds were a target of commercial hunting too. One of the most wanted birds was turtledove. Appleman indicated the activity of turtledove capturers in the Baluran forest.\textsuperscript{191} This bird was highly valued for its beautiful singing,\textsuperscript{192} and also due to the existing traditional beliefs linking it to mystical values for the owners.\textsuperscript{193} An observation by John MacKinnon on Java and Bali suggests the significance

\begin{footnotesize}
\textsuperscript{186} Boomgaard, \textit{Frontiers of Fear}, p. 140; Boomgaard, “Hunting and Trapping”, pp. 200-201.
\textsuperscript{187} “Hindia Belanda”, \textit{Pewarta Soerabaia}, 28 January 1914, p. 2.
\textsuperscript{188} “Lumadjang: Harimau Tunduk Sama Kris”, \textit{Pewarta Soerabaia}, 17 September 1952, p. 4.
\textsuperscript{190} “Is Banjoewangi Nog Een Jachtdorado?”, pp. 257-259.
\textsuperscript{191} Appelman, “De Baloeiran”, p. 51.
\end{footnotesize}
of birds in the wild animal trade both in the local and international markets.\textsuperscript{194} Besuki was apparently part of the longstanding trade network for wild animals.

5.5 Technological Change in Forest Exploitation

The type of technology was a key factor affecting the extent to which forest resources could be utilized and the scale of impact the exploitation might bring to the forest environment. Forest exploitation technology might be subdivided into three clusters: logging implements, transport facilities, and soil preparation. The development of each of the three technological clusters in Besuki appears to have started and gradually progressed at different times. But all of them facilitated the pushing back of the natural forest frontier and the expansion of the human-made forest in the region.

The use of manual implements seems to have long been common in the exploitation of forest. The felling of forest trees involved the use of axes.\textsuperscript{195} The use of saws was comparatively new. Epp reported that in mid-nineteenth century Banyuwangi saws remained unknown.\textsuperscript{196} The axes were either locally made or imported from outside Besuki and their improvement progressed slowly. Only in the 1950s were there initiatives to introduce better axes by taking inspiration from other countries, especially Germany.\textsuperscript{197} The use of steam-powered logging machines was long delayed.\textsuperscript{198} But in the late 1930s the steam-powered machine began to be adopted in the region and was first found in Jember.\textsuperscript{199} In the early 1950s, a sawmill was established in Benculuk, Banyuwangi and two portable sawmills were added around 1970, one in Jember and the other one in West Banyuwangi.\textsuperscript{200}

Logs were dragged from felling sites to temporary collection places near roads. From these points, logs were carried away with animal-drawn bullock carts. This mode of transport was predominant in Java until the early 1900s.\textsuperscript{201} A notable improvement was made with the adoption of pneumatic tires to replace iron wheels. Unlike the iron-wheeled

\textsuperscript{195}Hardjodarsono and Pramoedibyo, \textit{et al.}, \textit{Sejarah Kehutanan}, 1, p. 132.
\textsuperscript{196}Epp, "Banjoewangi", p. 247.
\textsuperscript{198}Hardjodarsono and Pramoedibyo, \textit{et al.}, \textit{Sejarah Kehutanan}, 1, pp. 132-133.
\textsuperscript{199}ANRI, "Memorie van Overgave (Van Romondt)", pp. 175-176.
carts, the pneumatic tire-wheeled carts did less damage to the roads. Another advantage was that the lower tray resulting from its smaller wheel diameter, which made loading and unloading easier. Moreover, the lighter requirement of pulling power increased substantially the carrying capacity.\(^\text{202}\) To support its operation, the Forestry Service built several cart road networks, for example a 12 km cart road in Bondowoso, stretching from Pecalongan via Gunasari to the forest of Raung-Suket mountains and a 60 km cart road in Jember. For the same purpose, in Bondowoso the Forestry Service was reported to have hardened an 8 km road from Pakisan to Sumberbalen.\(^\text{203}\)

The use of animal-drawn carts in forest exploitation continued during the post-colonial times.\(^\text{204}\) But another development also occurred in Java from the early 1900s, marked by the adoption of railway transport for conveying forest products.\(^\text{205}\) Although starting somewhat later than the other parts of Java, such a development also took place in the region.\(^\text{206}\) There were 12 km of rail lines in Jember and 20 km of rail lines in Banyuwangi built by the Forestry Service to facilitate the exploitation of forest.\(^\text{207}\) One major line in Banyuwangi connected Benculuk with Grajagan. The line went through plains and remote areas to Kutorejo and from this point it curved to Pangpang Bay.\(^\text{208}\) A loco traction with a formation of 15 lorries served this track before and after the Second World War.\(^\text{209}\) The reason for the mechanisation of forest wood transportation in Banyuwangi was primarily the lack of workers.\(^\text{210}\)

In the 1950s there was an attempt to improve the transport facility for forest exploitation. The lack of capital, however, forced the search for a less costly alternative. Rather than a rail line, the choice was directed to a road network which was seen as cheaper to construct. Another major reason was the growing popularity of trucks and trailers as a

\(^{202}\) G.H.B. Hofman, “Beberapa Tjatatan tentang Tjikar Memakai Ban Angin”, *Rimba Indonesia*, 2, 6-7 (1953), p. 239.

\(^{203}\) ANRI, “Memorie van Overgave (Van Romondt), pp. 171-172.

\(^{204}\) It was reported in the 1950s that some of the inhabitants of Banyuputih (Panarukan regency) obtained a livelihood from renting carts to the Forestry Service. Djojopranoto, “Masalah Projek Asembagus”, p. 202.

\(^{205}\) Soeharto, “Pemilihan Pengangkutan”, p. 84.


\(^{207}\) ANRI, “Memorie van Overgave (Van Romondt), pp. 175, 180.

\(^{208}\) Jacobs, “Botanical Reconnaissance”, p. 77.


\(^{210}\) Soetopo, “Kemungkinan2”, p. 418.
means of transport; these were considered more suitable to the region for topographical reasons.\textsuperscript{211} The result was the construction of the Kalipuro-north Banyuwangi road. A 36 km road track stretching from Kalibarumanis to Kalisetail was built in order to facilitate the transport of bamboo supplies from the felling plots to the Basuki Rachmat paper factory. In addition, there was improvement to the road connecting Rogojampi with Licin.\textsuperscript{212}

Unlike the mechanisation of the transport of wood, that of forest soil preparation occurred during post-colonial times. The practice was undertaken in South Banyuwangi, where the teak cultivation was extended to Imperata areas and there was a lack of workers to prepare the soil.\textsuperscript{213} The first mechanically prepared plots were the Plaosan and Tegalsari complexes.\textsuperscript{214} Two different views on mechanisation emerged. On one side, the adoption of mechanical land preparation was regarded as positive because it offered the fastest and cheapest way of establishing teak forest in such a difficult area.\textsuperscript{215} On the other side, there was a view that although helping with the preparation of soils, the small number of workers for planting in relation to the extensive mechanically prepared soils caused parts of the plots to revert to Imperata grass cover again before being planted.\textsuperscript{216} Despite the conflicting views, mechanisation undoubtedly facilitated the expansion of the human-made production forest and increased the scale of impact the human activities had on the forest environment.

5.6 Human Impact on the Forest
Together with agriculture and settlement expansion, the extraction of forest resources exerted significant influence on the forest. As has been shown, one major effect was the alteration of original vegetation into human-made production forest, including teak and bamboo. In addition, by the late 1940s there were another 2,700 hectares of human-made industrial forest.\textsuperscript{217} By 1968 the human-made forest reached 57,700 hectares, consisting of 26,200 hectares of industrial tree species, mainly bamboo, pine, and mahogany, and also

\textsuperscript{211}Soeharto, "Pemilihan Pengangkutan", pp. 91-92.
\textsuperscript{212}Soenarwanto, “Menindjau Hutan Bambu”, p. 50.
\textsuperscript{213}I. Komang Tjau, “Mengerjakan Tanah Secara Mekanis di Daerah Hutan Banyuwangi Selatan”, Rimba Indonesia, 2, 8-9 (1953), p. 346.
\textsuperscript{215}Tjau, “Mengerjakan Tanah”, p. 348.
\textsuperscript{216}Soetopo, “Mengerjakan Tanah”, p. 488.
\textsuperscript{217}Rd. Soepardi, Hutan Reboisasi-Industri (Djakarta: Balai Pustaka, 1950), pp. 52-53 and Table 18. In 1946 more than 560 hectares of forest lands in Jember and Banyuwangi were planted with dammar (A. damara). In Bondowoso, there were about 430 hectares of kemiri (A. molluccana). Other conversions were 140 hectares of jabon (A. cadamba), 105 hectares of kayu putih (M. leucaedendron), and 90 hectares of balsa (Ochroma spp) in Jember, 50 hectares of pine (P. mercusii) and 80 hectares of mahogany (S. macrophylla) in Banyuwangi.
31,500 hectares of teak. They accounted for 15 per cent of the region’s forest cover, larger than the figure of below 2 per cent in 1930. There were other impacts which were often unexpected and problematic to the humans and their interests. Deforestation, biodiversity loss and species extinction were important ones.

5.6.1. Deforestation

Besuki experienced deforestation somewhat later than most parts of Java. This by no means suggests that there was no forest clearing in the Besuki region before. Forest clearing certainly was not new, but for centuries it was not seen as a problem due to there being little clearing with the small population size, less developed technologies, and less intensified forest extractions. Among the Dutch officials, increasing population and converting more forest in the region’s hinterlands into agricultural lands was still seen as desirable for the region’s development until the early 1900s. Rather than being seen as a problem, the conversion of forest was regarded by the estate planters and most colonial officials as aesthetically and economically beneficial as it transformed the region’s less valued wilderness into “the garden of Java” and “the earthly paradise”.

The expanding forest removal in the Besuki region eventually aroused concerns. Important antecedents of the changes could be identified in earlier observations on Java and elsewhere, suggesting the adverse impacts of deforestation. There were two broad views regarding the issues. One view, called the “sponge theory”, suggested that the forest had a vital role as an hydrological regulator, in reducing run-off water flows, increasing water

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218 Perusahaan Kehutanan Negara, 1968, p. 68.
219 For 1930 based on total forest figure given by Zwart, “De Boschoppervlakte”, Table Appendix.
220 The felling of forest was often partly done to build new political centres, settlements, and agricultural fields. Babad Tawang Alun mentions the opening up of Bayu forest and later Sudimara forest by Tawang Alun and his followers. Similarly, about 40 followers of Pangeran Wilis, entitled by VOC as Prince of Blambangan, cleared up a tract of the Jangkung forest to establish a new village and agricultural fields. Arifin, Babad Blambangan, pp. 105-106, 112. In part forest felling was done to facilitate troop movement during the Dutch campaign against Bayu, as carried out along the southern slopes of the Raung Volcano. Poerwokoesoemo, Jati Jawa, p. 34.
221 “De Oeconomische Toestand van de Gewesten die door den Geprojecteerden Spoorweg Probolinggo-Parisin worden doorsneden”, De Indische Gids, 15, 1 (1893), pp. 1077; Onderzoek naar de Mindere Welvaart, 6 (14), p. 28.
absorption by the soils and regulating water springs and river flows. Around the mid-nineteenth century, Junghuhn had already voiced the need for protecting the watershed montane forest in Java for such reasons. Later, in the 1880s, Cordes drew the attention of the colonial administration to the hydrological effects of the deforested mountain areas. A de Jong challenged further deforestation for the sake of agriculture, which he considered hydrologically dangerous. Considering the adverse hydrological consequences, G.S. de Graaf advocated stopping the deforestation in Java.

The second view, called “desiccation theory”, suggested the connection between forest cover and deforestation, and rainfall and rainfall change. Central to this argument was a belief that the presence of forest would increase evaporation, cloud formation, and rainfall. Doubts about this theory’s validity were raised, for example by Cordes, who asserted that there was an absence of rainfall variations between the forested and deforested areas in Java. But the desiccation theory also had some support. Beekman stated that “modern science recognized the influence of forests on climate and rainfall”. This view was often taken as part of the arguments put forward to stop deforestation and to promote forest conservation. A number of figures, including S.P. Ham and J.H. de Haan, underlined the value of Indonesian forests for climatic, hydrological and orological reasons.

Circulating among the colonial figures, including the colonial officials in Besuki, the above theories must have affected the ways in which deforestation was perceived. The Declining Prosperity Investigation Commission in 1908 reported the occurrence of
deforested areas in Besuki and blamed them for the declining springs and river discharges. In some villages of the Wonosari and Wringin districts, no water was found though deep wells were dug. Many springs dried up, forcing villagers to search for water from distant places. In the Panarukan, Sumberwaru, and Prajekan districts the condition was said to be the same. The decreasing river discharges were reported observable in the Kumbolo, Tikus and Deluwang rivers (Panarukan), and in the Baru and Setail rivers (Banyuwangi). Deforestation, however, was apparently not the only cause of the problem. At the time, 1905, when the investigation was carried out, there was actually an El Niño-linked drought in Java. Such a fact seems to have been often neglected and deforestation continued to be regarded as the major cause of the declining springs and river discharges. The extensive forest clearance was said to have caused a decrease in rainfall in Kalibaru, Banyuwangi. As Altona found in the Brantas river, the deforestation of the Hyang forest was blamed for the more frequent and violent floods in the Sampean river.

Plate 5.i. Deforested Hyang Highland, 1902 (Ledeboer in Franck, 1937: 36)

234 Onderzoek naar de Mindere Welvaart, 7 (14) pp. 12-14.
235 Berlage, East-Monsoon Forecasting, pp. 31, 36.
Concern with deforestation in Besuki was also reinforced by erosion issues. Forest was regarded as serving to prevent soil erosion. The loss of forest cover caused an increasingly high silt content in the Bondoyudo and Bedadung rivers, and large quantities of fertile soils were brought down to the sea. The removal of the Ijen upland forest was blamed for the huge mud flood in the Banyuputih river in 1915. In the Tanggul river, the fast siltation posed health problems in the nearby villages during the dry season because the silt disturbed river flows and created mosquito breeding grounds. In 1918, the erosion brought by the Banyuputih river was reported as high as that of the Brantas river. In the Wringin upland (Bondowoso), the disappearing forest was said to be a cause of the loss of fertile soils and the creation of barren lands. Ch. Coster stated in 1936 that forest clearance by Indonesians created “dying land” (stervend land) and “catastrophes”. Part of the planting area of the Buduan sugar industry was said to have been devastated and on Mlandingan plain, erosion materials consisting of silt, sand, gravels, and stones “covered up agricultural fields, destroyed harvests, and reduced soil fertility”.

Plate 5.ii. Eroded Farm Lands in Mlandingan with Ranu Hills in the Background (Coster, 1936: 962, Reboisatie Commissie, 1931: 7-8)

243 Onderzoek naar de Mindere Welvaart, 7 (14), pp. 39, 59.
The Forestry report revealed that in Bondowoso alone there was about 2,000 hectares of deforested area in 1929.\textsuperscript{245} Shifting cultivation practice was said to be a major cause of the deforestation. Concern linking the two phenomena gained momentum around the 1920s. A.J. Koens was one of the figures who drew the attention of the colonial administration to the origins and consequences of shifting cultivation, which at that stage was said to constitute the major cause of deforestation in the outer islands of Indonesia.\textsuperscript{246} While regarding it as an economically efficient system, another study by Hagreis acknowledged that under certain circumstances, especially if applied in a short-term rotation, shifting cultivation could provoke the creation of alang-alang vegetation and increase the danger of fire.\textsuperscript{247} In Besuki the stigmatization of shifting cultivation as causing deforestation was explicitly expressed in the resident’s 1934 report, pointing specifically at the northern slopes of the Kendeng hills.\textsuperscript{248} Other causes of deforestation included forest fires and timber stealing. The deforestation caused by timber stealing was reported to have occurred for example in the Brebes and Beser hills, and also on the west slopes of the Raung mountain.\textsuperscript{249}

Attempts were made by the colonial authorities to tackle the problem of deforestation. One of the major measures in this field was afforestation. Although prior to 1870 there had been initiatives for afforestation, the primary objective was basically to secure timber supplies, rather than for environmental purposes. The adoption of afforestation measures for environmental reasons grew in importance in Java from the 1880s.\textsuperscript{250} In Besuki, such a measure started in the early 1900s in the Mlandingan and Kendeng hills (Panarukan).\textsuperscript{251} But it was only from the 1920s that afforestation was undertaken more systematically. With financial support from the Buduan sugar industry and the Raad van Besoeki (the Besuki Council) in 1926-1927 the deforested slope of the Ranu hills in Panarukan was reforested.\textsuperscript{252} Coster reported that the afforestation measure

\textsuperscript{245}Verslag van den Dienst van het Boschwezen in Nedelandsch-Indië 1929 (Batavia: Landsdrukkerij, 1931), p. 116.
\textsuperscript{248}ANRI, “Memorie van Overgave van den Resident van Besoeki 1931-1934”, p. 9.
\textsuperscript{249}Verslag van den Dienst van het Boschwezen, 1927, p. 95.
\textsuperscript{250}Changing Economy in Indonesia, 16. pp. 20-21.
\textsuperscript{251}Onderzoek naar de Mindere Welvaart, 7 (14), pp. 59-60.
\textsuperscript{252}ANRI, Memori Serah Jabatan, p. cxxxiv; The Buduan sugar industry contributed f 30,000 and the Raad van Besoeki helped with f 10,000. Verslag van de Reboisatie Commissie, p. 14.
gradually improved the conditions of the site. On the Kendeng hills, at around the same time, the Dampit estate was reported to have reforested part of its estate lands.

The colonial authorities also took preventive measures, primarily taking the form of forest conservation. In fact, a preference was apparently given to such measures rather than afforestation, which was considered a more costly and time-consuming effort. In 1907, the Prosperity Investigation Commission already suggested the need for preserving forest in Jember for climatic and irrigation considerations. From 1913, for example, a ban on forest clearing in the Hyang mountain complex was imposed. The need to protect the forest and for immediate and firm actions to fight against clandestine clearings were continuously reiterated.

One of the preventive measures was forest fire control. Colonial officials, including those in Besuki, actively looked for techniques to effectively deal with the problem. On the Hyang highland the technical measures included the construction of fire belts in the form of a 50 metre-wide coffee garden and living hedge with fire resistant plant species and the construction of pathways to speed up fire fighter mobilisation. In addition, special guards were placed in supervisory posts in charge of reporting any forest fire to the head of the sub-district, who then was responsible for forwarding the message to the related forest officials. Together they would mobilize the designated villagers to extinguish the fires. Other measures were tighter control on setting of fires to vegetation and on the practice of livestock grazing, and campaigns to reduce the growth of alang-alang.

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253 Coster, "Typen van Stervend Land", p. 962.
255 Djatipit, Memoires van een Houtvester (Amsterdam: De Bezige, 1951), p. 61.
256 Onderzoek naar de Mindere Welvaart, 6 (14), p. 61.
257 Onderzoek naar de Mindere Welvaart,7 (14), p. 61.
259 Von Faber, Naar het Geheimzinnige Kratermeer, p. 37; The conversion of the largest parts of the mountain areas into estates and the construction of buffer zones in the form of tree belts consisting of productive, but easily cut trees, were seen by Resident Neys as the effective ways of combating forest fire. ANRI, Memori Serah Jabatan, pp. cxxxiv-cxxxv.
261 Boomgaard, Changing Economy in Indonesia, 16, pp. 31-32.
Despite the measures, the problem of deforestation persisted. From the 1940s, the problem even worsened because more clearing occurred. Two years after the proclamation of Indonesian independence in 1945, there were new deforested areas in the region: 2,200 hectares in Bondowoso, 900 hectares in Banyuwangi, and 600 hectares in Jember. In total, it constituted more than one-third of the total newly deforested areas in East Java (9,700 hectares). Moreover, it was reported that the local people also cleared part of the mountain estates of Jember. The severity of the deforestation was due partly to the emerging popular misconceptions of independence as freedom from any rule, including freedom to clear forests for agricultural fields and firewoods. The deforestation continued in the 1950s and 1960s. In 1960, the deforested areas in the region covered 20,200 hectares, mostly found in Bondowoso and South Banyuwangi. Deforestation grew to 30,000 hectares in 1969.

The problems linked to deforestation from the 1940s continued unabated. A huge flood striking south Jember in 1942 was reported due primarily to the deforestation of the southeastern slopes of the Bromo mountain complex. Beside heavy rainfalls, deforestation was reported to have been a primary cause for the severe floods striking Jember from mid-December 1954 to early January 1955, which were described as the worst floods that ever occurred. Similarly, the deforestation was reported responsible for the huge floods inundating Panarukan in 1952. Many newspaper reports on Java in the 1950s indicated more frequent and violent floods resulting from deforestation. During the dry season, deforestation brought a different problem. Writing on Panarukan, Ashadi Djojopranoto stated in 1958 that the deforested upland of Asembagus caused a decrease in

263 Soepardi, Hutan Reboisasi, p. 38.
266 "18 orang Penebang Liar Ditangkap", Trompet Masjarakat, 4 October 1951, p. 4.
268 Soepardi, Hutan Reboisasi, p. 22.
269 Three districts of the Jember regency including Rambipuji, Ambulu, and Puger were reported to have suffered the most. The flood destroyed 13,404 houses and claimed 20 lives, and inflicted other damage including 690 hectares of rice crops, 512 hectares of horticulture crops, 1,216 hectares of dry-field crops, 32 big livestock, and 12 bridges. “20 Orang Mati Karena Bandjir Besar di Djember”, Trompet Masjarakat, 27 December 1954, p. 2; “Kerugian Bandjir di Djember Selatan”, Trompet Masjarakat, 11 January 1955, p. 2; “Kerugian Akibat Bandjir Melebihi Dari Dugaan Semula”, Trompet Masjarakat, 3 February 1955, p. 2.
irrigation supplies. The deforestation was also regarded as one of the three major reasons for the seriously deteriorating capacity of the Sampean irrigation network.

The Indonesian government certainly did not turn a blind eye to the seriousness of the deforestation. In 1952, the Forestry Service was reported to have planted the deforested areas of Tanahbulan and Pakuniran (Bondowoso). Around the same time, a similar measure was taken in the deforested areas of Lembean and Puger (Jember). In cooperation with the Information Service, the Forestry Service in the region discouraged the villagers from setting fires to *Imperata* grass. Another measure took the form of a one-kilometre tree forest belt to shield the protected forest against any encroachment from the nearby villagers.

The fight against deforestation, however, seems to have been an endless battle. While the afforestation measures were taken in particular places, at the same time the opposite process continued to occur in others. There were views that the measures were only partial and too small to have a significant effect on such a huge and complicated problem. In the early 1960s the approach to dealing with deforestation was improved, but a lack of funds posed a serious obstacle for its implementation. Only from the late 1960s, were there more regular funds to carry out afforestation. Under the first Five Year Development Plan starting from 1969, in the Jember regency alone about 4,100 hectares of deforested lands were rehabilitated. Such a measure was likely to have been undertaken also in the other

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274 “34.5 ha Direboisasi Dg Angsana”, Trompet Masjarakat, 24 January 1952, p. 3.
275 “34 ha Tanah Dihutankan Kembali”, Trompet Masjarakat, 2 October 1953, p. 2; “149.05 ha Dihutankan Kembali”, p. 2.
277 Republik Indonesia, Propinsi Djawa Timur, pp. 294-298.
278 It was argued that deforestation would only be successfully stopped through a systematic approach embracing three major fields: transmigration, agricultural intensification, and industrialisation. Prakoso, “Memorandum Masalah Pembukaan Illegaal Tanah Hutan Setjara Besar-Besaran di Djawa”, Rimba Indonesia, 3, 3-4 (1954), pp. 116-118.
regencies of Besuki. In East Java, the afforestation target of 21,000 hectares in 1970/1971 was reported to have been fully reached.280

5.6.2 Declining Biodiversity and Game Populations

The human activities in the region appear to have had effects on the forest ecology as a whole, on both flora and fauna. The lack of historical data makes it hard to elaborate this complex of consequences. It is likely that the forest resource exploitation had caused declining biodiversity. In several areas the richness of the heterogeneous natural forest had disappeared, being replaced with a more homogenous industrial forest. In the early twentieth century forester Spaan was alarmed by the scarcity of soga (Peltoporum pterocarpum), which used to be abundant.281 This plant produced tannin which was used in the process of making leather and in dyeing batik cloths.282 The biological richness of the Hyang highland with its diverse meadows was reported in 1971 to have gone and remained only “a shadow of its former glory”283 In addition, Acacia nilotica species, introduced in 1963 as a part of the creation of fire resistant belts, was reported to have expanded beyond control, pushing aside other plants and reducing the grass vegetation of Baluran.284

The effects of the increased human activities on animal populations were mixed. Some wild animals might have partly benefited from the human-made grasslands and gardens providing a better breeding ground. One of them was wild boar. Although continuously a target of extermination and continuously hunted, wild boar were never extinct. Reports by Soepardi and Appelman on Baluran in 1936 revealed an abundant wild boar population.285 Outside the protected forest it remained conspicuous. Although the exact population is hard to suggest, it might be evident from the extensive nuisance created by wild boar in the 1950s and the 1960s. The continuing survival of wild boar benefited from two other factors. First, the number of their predators, including tigers and crocodiles,

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281 Onderzoek naar de Mindere Welvaart, 6 (14), p. 61.
285 Soepardi, Hutan dan Hasilnya, 2, p. 34; Appelman, “De Baloeran”, p. 54.
had deteriorated. Second, wild boar has a high reproduction capability. In one year wild boar might breed twice and each litter could reach up to eight or even ten offspring.\textsuperscript{286}

In the case of the tiger, the negative impact of hunting outweighed the advantages of the human-made habitat creation. Boomgaard has pointed out the declining number of tigers and their disappearance in many parts of Java from the nineteenth century.\textsuperscript{287} In the Besuki region where tigers survived, their number dwindled from many to few. Even in 1948 Hoogerwerf believed that there were no longer tigers in Baluran, where they used to be abundant.\textsuperscript{288} In 1952 Soepardi stated that only a few tigers remained and were found only in the Purwo forest of Banyuwangi and the Sabrang forest of South Jember.\textsuperscript{289} A tiger hunter stated that his last capture was in 1962.\textsuperscript{290} It is clear that tiger shifted from abundant to (nearly) extinct (discussed in Chapter VII and Chapter VIII). Unlike the case of the Javan tiger that still raises controversy, the extinction of crocodiles has been more firmly established.\textsuperscript{291}

The case of the Javan tiger and crocodiles illustrated how hunting eventually brought about extinction of these animals. This finding in part challenges a view by Seidensticker and Suyono, who argue that the extinction of crocodiles was due to the destruction of their habitats brought by the rubber and coffee estates.\textsuperscript{292} However, this factor seems to have played only a minor role in the extinction because the estates operated outside the crocodile habitats in swamps and along river banks. Even where such habitat continued to occur, this predator was no longer present. Similarly, the Javan tiger was practically extinct due to hunting pressures, rather than the loss of habitat. Although not worse than these two species, other game populations seem to have suffered from hunting pressures. Around the mid-nineteenth century, Junghuhn reported to have seen thousands of deer in the Hyang highland in one day. But in the early 1900s the Ledeboer brothers found no more than 5 deer.\textsuperscript{293} Due to the declining game populations, in 1941 the forest of

\textsuperscript{287}Boomgaard, \textit{Frontiers of Fear}, pp. 216-219.
\textsuperscript{288}Hoogerwerf, "Het Wildreservaat", p. 40.
\textsuperscript{290}Wessing, "The Last Tiger", p. 193.
\textsuperscript{292}Seidensticker and Suyono, \textit{The Javan Tiger}, p. 57.
\textsuperscript{293}Franck, "Het Hiang-Plateau", pp. 33-34.
Banyuwangi was said to be no longer a golden place for hunting. In 1948 Hoogerwerf estimated that the remaining game population in Baluran was below 10 per cent of the pre-war population. Another estimate by F.W. Rappard in 1949 suggested that only 10 per cent of the former populations of wild oxen and 5 per cent of wild buffalo remained in the Baluran forest. It is likely that they would have been on the verge of extinction if protection had not been set in place during colonial times (discussed in Chapter VIII).

5.7 Conclusion

Forest resource exploitation in Besuki intensified from around 1870. The major driving force behind the intensification was the rising demand for forest products created by the establishment of export agriculture, the increasingly large population size, and partly the broader market. Diverse products both plants and animals were taken from the region’s forests to provide construction materials, firewood, foodstuffs, and other requirements. All the examined cases, from teak, sadeng palm, bamboo, to wild game, suggest that their commercial exploitation immediately led to resource depletion in the natural forest environment. The small territorial size of Besuki made the possibilities of adopting a frontier’s exploit-and move-on attitude more limited. The case of Besuki indicates that there was a interest in sustainable forest exploitation. This feature was clearly manifested in the increasingly large size of the planted forest with highly valued tree species. But the resulting outcomes seem to have varied from one species to another due to the different regenerative ability of each species. The exploitation of bamboo, for example, gave more sustainable output than those of sadeng palm and teak. Bamboo could give yields after three years, whereas teak and sadeng palm would need more than 50 years before they were ready for harvesting.

The forest exploitation also had complicated effects on the environment, larger than being merely a matter of resource supplies. It also radically altered the region’s environmental realities by replacing the original, heterogenous forests with more homogenous ones. In this process, the gradually improved technologies played an instrumental role both in intensifying the forest extraction and in facilitating the expansion

of the human-made forest by removing a complex of natural obstacles for exploitation. As a result, the jungle wood forest area continued to decline in size and deforested lands emerged in some places. The region’s biodiversity appears to have also experienced a deterioration, even though the evidence for this is inconclusive. It is likely that such an impact, especially with the conversion into homogenous planted forest, could have happened to a number of less valued species, but had gone unnoticed in historical records. It is clear that extinction overtook the crocodile and probably the Javan tiger too. With a few exceptions, including wild boar that benefited from the human-made habitat, other game populations also decreased and only escaped extinction with the adoption of protective measures. Another impact took the form of deforested areas, which tended to expand until the late 1960s and ignited a series of disasters, amid attempts by the government agencies to contain the problem and its multiple causes.
CHAPTER VI
HARVESTING THE WATERS

6.1 Introduction

The relationship between humans and the environment in the Besuki region not only embraced the land environment, but the marine environment as well. Waters constitute a notable element of the environment of Besuki as found in the northern, eastern, and southern parts of the region. The exploitation of marine resources had long taken place, but it intensified only after circa 1870. This development transformed the region into a leading centre of marine fishery. Muncar was recognized as the second biggest fishing complex in Indonesia after Bagan Si Api in Sumatra.\(^1\) Despite that fact, most studies on the fisheries of Besuki have focused on the contemporary period. Emmerson’s work discusses the social unrest among an early 1970s Muncar fishing community.\(^2\) Attention has also been paid to such issues as social life, social networks, and socio-economic change during the 1970s fishing modernisation.\(^3\) However, little has been known of how fishing extraction affected the fish stocks and the marine environment of Besuki. Although these issues have been part of the major concerns in the recently growing study of the environmental histories of Indonesian fisheries, most studies focus on the outer islands of Indonesia or look at the issues from a Java-wide perspective.\(^4\) The case of Besuki fisheries remains untouched, in spite of its major position in the fish resource extraction.

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\(^4\)Among thirteen contributions in a pioneering work on the environmental history of Indonesia, there is only one contribution on fishery, with a broad scope of Java. Masyhuri, “Fishing Industry and Environment Off the North Coast of Java, 1850-1900”, in Peter Boomgaard, Freek Colombijn, and David Henley (eds), *Paper Landscapes: Explorations in the Environmental History of Indonesia* (Leiden: KITLV Press, 1997), pp. 249-260. A broad focus on fisheries of Indonesia or outer islands also appears in Peter Boomgaard, David Henley and Manon Osseweijer (eds), *Muddied Waters: Historicals and Contemporary Perspectives on...*
Fisheries are a biologically renewable resource, meaning that continuous extraction can be done. Sustainable fisheries, however, require a certain level of extraction. Beyond this point extractions would cause resource depletion and eventually lead to a closure of the fishing frontier when there are no longer available new areas with the same capacity for expansion. Timothy Flannery argues that in Australia waters, overfishing had successively destroyed resources from one fishing frontier to another. John Butcher argues that in Southeast Asia, the closure of the frontier of fishing began to occur from around 1980. On the coastal fishing of Java, Masyhuri indicated that overfishing and marine environmental problems had already emerged around the 1870s. This contention has been supported by Pudjo Semedi’s micro study of a fishing community of Central Java’s north coast, arguing the movement of fishers from the traditional areas to more distant fishing grounds as a clear sign of overfishing. In the 1930s J.S. Furnivall asserted that the same problem existed in the riverine fisheries of Java.

This chapter elaborates the development of the fishing frontier in the Besuki region. It is argued that between 1870 and 1970 there was a notable expansion in the region’s fishing frontier. This chapter seeks to provide answers to the major questions: What was the marine environment of Besuki? How did the expansion of the frontiers of fishing take place? What forces were responsible for the process? How and to what extent were fish stocks and the marine environment affected by human activities? In the next section, the region’s marine environment is discussed, followed by a discussion of fishing operations, fishing technology, inland fisheries, and the human impact on fish stocks and the marine environment.
6.2 The Marine Environment

The waters of Besuki are part of the Sunda Shelf, which covers the Indonesian seas connecting the islands of Java, Sumatera, and Kalimantan and other tiny island groups with the Asian continent.\textsuperscript{10} The northern water, known as the Madura Strait, is flat, muddy and shallow, as is the Java Sea in general.\textsuperscript{11} This strait can reach a depth of 56 metres, but eastward it is deeper. To the north of Panarukan, the depth can reach 81 metres.\textsuperscript{12} This inclination reflects a broad feature of the Java Sea, showing an increase in depth from west to east.\textsuperscript{13} The eastern water, called the Bali Strait, is shallow in the north and becomes deeper to the south.\textsuperscript{14} The bottom features mud, sand, and coral reefs of varying depths, from 20 to 545 metres, but sheer around Blambangan. The latter feature is common in the southern waters: at 50 km from the coast, the depth can reach more than 1,000 metres.\textsuperscript{15}

The northern water generally is calm, and so is the Bali Strait. The southern water, by contrast, is rough and characterized by giant waves.\textsuperscript{16} The monsoons greatly affect the sea currents. One of the major influences is a change of sea water twice a year.\textsuperscript{17} During the east monsoon running from June to October, westward currents enter the Java Sea from the Flores Sea. During the rest of the year, eastward currents or the west monsoon current enter the Java Sea from the South China Sea.\textsuperscript{18} The monsoons also influence turbidity, measured from its particle content. In general the region's waters are somewhat clearer than the rest of the Western Indonesian waters due primarily to the region’s lower

\textsuperscript{17}H.P. Berlage, Jr., \textit{Monsoon-Currents in the Java Sea and Its Entrances} (Weltevreden: Landsdrukkerij, 1927), p. 28.

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rainfalls. During the east monsoon, a time when water recharges from the inland rivers are at their lowest, the sea waters are a bit clearer. During the rainy season (west monsoon), turbidity is higher because of larger volumes of sediments brought by the inland rivers.\textsuperscript{19}

The monsoons also affect salinity. During the west monsoon the salinity of the Java waters is lower than during the east monsoon. One of the major reasons is the lower salt content of the streams entering the Java Sea from the shallow South China Sea during the west monsoon. During the east monsoon, by contrast, the streams entering the Java Sea from the Flores and Makasar waters have a higher salinity.\textsuperscript{20} In the eastern part of the Java waters, including Besuki, the highest salinities occur at the end of the east monsoon.\textsuperscript{21} The salinity also fluctuates partly due to the different volumes of water recharges from the inland rivers between the two monsoons.\textsuperscript{22} There are also sea and land breezes forming an important element of the marine environment and exerting a great influence on fishing operations.\textsuperscript{23}

The region’s waters store more fish than the Java Sea in general. An investigation under the Gier expedition in 1908 concluded that the Bali Strait was the richest fishing ground, with an average catch of 85 kg per hour. On the east coast of Kalimantan, the second-best fishing ground, the average catch was 70 kg per hour.\textsuperscript{24} The 1909 trials with large nets resulted in higher average catches, 49.5 kg per hour in the Madura Strait compared with 42.5 kg per hour in the Java Sea.\textsuperscript{25} It was revealed in 1911 that the Madura Strait was the most feasible ground for trawl fishing.\textsuperscript{26} A much later survey in the 1970s


\textsuperscript{21}H.C. Delsman, “Preliminary Plankton Investigations in the Java Sea”, \textit{Treubia}, 17 (1939), 143.


\textsuperscript{23}Butcher, \textit{The Closing of the Frontier}, p. 12.


\textsuperscript{26}The trials indicated an average catch of 60 kilograms per hour in the Madura Strait, larger than 34 kilograms per hour in the Java Sea. Van Roosendaal, “Verslag der Verrichtingen”, p. 19; J.C.
indicated a fish density of 7.4 tons per square kilometre in Besuki's southern water, but there was only 3.7 tons per square kilometre in the southeastern waters of Kalimantan. In terms of fish species, however, Besuki is similar to the Western Indonesian waters. An estimate by Delsman in 1939 suggests 1500-2000 fish species in the Western Indonesian waters. In the northern water alone there are at least 60 ornamental fish species.

One major factor contributing to the large fish resources is the richness of plankton, which provides a source of food for particular fish species. The richest plankton area is the Bali Strait. The plankton richness of the Bali Strait results primarily from the upwelling of sea waters. For four months (March-July) during the east monsoon, large streams circulate in the Indian Ocean stretching along the south coasts from Java to Sumbawa. Part of the streams enter the Bali Strait and push against the water of the Java sea, leading to an upwelling of the sea water with low temperature and high salinity from the deeper column. Through the process, nutrients originating from decomposed organisms and other minerals stored in the bottom of the sea are brought up to the surface layer. In the Madura Strait, as in the other parts of the Sunda Shelf waters, the plankton density is generated by combined factors of organic nutrients brought down by rivers, wind-linked sea turbulences, and the rise and fall of tides lifting up phosphate and nitrate. Delsman’s observation found that the Java waters were richer in plankton than other tropical waters, although not as rich as the northern seas.

Another important factor contributing to the region’s fish potential is seasonal fish migration, although some fish species are domestic. The best illustration is layang (scads, Decapterus kurra). Although it is a major catch, the layang fish is not endemic to Besuki. Categorized as pelagic fish, the environmental niche of layang fish is deep seas.
with high water clarity and salinity. These features are hardly met by the Java waters. Based on monsoonal patterns, Hardenberg distinguishes between east and west layang seasons. During the east layang season, larger quantities of fish enter the Java waters from the Flores Sea than those via the Sunda Strait from the Indian Ocean during the west monsoon. In addition, the marine environment of Besuki is enriched by mangrove and coral reef ecosystems. The mangroves are found especially in Baluran, Grajagan, and Pangpang (Chapter V). The coral reefs occur around Baluran and Pasir Putih, and elsewhere in the eastern and southern waters. The two ecosystems are valuable for coastline protection and fish habitat.

On the whole, it might be said that the marine environment of Besuki provides a fertile ground for marine fisheries. The region has good fishing grounds, benefiting from a set of interrelated factors of higher levels of water clarity and salinity, seasonal fish migration, and rich marine ecosystems. Among the region’s waters, the Bali Strait was the most lucrative area with more natural advantages compared especially with the southern waters, which present a greater natural challenge. There was an enormous fish resource waiting for exploitation and the next section will examine the ways in which the extraction of the fish resource developed in the region.

6.3 Fishing Operations

During 1870-1970 there were two broad stages in the development of fisheries in Besuki; 1870-1925 and 1925-1970. The growing presence of foreign fishers was a dividing line that separated the two stages of development. The involvement of foreign ventures in

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fishing operations marked the second stage of development, bringing several distinctive features to the region’s fisheries. From the mid-1970s, the region’s fisheries entered a new stage of development, characterized by a strong intervention by the government under the so-called “fishing modernisation” intended to bring about improvement in the livelihood of fishing households by increasing catches. The last stage of development, however, is beyond the scope of this thesis.

Fishing communities emerged in many places along the coastal areas of Besuki. The fishing communities in Besuki consisted of mainly Madurese and Javanese but there were minority groups of Buginese-Mandarese and Chinese. The Mandarese were the descendants of the pre-1870 migrants who settled in Puger and Besuki, whereas the Buginese came to Muncar in the late 1950s. The two ethnic groups are well-known for their marine orientation. In absolute terms, from 1870 to 1970 the number of people engaged in fisheries grew across the Besuki region. In Banyuwangi, it increased considerably from 1,000 fishers in 1903 to 12,000 fishers in the early 1970s, and in Panarukan from 3,500 fishers to 9,800 fishers. The same trend presumably applied to Jember, where in 1903 there were 600 fishers. The proportion of fishers to the total population grew from around 0.7 per cent to 1 per cent in Banyuwangi and from 1.40 per cent to 2.30 per cent in Panarukan.

Apart from being integrated through neighbourhood relations and other social networks under the village structure, the region’s fishing community also operated through


43 The dividers are population data from 1895 and 1968, taken from J. Tennekes, “De Bevolkingspreiding der Residentie Besoeiki in 1930”, Tijdschrift van het Koninklijke Nederlandsch Aardrijkskundig Genootschap, 80 (1963), p. 335 and from Penduduk Indonesia: Registrasi 1968 (Djakarta: Biro Pusat Statistik, 1971), pp. 448-453. In 1895 there were 92,500 inhabitants in Banyuwangi and 257,800 inhabitants in Panarukan, whereas in 1968 there were 1,175,000 inhabitants in Banyuwangi and 433,000 inhabitants in Panarukan.
a patron-client relationship. This pattern was usually formed in a number of ways, such as
financial ties (lending-borrowing), subsistence assistance from the patron to clients during
hard times, and also family relations.\textsuperscript{44} There were two broad layers in the fishing
community’s social structure. The upper layer consisted of capital owners, including big
money lenders (pengambak) and fishing boat and gear owners (juragan darat). They
usually acted as patrons. The lower layer, as the clients, included skilled fishing leaders
(juragan laut), unskilled fishing crew (pandhega), fish transporting coolies (manol), and
fish trade brokers (belantik).\textsuperscript{45} Most fishing operations were collectively run and each
crew operated independently.

The region’s fisheries formed an open-access resource. It meant that anyone with
capital and capability could extract the available fish resource. Outsiders were not
prevented from entering.\textsuperscript{46} One possible reason why marine tenure did not evolve in the
region is that such a tenure tends to develop among social communities living in tiny
islands where marine resources nearly become the only source of livelihood, as indicated
by a study in Eastern Indonesia.\textsuperscript{47} This feature clearly does not characterise the Besuki
region. The other reasons may be partly linked to the fact that most of the region’s fishers
had no local origins, as illustrated by the predominant Madurese element. This
characteristic may have led them to prefer an open-access resource, and yet there were
relatively abundant fish resources available. In addition, the development of community-
based marine resource management assumed a strong communal orientation among the
fishers, a feature that seems to have been marginal, even among the region’s agrarian
villages as reflected by the absence of communal land ownership (Chapter II).

Fishing developed in various places (Map 6a), but the northern seas seem to have
initially been the main focus. G.N. Verloop suggested a total revenue of $3.5 million on
the north coast of Besuki around 1870, but only $1.8 million for Banyuwangi.\textsuperscript{48} The
1880s annual reports from Besuki confirmed that there were more developed fisheries on

\textsuperscript{44}Sumardiati, “Perikanan dan Usaha Nelayan”, pp. 41-42; Emmerson, “Orders of Meaning”, p. 156.
\textsuperscript{45}Mohamad Hadi Sundoro, “Pengaruh Modernisasi Perikanan Terhadap Nelayan di Kabupaten
Sumardiati, “Perikanan dan Usaha Nelayan”, p. 50.
\textsuperscript{46}J.W. de Stoppelaar, \textit{Balambangansch Adatrecht} (Wageningen: Veenman, 1927), pp. 81-82.
\textsuperscript{47}Dedi Supriadi Adhuri, “Hak Ulayat dan Dinamika Masyarakat Nelayan di Indonesia Bagian Timur: Studi
\textsuperscript{48}G.N. Verloop, “Zeevisscherij Naast de Inlandsche Landbouw”, \textit{Tijdschrift voor Nijverheid en Landbouw in
Nederlandsch-Indië}, 69 (1904), pp. 322-325.
the northern coast than on the southern and eastern coasts.\textsuperscript{49} The distribution of the fishing villages reflected this reality too. In the early 1900s there were 54 fishing villages on the northern coast, whereas in Banyuwangi there were 22 fishing villages, located largely on the eastern coast. On the south coast of Jember, only 4 fishing villages were reported.\textsuperscript{50} Apart from the higher population size (Chapter III), the dominant position of the north coast’s fisheries was partly due to the physical aspects mentioned above. In the southern water, by contrast, giant waves posed a serious danger.\textsuperscript{51} In the local beliefs, the danger was linked to the Indian Ocean goddess.\textsuperscript{52} Accidents were reported to have often occurred and its danger has been reflected in the names of sites along the coast, such as \textit{watu mayit} (corpse rocks) and \textit{pelawang maut} (the gate of death).\textsuperscript{53}

\begin{center}
\textbf{Map 6a. Major Fish Landing Centres in Besuki}
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\textsuperscript{50}Onderzoek naar de Mindere Welvaart, 1 (14), p. 8.


\textsuperscript{52}Vissering noted the existence of the legend in Puger around the early twentieth century. C.M. Vissering, \textit{Een Reis door Oost-Java} (Haarlem: De Erven F. Bohn, 1912), p. 80.

Each area seems to have had a special feature, besides sharing a number of catches in common. The major catch in the northern water was layang. During the layang season, as found in Panarukan, pickled fish-making activities (pindang), flourished. But in Banyuwangi, lemuru (Bali sardinella, Clupea longiceps) was the primary catch. An estimate suggested that in the 1960s lemuru made up around 70 per cent of the total catches in Muncar. The Bali Strait has been regarded as the best lemuru habitat. In the southern water fish captures included a variety of species, but there was no single dominant catch. Besides fish, green turtles (Chelonia mydas) and their eggs were also collected by fishers along the bays of Banyuwangi and Jember. In general, the major commercial catches in the region were layang and lemuru. Apart from the special characteristics from one locality to another, times of good and bad catches through the year characterise fishing operations across the region. Catches also varied considerably between years. Unsurprisingly, rites played an important role in the region’s fishing life in securing the people’s fragile marine-based livelihood.

Among the region’s fishing communities, a catch sharing system was commonly practised. Under this system, the fishing crew obtained an agreed portion of the catches and their revenues were determined by catches and fish prices, rather than a fixed wage. It

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55 Layang was the largest proportion of pindang. ANRI, “Memorie van Overgave van den Resident van Besoeeki, Ch. A. van Romondt over de Periode 30 Januari 1935-26 Februari 1938”, pp. 104-105.
59 The catches included for example tuna, tengiri, bangbangan, putihan, layur, mungsing, kacangan, grogo, garna, cakalang, and layur. Onderzoek naar de Mindere Welvaart, 1 (14), pp. 13-15.
63 These rites are called slametan pancer in Puger and petik laut elsewhere in the region. They were adopted through generations and performed annually in the sacred month of sura in the Javanese calendar through which the fishers asked the sea-mastering spirits for protection and good catches. Wessing, “Nyai Roro Kidul”, pp. 114-115; Hendro Sumartono, “Upacara Adat Larung Sesaji: Studi Kasus di Komunitas Nelayan Puger Kabupaten Jember”, Prisma, 6 (1996), pp. 80-81.
meant that the risk of fishing operation was distributed among all those involved in the venture and the risk to capital owners, therefore, was minimised. Dietz recognized in 1923 that the catch sharing system was more effective in sustaining working spirit among the Madurese fishing crew, indicating a greater possibility of maximising the income opportunity for the fisher. There was a diverse catch-sharing arrangement, but almost certainly the capital owners (pengambak and juragan darat) took the largest portions. In 1905 about 33-42 per cent of the catch in the Besuki district went to the capital owners, while the rest of the catch was shared among the crew. The catch sharing system continues to be observed in the region up to the present.

Besides the continuance of traditional institutions, notable developments took place from the 1950s. Some fishers began to utilize social organizations as a means of coping with livelihood vulnerability. The organization (Gyōkyō kumiai) emerging during the Japanese occupation years basically served the Japanese interests, rather than that of fishers. On the initiative of Sumadji Irawan, a fishing cooperative was established in 1951 in Muncar, called Menak Djinggo. Although the primary objective was to protect fishers' interest against Chinese fish traders, the cooperative also provided financial assistance to fishers for resuming their operations in case of accidents at sea. In Besuki such an organization was clearly a post-colonial phenomenon, though in other parts of Java it had much earlier developed, around the 1910s. Although the fishing organizations did not always succeed in improving the fishers' livelihood, the use of such an organization was a new development in Besuki.

Both coastal and deep-sea fishing operated in Besuki, as indicated by the presence of mayangan and non-mayangan boats which were different in terms of size, construction

66Onderzoek naar de Mindere Welvaart, p. 9.
70The first fishing organization, called Misojo Mino, was established in 1914 in Tegal. In 1917 it was followed by the Saja Sari (Sawojajar) and Ngoepojono Mino (Batang). Three other organizations established in 1918: Misaja Sari (Tanjungsari), Saja Soemitro (Indramayu), and Mino Sojo (Wonokerto). Instituut voor de Zeevisscherij te Batavia: Jaarverslag 1940 (Batavia: Kantoor van het Instituut, 1940/1941), pp. 38-39; Pujo Semedi, “Political Life of Javanese Fishermen”, Masyarakat Indonesia, 28, 1 (2002), pp. 62-63.
materials, fishing gears and operation areas (discussed in Section 6.4). Around the early 1900s the mayangan fishing was more common in the northern than in the eastern and southern waters. In the latter two areas, coastal fishing with smaller size, non-mayangan boats predominated. Such boats were believed to be more suitable and safer for fishing operations in areas where giant waves and sheer reefs occurred. The reach of the fishing technologies in most of the period under consideration, however, remained limited. In Java the wind-powered mayangan boats could hardly operate beyond 90 km from the coastline and fishing operations were usually run in areas between 40 to 50 km from the coastline. Combined with fishing nets useful mostly for capturing pelagic fish, the existing technologies could not extract fish stocks located in deeper layers and more distant fishing grounds. It was estimated in 1917 that only 25 per cent of Java’s fishing grounds, mostly near the coast, was already used.

Unsurprisingly, in contrast to the region’s strong export-oriented agriculture, the fisheries of Besuki were predominantly local-oriented. In 1885 the resident of Besuki stated that the fish catches were locally marketed. Another report revealed in 1905 that the fish catches of Puger were channelled to the other districts of Jember, which also became the market destination for fish products from Banyuwangi, while Bondowoso absorbed fish from the northern coast. But with the growing population the local production was apparently insufficient and fish imports became necessary. Dried fish imports originated mainly from Madura, Makassar, Banjarmasin, and Palembang.

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71 In 1903 there were 145 mayangan boats in the northern water of Besuki, only 5 mayangan boats in Jember and none in Banyuwangi. In the same year there were 229 non-mayangan boats in Jember and 441 non-mayangan boats in Banyuwangi and 676 non-mayangan boats in the northern water. Onderzoek naar de Mindere Welvaart, 1 (14), pp. 18-19; Onderzoek naar de Mindere Welvaart, 1b (2), p. 82.
76 ANRI, Arsip Residensi, Besuki 9.16, “Algemeen Verslag van Residentie Besoeki over het Jaar 1885”.
77 Onderzoek naar de Mindere Welvaart, 1 (14), pp. 11-12.

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annually reaching about 3,900 picol (240 tons) in the early 1900s, but smaller quantities of fish came from Bali and Sumbawa. In 1920, Ch.O. van der Plas noted that Besuki was one of the primary markets for fish exports from the Sapudi and Kangean islands of Madura. This corresponds with reports from Madura, revealing the importance of the fish trade between Madura and Java including Besuki.

From the mid-1920s, Japanese and Dutch fishing fleets became involved in the fish resource exploitation. These foreign fishers employed more developed boats and fishing gear. This development was induced by the setting up of colonial policy designed to promote domestic industry and to reduce dependency on fish imports. Patchy evidence suggests the activities of Japanese fishers in the region, including reef fishing in the Bali Straits. This activity was part of the growing Japanese interest in the Indonesian fisheries from the mid-1920s. The Japanese operated with steam-powered boats, trawler and muroami nets designed for reef fishing. The moves were motivated by the fast-growing fishing industry in Japan and the emerging overfishing problem, which led to tighter competition for fish resources. The Japanese fishers confronted restrictions imposed by the Soviet and Chinese governments and were forced to search for new fishing frontiers elsewhere. Through various investigations the Japanese fishers had been equipped with an adequate understanding of the fish resources in Indonesian waters.

The interest of the Dutch fishers in exploiting the fish resources in Besuki had already emerged in the early 1900s. In 1913 Broersma noted a European-run fishing

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83It was estimated that in the 1930s around 4,000 Japanese fishermen with more than 500 fishing boats operated in the Indonesian waters. Ten Years of Japanese Burrowing in the Netherlands East Indies (New York: Netherlands Information Bureau, 1944), p. 36.
venture in Puger. However, the activity soon discontinued after the loss of capital from a sea accident and the owner failed to resume his business.\textsuperscript{86} The interest was only renewed around 1930, following the sluggishness of the fisheries in the Netherlands. Poortman, a director of the fishing company at Maassluis, in cooperation with Pot, a herring fisherman at Vlaardingen, decided to shift their operation to colonial Indonesia.\textsuperscript{87} Following the government’s approval, a Dutch fishing company was established with its centre in Jakarta. This company also operated in the Besuki waters and a fish processing factory was set up in Banyuwangi.\textsuperscript{88} The capacity of the Dutch- and Japanese-run fishing ventures in the region is unknown but might have been quite large.

The operations of modern fishing seem to have boosted the size of fish catches. The marine fisheries of Besuki grew considerably, symbolized by the emergence of the Muncar fishing complex as its centre.\textsuperscript{89} The best \textit{lemuru} production in Muncar was achieved in 1938, reaching 20,000 tons. This development raised optimism that Muncar was a big competitor for the fish-producing centre of Siam.\textsuperscript{90} There was a radical change in the position of Besuki in the fish trade. Previously, to meet local needs the region always depended on fish imports. But from the 1930s the region began to export fish products. In 1936, a total of 439 tons of fish was transported from Banyuwangi to Surabaya and by 1937 it increased to 2,241 tons.\textsuperscript{91} In 1941, the Borsumij firm was reported to have exported a significant quantity of canned fish from Banyuwangi.\textsuperscript{92} During the tumultuous years of the 1940s the output of the region’s fisheries seems to have declined. A set of factors regarded as responsible for the decline in East Java, probably including Besuki, were the decrease in fishing boats and gear due to the “scorched earth” policy before the Japanese invasion, the difficulty in obtaining timber for boat renewals, and fishing restrictions at night imposed by the Japanese.\textsuperscript{93}

\begin{itemize}
  \item \textsuperscript{87}R. Broersma, “Westersche Zeevisscherij voor Ned.-Indië”, \textit{Koloniaal Tijdschrift}, 16 (1927), pp. 454-455.
  \item \textsuperscript{88}Masyhuri, “Pasang Surut Usaha Perikanan”, pp. 180-181, 195.
  \item \textsuperscript{89}ANRI, “Memorie van Overgave (Van Romondt)”, p. 103.
  \item \textsuperscript{90}Waluyo Subani, “Masalah Perikanan Lemuru di Selat Bali”, \textit{Tindjuan Ekonomi BNI}, 5, 38 (1971), p. 25.
  \item \textsuperscript{91}Masyhuri, “Pasang Surut Usaha Perikanan”, p. 224.
  \item \textsuperscript{92}Kementerian Penerangan, \textit{Republik Indonesia}, pp. 346, 372-374.
\end{itemize}
With the improved political stability from the late 1940s, the region’s fisheries revived. A steep increase in catches between 1949 and 1950 (Figure 6.1) might have stemmed from the increase in fishing operations and better stocks linked to years of under-exploitation. If the data for the whole of East Java for the 1955-1960 period is any
indication, the catches in Besuki might have slightly and steadily increased until 1960. But the catches of *lemuru* in Muncar for the same period suggest the opposite (Figure 6.2). Comparing Figures 6.1 and 6.2, it can be seen that there is a rather similar trend between *lemuru* catches in Muncar and total catches in Besuki, which might suggest that between 1955 and 1960 the catches in Besuki were constantly low. A significant increase began from 1963 with a peak catch in 1968, reaching 23,000 tons. In 1968 the catches landed in Banyuwangi alone constituted nearly 70 per cent of East Java’s total catches, while the proportions of fishers and fishing vessels in this regency were only 8 per cent and 11 per cent. The increase in catches in the 1960s seems to have stemmed from the significant improvement in fishing technology.

### 6.4 Fishing Technology

Technology is one of the major factors mediating human impact on the environment. In the context of fisheries, Butcher calls it “the art of fishing”, which embraces three key elements: fishing boats, fishing equipment, and practical knowledge. These elements were also observed in Besuki and they reflected local resources, ethnic diversity, and a slow process of technological change.

The fishing boats in the Besuki region were not uniform. A traditional literature from Banyuwangi mentions *mayang* canoe (*kano mayang*), *mancing* proa, and *jorong* proa. Hageman noted two types of fishing boat in Jember: proa (*perahu*) and outrigger canoe (*jukung*). The early 1900s colonial report identified four types of fishing boats: *kolek*, *sampan*, *jrupih*, and *jukung*. The first three boats basically had something in common in the sense that they were made from wooden boards with diverse bows and stern shapes. The names reflected their sizes. The largest fishing boat was called *kolek*,

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94The catches in East Java were 14,000 tons (1955), 17,000 tons (1956), 21,000 tons (1957), 28,000 tons (1958), 23,000 tons (1959), and 25,000 tons (1960). *Hasil Penangkapan Ikan Laut di Jawa dan Madura dalam Tahun 1955-1962* (Djakarta: BPS, 1964), p. 8.
101Onderzoek naar de Mindere Welvaart, 1 (14), pp. 16-17.
and had a length of around 8 metres, a width of 2.25 metres with 7-8 sailing crew. The other boats, *sampan* and *jrupih*, were smaller in terms of size and crew capacity.  

Meanwhile, outrigger canoes (*jukung*) were directly shaped from a wood beam, occasionally heightened by adding a couple of wooden boards.  

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102 Arends, “Verslag van een Reis”, p. 174; *Onderzoek naar de Mindere Welvaart*, 1 (14), p. 14. According to the latter report, the *sampan* boat was 6.5-8 metre length, 0.75-1.25 metre width, 0.45-0.60 metre depth, with 4-7 sailing crew. The third boat called *jrupih* had a 6-7 metre length, 0.40-0.60 metre width, 0.30-0.50 metre depth, and 2-3 sailing crew.

The different boats could also be identified by ethnic origin. As a recent observation indicates, in Puger there were three types of fishing boat: *pakisan* (Java type), *eder* (Madurese type), and *pancingan* (Mandar type).\(^{104}\) The Madurese type was the most common on the northern coast, whereas the Javanese type was found mainly on the southern coast.\(^{105}\) The Balinese influence was present in the form of outrigger construction, whereas the adoption of a wide, rectangular sail and longer mast represented the Buginese-Mandarese influence.\(^{106}\)

![Figure 6.3 Number of Fishing Boats in Besuki 1895-1952](image)


In terms of operation area, the fishing boats in Besuki can be broadly grouped into two categories. The first category was *mayangan*, which was used for deep-sea fishing operations.\(^{107}\) In Besuki what was called *kolek* was a *mayangan*.\(^{108}\) This boat often had different names across Java, such as *konting*, *besse*, *kolekan*, *potik*, and *menting*.\(^{109}\) The second category was non-*mayangan*, including *jukung*, *sampan*, and *jrupih*.\(^{110}\) They were

\(^{104}\) Rato, “Prahu Madura”, p. 11.
\(^{108}\) *Onderzoek naar de Mindere Welvaart*, 1 (14), pp. 16-17; Schippers, “De Zeevisscherijen”, p. 19.
\(^{110}\) *Onderzoek naar de Mindere Welvaart*, 1 (14), pp. 16-17.
used for coastal fishing operations. Figure 6.3 indicates that between 1895 and 1952 the two types of fishing boats grew in number. The *mayangan* type doubled, whereas the non-*mayangan* type rose by more than 50 per cent. The *mayangan* boats made up roughly 10 per cent of the total fishing boats in 1895, and it grew to 13 per cent by 1952. Despite the increase, the figures indicate that the non-*mayangan* predominated among the region’s fishing vessels during most of the period under consideration.

A variety of timber was used for fishing boat construction. As elsewhere in Java, in the Besuki region the *mayangan* boats were made from teak. The non-*mayangan* boats, however, mostly used jungle wood species such as *bendo* (*Artocarpus elastica*), *nyamplung* (*Callophylum inophyllum*), *ingas* (*Gluta renghas*), and *gangangan* (*Tetrameles nudiflora*). Both teak and jungle wood timber could locally be found in the forest. The forest of Puger was described in the early 1900s as supplying timber for boats, but in the Besuki district the materials were imported from Pasuruan and Rembang (Central Java). From the late nineteenth century some fishing boats were also imported. One major supplier, especially for *mayangan*, was the Rembang residency (Central Java), Java’s leading boat-producing centre. Some smaller boats came from Gresik and occasionally also from Jembrana (Bali). The major reason for the imports was the decline in boat production due to the difficulties in obtaining timber. This situation was caused by the growing demand for wood from estates and railways, the dwindling supplies of timber in accessible locations, and obstacles to extract timber from the remaining forests due to poor transport.

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113 The valuable jungle wood species for boats were found for example in the Meru-Betiri forest. Seidensticker and Suyono, *The Javan Tiger*, p. 30; in 1951 when the Fishery Service built *mayangan* boats in Panarukan, teak was locally obtained from Asembagus. “Aneka Warna dari: Daerah Kab. Panarukan”, *Trompet Masjarakat*, 1 August 1951, p. 3.
114 *Onderzoek naar de Mindere Welvaart*, 1 (14), pp. 10-11; *Onderzoek naar de Mindere Welvaart*, 6 (14), p. 60.
117 ANRI, Arsip Residensi, Besuki, 9.20. “Algemeen Verslag van Residentie Besoeki over het Jaar 1889”.

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Despite the difference in size and construction materials, there was one similarity. All fishing boats relied heavily on the daily pattern of sea breezes as a source of power to go to and from fishing grounds. The ways in which the Indonesian fishing boats of Besuki operated seem to have been essentially similar to the early nineteenth-century descriptions by Raffles. The fishing boats usually departed from the shore in the very early morning by utilizing the off-shore winds and returned in the afternoon by relying on the on-shore sea breezes. The breezes were caught with sail, made initially from corypha palm fibres (agel), but later also from cloth. The use of sail was common among the local fishers.

Each type of fishing boat had different equipment. Deep-sea fishers used a large sack-like net with two long wings (payang), especially during the layang season. This kind of net, which could reach 180 metres in length and 120 kilograms in weight, was made from agel rope. The agel-producing trees grew in the region’s forest and were regarded by the local inhabitants as among its most valuable products. The fishing operation was frequently aided with rumpon, a floating fish lure consisting of a long rope with sinkers along one edge and floats on the other to support it upright in the water. Along the rope were bound coconut leaves, as hiding places to attract fish. Fish schools were periodically captured, first by lifting up the rumpon. Besides layang as a major catch, a variety of fish was captured in the operation. Outside the layang season, the

124 They included *seler ijo* (Caranx affinis), *seler bentong* (C. crumenophthalmus), *seler kuning* (C. leptolepis), *deles* (Decapterus macrosoma), *banjar* (Scomber kanaagurta), *bawal* (Stromateus niger), *lemuru* (Clupea longiceps), and *tembang* (Harengula fimbriata). “Station voor Waarnemingen over de Zeefauna (‘Visserij-Station’) te Batavia en Onderzoekingsvaartuig ‘Braak’”, *Jaarboek van het Departement van Landbouw in Nederlandsch-Indië 1915* (Batavia: Landsdrukkerij, 1917), pp. 19-20; Republik Indonesia, *Propinsi Djawa Timur*, p. 358
deep-sea fishers used gill nets and fishing rods. There was a variety of equipment for coastal fishing. The major catches came from the use of *jaring jabur*, a *payang*-like net but finer and smaller in size, suitable for capturing small fish and shrimps.

The above fishing technologies were combined with practical knowledge too. The local fishers were described as having a good knowledge of how to identify fishing grounds, to understand sea currents, fish behaviour, and the right time to throw nets. Such practical knowledge was still current among the region’s fishers after 1970. On the region’s north coast, if the recent situation is an indication, the fishing grounds were usually recognized from constellations and natural landmarks such as the position of volcanoes seen from the various locations. In determining the fishing and off-fishing seasons, the time for starting and ending operations, the fishers adopted the lunar calculation system.

From circa 1910 there had been experiments with new fishing technology such as larger and finer nets and motorized boats. In Besuki around 1920 there was a pioneering fishing venture employing motorized boats and large nets in the Madura Straits run by Dietz, taking inspiration from the European fisheries. The venture, however, soon ceased to operate due to poor engine quality and difficulties in renewing spare parts. An attempt was made by the Zeevisserij-Instituut (Sea Fishery Institute) to equip *mayangan* boats with motor power. But there was no evidence that in the 1930s the motor-equipped fishing boats that were already in use around Jakarta, were also present in Besuki. One reason behind this slow development was that capital was too expensive relative to labour. Unsurprisingly, the fishing boat motorization, which later took place,

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125 Masyhuri, “Pasang Surut Usaha Perikanan”, p. 35.
126 They included *jaring jabur* (also called *payang pinggir*), *krakat*, *jala*, and also fishing traps such as *bubu* and *cager*. Kementerian Penerangan, *Republik Indonesia*, pp. 358-360.
134 “Jaarverslag 1936”, p. 53; Delsman, “Fishing and Fish Culture”, p. 105; Natadisastra, “Perusahaan Mayang”, p. 3.
often had to be encouraged through foreign aid development projects. Among the local fishers there were beliefs that the use of motor-equipped boats would scare fish and reduce catches because of engine noise. In the 1950s the motor-equipped fishing boats were still on trial in the Surabaya-based marine fishing station. Limited capacity and less developed technology were reported still common among the local fishers along the coast of East Java from Bangil to Banyuwangi.

Of course, several changes did take place. Initially, the region’s fishers attracted fish with torches. But from 1950 the use of kerosene lanterns, which were believed to attract more fish gatherings, thereby promoting better catches, developed in Banyuwangi. This practice apparently became more common in the 1960s. A number of the fishers also began employing a Japanese-style fishing rod. From around 1960 some fishers in Banyuwangi adopted the lift-net (bagan). Brought by the Buginese migrants to the region in the late 1950s, the lift-net became popular in Pangpang bay.

Despite these facts, it can be said that between 1870 and 1970 the fishing technologies employed by the local fishers only facilitated the increased extraction of fish resources in the traditional fishing grounds, but without having the effect of expanding the fishing frontier. Only from around 1968 onwards did a new trend begin to grow parallel with the adoption of motorised fishing vessels and nylon purse seine nets, and reached its full-

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fledged development from the mid-1970s. This technology gave access to new fishing grounds that had previously remained inaccessible to the local fishers. Before moving on to the extraction impact on fish stocks and the marine environment, our discussion would be incomplete without looking at inland fisheries.

6.5 Inland Fisheries

The main form of inland fisheries in the region, in terms of production and area, was brackish-water pond cultivation. By 1863 all the brackish-water ponds were located in Panarukan regency. There are no reports of brackish-pond fish cultivation in the other regencies for the same year, perhaps indicating the absence of the practice. A 1905 report revealed the absence of brackish-water ponds in Jember and Banyuwangi. In the 1920s, the brackish water ponds developed in Banyuwangi, but anti-malaria measures led to their closure and the colonial authorities in Besuki discouraged the local inhabitants from making further expansion (discussed in Chapter VII). Despite that fact, the area of brackish water ponds continued to increase (Figure 6.4). In the early 1950s, the largest area remained in Panarukan, but it had begun to develop in Jember and Banyuwangi. Around 1970 the area of brackish-water ponds in Jember was 36 hectares.

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144 In 1973 there were more than 64 motor-powered fishing boats in Besuki: 51 boats in Banyuwangi and 13 boats in Panarukan, Laporan Tahunan Dinas Perikanan Daerah Propinsi Jawa Timur 1973 (Surabaya: Dinas Perikanan Daerah, 1974), p. 33.
146 Onderzoek naar de Mindere Welvaart, 1 (14), pp. 5-6.
148 In the same year, the area of brackish-water ponds was 5 hectares in Jember and 25 hectares in Banyuwangi. Kementerian Penerangan, Republik Indonesia, p. 385.
The primary species reared in brackish-water ponds in Besuki had long been milkfish (*Chanos chanos*), known locally as *bandeng.* This custom was not exclusive to the region, but was also common along Java's north coast. The habitat of the milkfish covers an extensive area, stretching along the Java Sea coast, eastward to the Paumotu islands, north to Southern Japan, southward to New South Wales, westward to the Red Sea and the East coast of Africa and Madagascar. In Java, however, mature milkfish were rarely captured in open waters which explains why they were reared for commercial purposes. But this fish does not spawn in brackish-water ponds and consequently, milkfish cultivation depends on fry captured regularly. The major sources of fry were Asembagus and Banyuwangi. Besides being locally sold, large quantities of *bandeng* fry were transported outside Besuki, including to Surabaya and Pasuruan.

The *bandeng* fry season runs twice a year, from April to June and September to December, with micro variations across the region. The beginning and the end of *bandeng*
fry season was recognized by constellations, winds and other climatic events, and marine phenomena such as the appearance of certain fish and the state of particular marine flora.\textsuperscript{155} Brought landward by the waves, bandeng fry were collected along the sandy beaches by fishers with small landing nets. To attract bandeng fry, simple lures made from ropes and alang-alang were installed near the coast. The bandeng fry might be sold to traders or directly reared in brackish-water ponds. The length of cultivation in brackish-water ponds was around one to two years, the fish being roughly harvested before reaching their full physical growth and sexual maturity. At this age bandeng was believed to have the best taste and economic value.\textsuperscript{156}

In the 1930s, an attempt was made to promote better ways of rearing milkfish, but primarily for the sake of malaria control rather than promoting bandeng production.\textsuperscript{157} A new era for brackish-water pond cultivation only began in the late 1960s with the rising commercial value of shrimps, leading to a more intensified production system.\textsuperscript{158} For a long time, shrimps were merely considered as a byproduct of milkfish cultivation.\textsuperscript{159} A survey carried out by the Fishery Service around 1970 found several places in Panarukan, including Tanjung Pecinan, Landangan, and Wonorejo, as suitable for shrimp cultivation.\textsuperscript{160} Shrimp cultivation also attracted strong interest in Banyuwangi, not only in the northern coast of the region.\textsuperscript{161} This development was greatly stimulated by the growing preference for shrimps, particularly in Japan, as one of the major markets of Indonesian fish exports.\textsuperscript{162} But this issue is beyond the scope of this thesis.

\textsuperscript{155}Starting on April, the first bandeng fry season ended in June in Panarukan, but in May in Banyuwangi and Jember. Meanwhile, the second bandeng fry season started in September in Panarukan and Jember, but in October in Banyuwangi. In Panarukan the beginning of bandeng fry season was recognized by “Kerti” and “Lumbung” constellations, and northeasterly wind. Another marker was the appearance of serinding and layang hatchlings in Jember, and of bulan-bulan hatchlings in Panarukan. Hasanuddin Saanin, “Beberapa Hasil dari Angket Nener”, Berita Perikanan, 5, 9 (1953), pp. 133-135.

\textsuperscript{156}Delsman, “Fishing and Fish Culture”, p. 105; Delsman, Fish Eggs, pp. 97-98, 130-131; Van Kampen, De Hulpmiddelen, pp. 73-74; Botke, “A Short Survey on Fishing”, pp. 400-401.

\textsuperscript{157}ANRI, “Memorie van Overgave (Van Romondt)”, p. 101.

\textsuperscript{158}Pudjo Semedi and Ruddy Gustave et al., The Blue Revolution: Another Environmental Disaster in Indonesia (Jakarta: Konphalindo, 2001), pp. 1-2.


River fishing was another form of the region's inland fishing. The scarcity of historical accounts makes it hard to get a clear picture of this sector. Prior to 1870 river fishing seems to have played only a minor role. Hageman, in the 1860s, cursorily mentioned the rarity of fishing implements in inland Besuki.\textsuperscript{163} Around 1900, river fishing was reported to remain commercially insignificant and was regarded as a pastime activity. The activity generally involved the use of small nets, traps (\textit{bubu}), fishing rods, and poison (\textit{tuba}).\textsuperscript{164} The use of \textit{tuba} in river fishing seems to have been traditionally practiced in Besuki as elsewhere in Java and the Indonesian archipelago.\textsuperscript{165} The region was well-known for its poison-producing tree, the upas (\textit{Antiaris toxicaria}) or \textit{ancar}, on which several observations, including by Horsfield, were made.\textsuperscript{166} With the growing inland population, river fishing appears to have grown in importance and more people became involved in the practice. Although the expansion in irrigation networks added extra fishing grounds, the demographic pressures seem to have led to declining supplies of river fish.

The development of fish cultivation in ponds and wet fields might indicate a dwindling stock of inland fisheries. General reports on Besuki in the 1880s explicitly stated the absence of such practices.\textsuperscript{167} This feature remained unchanged until around 1930, as revealed in a report by Resident Neys.\textsuperscript{168} Perhaps only from the 1930s the practice began to develop in the region. In 1937 Resident Romondt mentioned 13 hectares of \textit{sawah} fish cultivation, 7 hectares of ponds, and 3 hectares of fish hatchlings in Jember. A joint investigation by the Binnenlandsch Bestuur (the Interior Ministry Officials), the Provincial Irrigation Service of Pekalen-Sampean, the Agricultural Service, and the Health Service recommended the development of various muddy areas for \textit{sawah} fish culture, which was also regarded as beneficial in fighting malaria. In Bondowoso, the \textit{sawah} fish cultivation developed for example in Wonosari district and a fish hatchling centre was

\textsuperscript{164}Onderzoek naar de Mindere Welvaart, 1 (14), pp. 4-5.
\textsuperscript{167}ANRI, "Algemeen Verslag, 1882"; "Algemeen Verslag, 1883"; "Algemeen Verslag, 1888".
established in the former muddied area of the Badean village. Another response was the spreading of fish hatchlings to rivers and common waters to rejuvenate the stocks.

Sawah and pond fish culture developed further after independence. In Jember around 57,000 fish hatchlings were distributed from Sumberwadung and 6,500 fish hatchlings from Sumberjambe in 1952. The fish species was primarily *Cyprinus carpio*, which was described by A.L. Buschkiel as fast-growing and with high reproductive ability. Imported from the Netherlands, this species was first introduced in Java in 1927 and then spread across Java and the outer islands of Indonesia. In 1954 from Bondowoso there was a report that around 22,000 fish hatchlings were distributed among the region’s fish cultivators. As a new alternative, the sawah and pond fish culture raised great expectations. One major reason for the large production capacity was the availability of extensive cultivable wet fields and until 1960 only 1 per cent of the areas being utilized. Another reason was the introduction of suitable species, particularly *Trichogaster pectoralis* (sepat siam), and *Tilapia mossambica* (mujair). To rejuvenate fish stocks, the spreading of fish hatchlings to rivers and common waters was undertaken. Such features were actually part of the global interest in developing and reviving inland fisheries which grew from the 1950s. One limiting factor to their development in Besuki seems to have been the increased use of chemicals in agriculture. An observation by H. Saanin in the 1960s found that in Java the chemical application in sawah agriculture was above the lethal dosage for fish cultivation.

174 In 1952 figures for inland fish production in the entire region were 250 tons (river fishing), 3.5 tons (sawah fishing), 3.2 tons (pond fishing), and 2 tons (reservoir fishing). Kementerian Penerangan, *Republik Indonesia*, pp. 392-395.
On a whole, inland fisheries formed a steadily growing activity in the Besuki region. Despite discouragement, the region’s brackish-water ponds also grew in size, benefiting partly from the abundant *bandeng* fry stocks. But significant expansion took place only from the 1960s, stimulated by international demands for shrimp. This differed from river fishery, which was primarily linked to local demand. The limited potential caused the region’s river fish stocks to quickly deteriorate as increased extractions resulted from population growth. Attempts were made to deal with the dwindling stocks through wet-field and pond fish cultivation from the 1930s. Unlike the brackish-water ponds whose development was blamed for the malaria problem, the development of wet field fish cultivation was perceived as part of the solution.

### 6.6 The Human Impact on Fish Stocks and the Marine Environment.

Apart from the damaged marine environment, the impact of fishing activities has most frequently been associated with overfishing. The term overfishing basically refers to a state under which the rising number of fishing fleets and fishing efforts results in no increases but decreases in total catches and a smaller size of fishes. Butcher used this term to indicate severe depletion. Overfishing issues in colonial Indonesia had been raised by the experiences of halibut fishery in the Pacific and haddock fishery (*schelvis*) in the North Sea. It is hard to suggest with certainty whether overfishing was already a problem in pre-1970 Besuki, given the scarcity of data on fisheries. Although statistical data on catches by regency became available especially for the period after the 1960, there is little information on captured fish size.

Despite the poor statistical evidence, there is good reason to suggest that the case of Besuki does not conform to the view put forward by Masyhuri and Semedi, suggesting the occurrence of pre-1900 overfishing. Even until the late 1920s fish extraction in Besuki remained far below the region’s marine ability to naturally rejuvenate fish stocks. Despite the growing number of fishers and fishing boats, the region’s fish stocks seem to have remained under-exploited, given the relatively limited capacity and less developed extraction technologies. Under such circumstances, the possibility of tight competition over the fish resources was slim. Unsurprisingly, J.W. de Stoppelaar stated in 1927 that

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the fishing activities by Japanese fishers encountered no obstacles from the local fishers.\footnote{J.W. de Stoppelaar, Balambangansch Adatrecht (Wageningen: Veenman, 1927), p. 82.} Apart from the under-exploited fish resource, another possible reason was that the Japanese fished different species and in different fishing grounds. Reef fishing was probably their main target in the region and there seems to have been low capability among the local fishers to exploit reef fish, as elsewhere in Indonesia.\footnote{Masyhuri, “Pasang Surut Usaha Perikanan”, p. 202; Delsman, “Fishing and Fish Culture”, pp. 101-103.}

The increase in fishing operations in the 1930s appears to have increased pressures on fish stocks. In 1949, Van Pel reported that in Muncar the average size of \textit{lemuru} catches was 12.5 cm, smaller than that of the pre-war period, ranging from 15 to 16 cm.\footnote{Van Pel, “Muntjar en Tratas”, p. 13.} This feature could be a sign of overfishing. But the absence of time series data makes it hard to arrive at a firm conclusion. The difficulty in determining whether overfishing might or might not occur is further complicated by the fact that unlike forest or land, fish are a mobile resource, easily moving from one place to another, which makes it hard to accurately detect changes.\footnote{David Henley and Manon Osseweijer, “Introduction: Forests and Fisheries in Island Southeast Asia: Histories of Natural Resource Management and Mismanagement”, in Boomgaard, Henley and Osseweijer, Muddied Waters, pp. 16-17.} Before the nature of the fish resources was fully understood, overfishing would remain a big question, hard to answer.

The possibility of overfishing, however, already attracted concern among several figures, including Soemarto in the late 1950s and Subani around 1970. Their concerns with the issue of overfishing emerged after considering the sharp decline in \textit{lemuru} catches from the mid-1950s (Figure 6.2), amid the growing number of fishing vessels.\footnote{Soemarto, “Masalah Hilangnya Ikan Lemuru”, Berita Perikanan, 11, 1 (1959), pp. 5-6; Walujo Subani, “Masalah Perikanan Lemuru di Selat Bali”, Tindjauan Ekonomi BNI, 5, 38 (1971), p. 25.} But the fact that significant increase in \textit{lemuru} catches could still be achieved in the 1960s with little improvement in fishing technologies might indicate that overfishing was not a problem in the Bali Strait until 1970. It is most likely that the decline in catches was linked to the \textit{lemuru} behaviour. This species was reported to have appeared in large quantities in one year, but become scarce in the other years.\footnote{W.C.A. Vink, “Verslag der Verrichtingen van het Onderzoekingsvaartuig voor de Visscherij ‘Gier’ over 1910”, Mededeelingen van het Visscherij Station te Batavia No. 6 (Buitenzorg: Department van Landbouw, Nijverheid, en Handel, 1911), p. 4; P.N. van Kampen, Visscherij en Vischteelt in Nederlandsch-Indië (Haarlem: Tjeenk Willink, 1922), p. 8.} This phenomenon has recently been associated with the El Niño-Southern Oscillation (ENSO) events, which occur every two to seven years, brings prolonged droughts in the Southeast Asian region, and leads to
unpredictable catches either good or bad. Unlike in the Bali Strait, where overfishing has already been regarded as one possibility, in the southern waters the problem appears to have been very unlikely, given the less developed fishing operations even after 1970. But in the region’s northern waters the problem of overfishing seems to have been more likely, as indicated by the flow of temporary migrant fishers to the Bali Strait during the fishing season and the early 1970s closure of the Madura Strait to all motorised trawl fishing operations.

Another impact of the fishing operations was marine environmental damage, especially with the use of inappropriate fishing technology. In 1911, the use of dynamite was blamed for the decline in fish catches in Banyuwangi. In 1955, the authority in Besuki was reported to have detained fishers using explosives in the region’s waters of Senggrong and Beringin (Banyuwangi). In Western Indonesian waters, the use of explosive was claimed responsible for the decline in coral reef fish catches from 1954 to 1970. The direct link between explosive use and decrease in catches raises some questions, but there is no doubt on the bad effect of the explosive use. Not only did it kill fish indiscriminately, the use of explosive also inflicted damage on the fish habitat. The lack of historical accounts, however, prevents us from drawing firm conclusions on the intensity of explosive use and the scale of damage the practice had caused in the region’s waters. Meanwhile, the growing use of bagan in the Bali Strait also presented problems. Besides posing a danger to sailing, this fishing gear caught juvenile and small fish, which could have had a negative impact on the sustainability of fish stocks.

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190 Vink, “Verslag der Verrichtingen”, p. 4.


Apart from fishing operations, the marine environment and fish stocks appear to have also been affected by land-based resource use. The clearing of forests for settlements and agriculture exacerbated the natural siltation in the river estuaries and coastal areas of the region. There are no specific reports on Besuki linking catches to siltation, but by the early 1900s siltation on the coastal areas of Java had also been been regarded as one of the factors causing poor catches. In Bagan Si Api Api (Sumatra), siltation was believed among the factors contributing to the deterioration in the fishing industry. More recently, an observation described siltation as a great threat to Java’s artisanal coastal fishing operations. It is hard to elaborate its full impact on the region’s marine animal populations in the absence of historical sources. However, in some parts of the northern coast of Besuki, the fishers found the distance between their villages and the sea growing gradually. The coastline changing as a result of siltation had also been observed in many places along the north coast of Java and east Sumatra.

Siltation was not the only threat to fishing stocks and the marine environment. Industrial operations had polluted some of the region’s rivers. As early as 1900, the fish of the Sampean river were reported to have badly suffered from the sugar factories. This feature confirmed a general observation by Furnivall, suggesting that in Java many rivers had been contaminated with pollutants discharged by land-based factories. More recently, several studies do indicate the damaging consequences of the factory operations on the region’s river fauna populations. A study undertaken in 1992 suggests that the discharges of polluted water from the Olean sugar mill caused the poor growth of

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199 Onderzoek naar de Mindere Welvaart der Inlandsche Bevolking op Java en Madoera, Vol. 7 (14): Samentrekking van de Afdeelingsverslagen over de Uitkomsten der Onderzoekingen naar de Irrigatie in de Residentie Besoeki (Batavia: Albrecht, 1908), pp. 43-44.
planktons and the limited number of fish species in the Sepao river. Another study on the Panji sugar mill in 1992 reveals similar findings in the Kapongan river. Given the colonial origins of the two sugar factories, the same consequences presumably have been present since then. From the late 1960s the region’s inland fisheries seem to have suffered from the growing use of chemicals in agriculture (Chapter IV). Such problems were common elsewhere and raised global concerns for an environmentally friendly approach to deal with pest creatures and plants.

6.7 Conclusion

Fisheries formed a growing element in natural resource extraction in the Besuki region from 1870. The most discernable outcome of the growth was the shift in the region’s centre for marine fisheries from the northern coast of Panarukan to the eastern coast of Banyuwangi centering in Muncar, which became the second largest fishing complex in Indonesia. This development reflected two important realities prevailing in the region around 1870. The first was the abundant availability of nearly untapped resources in the region’s waters, meaning that there was space for a significant expansion of the fishing frontier. The second reality was the less developed marine resource extraction. Although such an activity was already developed before 1870, the small population size and the less developed technologies presented a major limiting factor for a fishing frontier expansion. With the region’s rapidly growing population size and the rising number of fishing boats, the fisheries sector seems to have increased in scale. The presence of Dutch and Japanese fishing operations from the mid-1920s intensified the extraction of marine resources. With more developed fishing technologies, their operations also expanded the fishing frontiers to new areas, which had previously remained under-exploited. Apart from bringing an increase in catches and enabling Besuki to export fish, this development brought an increasing pressure on fish stocks and the marine environment.

Given that the level of extraction and the fertility of the marine environment were not uniform across the region’s waters, the scale of impact on fish stocks and the marine environment varied from one locality to another. The fish resource along Besuki’s northern seas appear to have been overfished due to the longstanding and rising scale of extractions resulting from the growing number of fishing fleets, which led to the ban on motorised trawl fishing from the early 1970s. Although there were situations arousing concern in the late 1950s, the fishing potential in the Bali Strait were not fully realised until the end of the 1960s. With improved fishing technologies, the frontier of lemuru fishery still could be extended towards new fishing grounds. But the least discernable effects seem to have been in the southern waters where the extraction of fish resources remained relatively marginal until the end of the time period of the present study. Besides fish stocks, fishing operations also affected the marine environment particularly from the use of explosives, but it is hard to tell the scale of the impact given the absence of historical records. It is clear, however, that the damage to the marine environment from fishing operations was not new, but a phenomenon that had colonial origins. What makes it different from the post-1970 situation is only its scale and intensity.
CHAPTER VII
COPING WITH ENVIRONMENTAL PROBLEMS

7.1 Introduction
The demographic and economic processes taking place in the Besuki residency from circa 1870 significantly reshaped the region's physical environment. Simultaneously, the region saw the fast expansion of settlement and agricultural frontiers and the continuing retreat of the forest frontier. The processes were not smooth, but always encountered problems arising from the environment. This chapter focuses specifically on problems linked to diseases and noxious wild animal species. This chapter argues that in the Besuki region, diseases and noxious wild animals were major problems, which posed a threat to inhabitants and their interests and impeded the region's socio-economic development. As shall be shown, the two problems raised deep concerns among the planters and state authorities, and a variety of measures were gradually taken in response. The ways in which the problems were contained clearly reflected the influence of the gradual development of scientific investigations and discoveries, the growing understanding of the nature of the problems, and the environmental realities of Besuki. In the next section, the problem of endemic diseases is elaborated, followed by a discussion of disease control. The next sections deal with noxious wild animals and measures taken to contain them.

7.2 Endemic Diseases
As in the previous decades, after 1870 endemic diseases continued to raise concerns among the colonial authorities. There are two major reasons for this trend. First, European settlers encountered deadly realities in their distressing experience with tropical diseases. Many considered life in the tropics, in A.H.M. Kerkhoff's terms, "harsh, unhealthy, and full of dangers", and as Pierre Gourou put it, "a heavy toll to disease" had been paid by the European settlers.1 On Besuki, early reports described Banyuwangi as "unhealthy" or even "one of the unhealthiest places of Java".2 The Resident of Besuki stated in 1887 that a great number of Europeans suffered from

malarial fever as did most Indonesians.3 Severe malarial fever epidemics in Jember were reported for example in 1901 and 1902, attacking more than 9 per cent of the population in both years and caused around 2900 deaths in 1901 and 2800 deaths in 1902.4 Unsurprisingly, in 1913, Resident J. Bosman explicitly called Besuki a “malarious land”.5 Malaria was, in Swellengrebel’s terms, “the silent cause underlying all the evil”, broadly referred to as “the tropical climate”.6 Malaria was certainly the scourge of the Besuki region, but cholera was also frequently mentioned,7 apart from other diseases vaguely named in many colonial reports as fevers (koortsen).8

Second, the growing health issue was also inseparable from the expanding estate interests, particularly in newly developed areas initiated with forest clearance. It was reported that in an agricultural colony in Banyuwangi, dysentery was the major cause of death.9 Later, a number of the European planters running estates in the Besuki region also complained of suffering considerable losses from the frequent cases of illness especially malaria and fevers (koortsen).10 The unhealthy environment was blamed for the difficulty in persuading workers to stay longer in the estates. About 40 per cent of the imported workers were said to have abandoned the estates before their work contract expired.11 The Commissie van Enquête in zake Werkvolkwestie noted in 1914 that among 43,000 migrant workers imported by the estates of Banyuwangi between 1911 and 1913, less than 6,000 workers were reported to remain in the estates by 1913.12

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3ANRI, Arsip Residensi, Besuki 9.18, “Algemeen Verslag van Residentie Besoeki over het Jaar 1887”.
5ANRI, “Memorie van Overgave van den Aftredenden Resident van Besoeki J. Bosman, Augustus 1913”, p. 16.
7The early specific report on cholera in the region is from 1851. ANRI, Arsip Medica, No Inv. 14, “Staat van Personen Lijdende aan Cholera op Diverse Residenten op Java 14 Mei 1851 t/m 15 December 1851”, specifically the report dated 3 May 1851 from Resident Besuki and the report from Assistant Resident of Banyuwangi dated 6 June 1851.
10Rapport in Zake Werkvolkwestie in Banjoewangi (Weltevreden: Visser & Co., 1916), pp. 14-17. For 1914 alone the Purwojoyo estate reported 28 cases of illness/ day and 25 deaths. The Kalitelepak estate there were 12 cases of illness/day and 22 deaths. The other figures for the same year were 10 cases of illness/ day and 14 deaths in Pager Gunung estate, 13 cases of illness/ day and 40 deaths in Kalikempit estate, and 16 cases of illness in Lidjen estate, and 12 deaths in Pegundangan estate.
addition, in Rogojampi district the unhealthy environment was also regarded as causing difficulties in recruiting workers.13

The real causes of diseases were only gradually understood, but many Europeans believed that there was a link between the chronic diseases and unhealthy tropical environment.14 One early nineteenth century belief claimed that poor health conditions in Banyuwangi were due to the oxygen-absorbing sulphurous vapours from the existing volcanoes, as also believed to have been the case in Jeldah and Ramguhr in British India.15 Until the late nineteenth century, fevers were believed due to poisonous gases emanating from decomposed materials in muddy and swampy terrain.16 Commenting on Banyuwangi, Epp in 1849 attributed endemic fevers to a miasma resulting from swamps and decomposed organic materials from forests.17 Around 1900, J.H. Rering, a controleur and Mas Soemo Taroeno, Patih Wedono also blamed bad air (hawa koerang baik) for the chronic problems of health.18 But there were other beliefs, especially among the Europeans, probably also in Besuki, linking fevers to swamp water consumption.19

Among the Indonesians of Besuki, the connection between diseases and environment seems to have also been acknowledged. One of the beliefs, as reflected in the traditional literature of the region, was that widespread diseases and deaths were caused by the anger of evil spirits which were thought to reside in the adjacent forests.20 Such a belief was not exclusively restricted to Besuki, but also observed elsewhere in the Indonesian archipelago and in Southeast Asia. Among many Southeast Asian communities, the forest was partly seen as a sacred place, together with the ocean and the inhabited world, where dangerous spirits were present and able to cause illness to

13ANRI, Arsip Residensi ‘Pasar Ikan’, No. 923, “Stukken Inzake de Aanvragen van Gronden in Besoeki, 1902-1908”.
15Schoute, Occidental Therapeutics, p. 105.
18ANRI, Arsip Residensi ‘Pasar Ikan’, No. 923, “Stukken Inzake de Aanvragen van Gronden”.
people who disturbed their domain. The remnants of the beliefs could still be observed even until today, as recent studies in Madura and parts of Java indicate. However, it did not necessarily mean that all kinds of diseases were believed to have mystical causes. Many Indonesians also held the notion that the cause of the diseases could have links to something physical, which required medicinal responses.

Unlike the nature of malaria, which long remained obscure, notable progress in a malaria cure had been made quite early. The use of chichona bark for malaria treatment was discovered in 1630 by Jesuit priests in Peru, South America, and by 1820 French chemists, Pelletier and Caventou, had discovered the isolation of quinine. The two events were landmarks in the centuries-long process of uncovering the mysteries surrounding the malaria disease. A number of Dutch botanists urged the government to establish chichona cultivation in the Netherlands Indies, but only around 1850 was there a serious response from the government. Attempts were made to import cinchona plants from South America and develop them in the Bogor experiment gardens. Through a series of trials done by J.K. Hasskarl, F.W. Junghuhn, K.W. van Gorkom, and Bernelot Moens, chichona eventually spread in various places in Java. In Besuki cinchona cultivation was observed in Sukaraja, Banyuwangi in 1872. Parallel with this


25 ANRI, Arsip Banyuwangi 1691-1881, No. Inv. 31, "Dagboek Controleur Soekaradja 1872". His notes on quinine plants were made on October 6, 1872 and May 1, 1873.
development, the use of quinine as a remedy and prophylaxis grew and became standard practice for malaria medication.

Around 1900, perceptions about malaria shifted remarkably, as the result of scientific findings by Ronald Ross in India and Giovanni Battista Grassi linking the spread of malaria to Anopheline mosquitoes.26 Ronald Ross and Malcolm Watson contended that malaria parasites had nothing to do with “the water or air of marshes, nor decaying vegetation”, but with anopheline mosquitoes acting as vectors.27 Parallel with these findings, there had been growing concerns about mosquito breeding grounds. A 1909 report on Besuki by the Prosperity Investigation Commission explicitly attributed chronic malaria to puddles and swamps.28 In 1922, Resident Fessevier acknowledged the persistent malaria problem in areas near the coast.29 Meanwhile, commenting on the same area, Resident Neys in 1929 specifically blamed the brackish-water ponds for the chronic malaria and high death rates.30 Such views led to the creation of an image that brackish water ponds, as Snapper put it, were “dangerous hotbeds for malaria”.31

Plate 7.i. ‘Kromo’ Made Malaria, Fish Ponds in Banyuwangi (Essed, 1928: Opposite p. 576).

28Swamps and marshes were found in the coastal areas of Banyuwangi and Panarukan, and southern Jember. Onderzoek naar de Mindere Welvaart, 9 (14), p. 78.
31I. Snapper, “Medical Contributions from the Netherlands Indies”, in Honig and Verdoorn (eds), Science and Scientists, p. 312.
The transmission of malaria, however, was not linked to one anopheline species. The anopheline mosquitoes consisted of many different species with a world-wide distribution. But investigations by W.F.R. Essed in Banyuwangi in 1927, and by J. Kuipers and W.J. Stoker in Lamongan, East Java in 1933, firmly established that *Anopheles sundaicus*, which bred in brackish water, played a prominent role in the transmission of malaria. The role of other anopheline species was regarded as marginal. The findings confirmed earlier local investigations by Swellengrebel in various places across the archipelago, but differed from Watson’s observations on the Malay Peninsula, which suggested *A. umbrosus* and *A. maculatus* as most dangerous and the chief malaria vector. The feature was also different from that of African countries where Gourou claimed *A. gambiae* as the most dangerous malaria vector. A more recent observation suggested that besides Indonesia’s coastal areas of Java, Sumatra, North Kalimantan, and several others, *A. sundaicus* is observed in coastal areas stretching from northeastern India to southern Vietnam and has been blamed for the malaria epidemics in India between 1930 and 1940, and in Vietnam in 1965.

Concerns about *sawah* (irrigated land) malaria also grew in Besuki. But only in the 1930s was this issue first given adequate space in the resident’s report. Despite its importance in rice production, irrigated land was considered a problem as it provided ideal conditions for the breeding of the malaria vectors. This view seems to have been inseparable from observations by Swellengrebel in Mojowarno, East Java in 1919, and by Van Gorkom in 1912 and Mangkoewinoto in 1917 on the Cihea plain, Bandung (West Java) suggesting irrigated lands as a breeding ground for *A. aconitus*. The links
between the two phenomena in Besuki were indicated by a report on Ambulu, Jember in
1941, describing the rice harvest season as the outbreak time of malaria and, according
to Swellengrebel, the disease was regionally called “harvest fever”.39

The growing understanding of the nature of malaria further shifted the perceptions
regarding the role of humans in malaria transmission. The disease seems to have long
been regarded as being inherently present in particular natural environments and the
expanding human activities unavoidably increased their vulnerability to the disease.
Humans were merely regarded as being victims, rather than players in the spread of the
disease. Pointing to the case of Banyuwangi, Essed stated that malaria was a “man-
made disease” and was linked to A. sundaicus breeding on brackish water ponds.40
Other medical officials, E.W. Walch and R. Soesilo, shared the same view, and stated in
1935 that in the Netherlands Indies “man-made malaria” was facilitated by human
interventions creating anopheline breeding grounds, such as mangrove removal, water
flow disruption, and brackish water pond culture.41 In 1938, Swellengrebel stated that
the label “man-made disease” was more frequently attached to malaria.42

Apart from malaria, gastrointestinal diseases especially cholera and dysentery
were also a prominent problem in Besuki as elsewhere in Indonesia.43 These diseases
were closely linked to polluted drinking water and the major source of contamination
was faeces.44 Believed as having its origins in India, cholera spread across the world
especially through sea routes and reached Java around 1820. It was John Snow, a British
scientist, who, around the mid-nineteenth century, discovered the contaminated drinking
water transmission of cholera and the links between cholera epidemics and water

39“Berjangkit Penjakit Panas”, Pewarta Soerabaia, 15 July 1941, p. 3/1; Swellengrebel, “Malaria in the
Netherlands Indies”, p. 42.
40W.F.R. Essed, “De Gezondmaking van Banjoewangi, een Typisch Voorbeeld van Species-Assaineering
Volgens Swellengrebel”, Mededeelingen van den Dienst der Volksgezondheid in Nederlandsch-Indië, 21,
2 (1928), p. 50.
41E.W. Walch and R. Soesilo, “Malaria Control in the Netherlands Indies”, Mededeelingen van den
Dienst der Volksgezondheid in Nederlandsch-Indië, 24, 3 (1935), p. 88; R. Soesilo, “Malaria bestrijding in
den Oost-Indischen Archipiel”, Geneeskundig Tijdschrift voor Nederlandsch-Indië, Feest bundel (1936),
P. 50.
42Swellengrebel, “Malaria in the Netherlands Indies”, p. 38.
43The Netherlands Indies Medical and Sanitary Service, Control of Endemic Diseases in the Netherlands
Indies (Weltevreden: Landsdrukkerij, 1929), pp. 54-60.
Booogaard, “Morbidity and Mortality in Java, 1820-1880: Changing Patterns of Disease and Death, in
Norman G. Owen (ed.), Death and Disease in Southeast Asia: Explorations in Social, Medical and
Pollution in Java, 1600-1850”, in Peter J.M. Nas (ed.), Issues in Urban Development: Case Studies from
supplies. But the isolation of cholera bacteria was particularly credited to a German scientist and a leading proponent of the germ theory of disease, Robert Koch, in the late decades of the nineteenth century.

A cholera epidemic was reported to have struck Besuki, Panarukan and Bondowoso areas in 1881. A similar event occurred in 1888, striking the three areas and also Jember. Another report by the Prosperity Investigation Commission revealed in 1909 that cholera epidemics also struck Besuki district in 1897, 1902, and 1903, Panarukan regency from 1900 to 1902, and Banyuwangi regency in 1902. Dysentery was reported to have been commonly found in the Banyuwangi estates both among the Europeans and Indonesians. Not only in Besuki were intestinal diseases a big problem, but elsewhere in colonial Indonesia as well. In the estates of Sumatra, cholera was described as one of the big “cooie killers”. Similarly, the Netherland Indies Medical Service depicted the role of cholera in causing deaths as “a very big one”, whereas dysentery was regarded as “one of the most dangerous diseases”.

Another major problem was smallpox. Although the scale and frequency of smallpox epidemics decreased with the nineteenth-century introduction of vaccination, the disease was still present until the 1960s. In Banyuwangi, the spread of smallpox in the 1870s was reported to have been caused by the incoming migrants. Epidemics occurred in 1899 and 1900, with Besuki and Panarukan as the most affected areas. The reappearance of smallpox epidemics was partly due to the fact that the acquired immunity by survivors of the disease could not be passed on to their offspring who consequently were not protected in the event of an outbreak.

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48Onderzoek naar de Mindere Welvaart, 9 (14), pp. 82-84.
49Henri Carel Zentgraaff, In den Zuidoost-hoek van Besoeki (S.I.: s.n.), pp. 4-5.
50Other major “cooie killers” were dysentery, beri-beri, and hookworm. G.T. Haneveld, “From Slave Hospital to Reliable Health Care: Medical Work on the Plantations of Sumatra’s East Coast”, in van Heteren, de Knecht-van Eekelen, Poullissen and Luyendijk-Elsout (eds), Dutch Medicine, p. 80.
51The Netherlands Indies Medical and Sanitary Service, Control of Endemic Diseases, pp. 56, 60.
52For valuable discussions on smallpox and vaccination, see Peter Boomgaard, “Smallpox and Vaccination on Java, 1780-1860: Medical Data as a Source for Demographic History”, in van Heteren, de Knecht-van Eekelen, Poullissen and Luyendijk-Elsout (eds), Dutch Medicine, pp. 119-131; Peter Boomgaard, “Smallpox, Vaccination, and the Pax Neerlandica Indonesia, 1550-1930”, Bijdragen tot de Taal-, Land- en Volkenkunde, 159, 4 (2003), pp. 590-617.
54Onderzoek naar de Mindere Welvaart, 9 (14), p. 83.
smallpox sporadically occurred. On the last days of December 1913, smallpox was reported to have infected 7 people in Jember, Panarukan, and Bondowoso, and of these at least two ended in death.\textsuperscript{56}

While malaria, intestinal diseases, and smallpox were major epidemic killers, beri-beri was also significant in the Besuki region. Assistant Resident Jember, Repelius, stated that beri-beri was always present through the year among the inhabitants of Jember and a serious outbreak occurred around 1870. A similar event struck Bondowoso in 1879 and the Jember and Bondowoso gaols between 1894-1896. It was reported in 1894 that there were 124 beri-beri sufferers in the Jember gaol, of whom 51 had died, whereas in the Bondowoso gaol there were 178 sufferers. A 1895 report mentioned it affecting 129 prisoners in Jember, of whom 45 were dead.\textsuperscript{57} This disease seems to have remained common in the region in the following decades. In the 1930s reports, Rogojampi district of Banyuwangi was one of the often mentioned beri-beri prone areas in the Besuki region.\textsuperscript{58}

There were diverse views on beri-beri. One belief circulating in the nineteenth century perceived beri-beri as an infectious disease, whereas other beliefs claimed that beri-beri resulted from dietary influences, linking it to dried fish imported from China, lack of proteins and fat, or toxin in polished rice. The scientific findings by Eijkman and Grijns in the early twentieth century brought a new light on the issue of beri-beri, and led to a firmly established view that beri-beri was a deficiency disease.\textsuperscript{59} Their views led to further clinical investigations on links between beri-beri and polished rice, and on vitamins by other Dutch scientists. But the term “vitamins” itself was proposed in 1912 by Casimir Funk, a Polish scientist working at the London-based Lister Institute.\textsuperscript{60} The colonial officials in Besuki seem to have been influenced by their views. Reporting on Rogojampi district, the residents of Besuki stated in the 1930s that the frequent beri-beri outbreaks among the Indonesians were caused by polished rice consumption.\textsuperscript{61}

\textsuperscript{56}“Hindia Belanda”, Pewarta Soerabaia, 9 January 1914, p. 2.
\textsuperscript{57}Onderzoek naar de Mindere Welvaart, 9 (14), pp. 82-83.
\textsuperscript{58}ANRI, “Memorie van Overgave, Van Romondt”, p. 133; ANRI, “Memorie van Overgave van den Resident van Besoeki 1931-1934”, p. 28.
\textsuperscript{60}M. Coates, “Beri-beri”, in F.E.G. Cox (ed.), The Wellcome Trust Illustrated History, p. 397.
Other diseases also affected the Besuki region, but the historical records are very sketchy. Tuberculosis was reported to have been frequently found in Jember and Banyuwangi. Meanwhile, in Panarukan frambesia was endemic, but more sporadic in the region’s mountainous areas. This feature supported the held view that frambesia occurred principally in the lowlands and its intensity decreased as the latitude increased. Bubonic plague, transmitted through the medium of fleas from rats, broke out first in Malang where it took around 20,000 lives between 1911-1915. The disease spread across Java and reached Besuki in 1921, but on a smaller scale and restricted to Jember where it infected 57 people, of whom 54 died. While leprosy was relatively uncommon across the region, syphilis was, by contrast, more numerous especially in the Bondowoso regency.

During the independence period, the nature of problems essentially remained much the same as during colonial times. The most illustrative case is malaria. A report on Pasanggaran, Banyuwangi, in 1953, and elsewhere in East Java, clearly suggested that swamps, marshes and puddles were part of the malaria problems. Brackish water ponds were also blamed for the outbreak of malaria in the coastal villages of Panarukan in the early 1950s. The state officials in Banyuwangi were reported in 1961 to have shared the same perception, leading to the prohibition of new brackish water ponds, despite the large milkfish fry production. Moreover, irrigated land was still considered responsible for the chronic malaria in the adjacent villages. In Java in general, the fear of malaria was recognized by state officials to have aborted various plans for irrigated land expansion, which was essentially required to meet the growing needs for food. Despite the declining scale and intensity of malaria incidents in the 1950s and the 1960s, the diseases continued to pose a problem in Besuki and other parts of Java even

64 The Netherlands Indies Medical and Sanitary Service, *Control of Endemic Diseases*, p. 61.
65 The Netherlands Indies Medical and Sanitary Service, *Control of Endemic Diseases*, pp. 36-41; ANRI, *Memori Serah Jabatan*, p. cxvii;
66 Onderzoek naar de Mindere Welvaart, 9 (14), p. 82.
after 1970. As observed in Banyuwangi in 1964, one of the reasons was human traffic, especially transmigrants bringing the disease from the other islands of Indonesia where little malaria control had been done.

The problems linked to other diseases during colonial times appear to have persisted in the 1950s and the 1960s. In 1950, for example, smallpox was declared to have infected Panarukan. Death statistics for the period 1951-1964 indicate that in the case of Java, most likely also including Besuki, smallpox, typhoid, and dysentery still took a significant number of lives every year. Although the severity of several diseases could be reduced, cholera, by contrast, remained a big problem until 1970 as the vast majority of inhabitants continued to have unhygienic lives. Besides cholera and dysentery as major causes of illness and deaths, tuberculosis was regarded as the third major cause of deaths around 1970. Beri-beri and framboesia remained a significant problem too. Apart from the continuing problems linked to diseases dating from colonial times, a new disease called dengue haemorrhagic fever, regarded as originating from Thailand, appeared in various places in Java in 1968. This disease was feared to cause major epidemics because its vector was said to be numerous and to have been observed in many places, including Besuki, while knowledge and equipment required to contain it remained inadequate.

7.3. Disease Control

As in other parts of the archipelago, in Besuki there were both indigenous and European methods of disease control. The indigenous methods of disease control had diverse elements. Part of them reflected the influences of mystical beliefs. In this sense, the practices in Besuki might have been similar to those observed by van Ossenbruggen in

Madura around the early 1900s, which partly involved traditional healers, rites, and offerings. Observations by Clifford Geertz in one locality in East Java in the 1950s and more recently, by Andrew Beatty and Inez Mahoni on Banyuwangi still found such features. But there were rational elements too, as evident from the fact that medicines, usually in the form of herbal products, also played a major role in disease control. In 1947 when malaria broke out in Puger, a Jember-based magazine reported the use of “Javanese medicines” as part of the medication. Among the Javanese, paw paw leaves (Carica papaya) and Brotowali (Tinaspora rumphii) were commonly believed effective to cure and to prevent malaria. As recent observations might indicate, numerous herbal medicines were collected from the forest of Banyuwangi.

To what extent the indigenous methods of diseases control were effective is problematic. With regards to traditional medicines, comprehensive scientific investigations have hardly been carried out to uncover their properties and efficacy in curing and preventing diseases. But the fact that their use was sustained through generations gives an indication that in some cases, the indigenous medicines had rational values for their users. Even several European naturalists recognized the Indonesians’ well-established knowledge of medicinal, edible, and poisonous herbs. A few medicinal herbs were brought under laboratory tests and part of them was confirmed as having officinal values. In the 1960s anti-fever qualities in a number of

80 Epp, “Banjoewangi”, p. 251; Sardjito, Perkembangan Ilmu Pengetahuan Kedokteran, p. 3; Hobart, Healing Performances, pp. 220-223; The reliance on herbal medicines was also found among the Indonesian inhabitants of Jakarta where the European influences might have been stronger than elsewhere in colonial Indonesia. Susan Abeyasekere, “Death and Disease in Nineteenth Century Batavia”, in Owen (ed.), Death and Disease, p. 203.
82 Reksodihardjo, Soedibyo, and Soetomo, Pengobatan Tradisional, p. 112.
indigenous medicinal herbs in Java were scientifically proven under laboratory tests. More recently, some indigenous medicines from Kalimantan and peninsular Malaysia have been proven to contain anti malaria properties.

The growing presence of Europeans brought about western-style responses. The estates enterprises in Besuki through the Netherlands Indies Estates Syndicate (Nederlandsch-Indië Landbouw Syndicaat) played a significant role in stimulating the adoption of measures for improving health conditions. On the estates in Java, there was an increasingly strong awareness that promoting the inhabitants’ conditions of health was, in P.W.L. Pennis’ terms, “not luxury but imperative” to the estate interests. Unlike smallpox, which had been successfully overcome before 1870 with vaccinations, the nature of malaria and the ways in which this disease might be fought against remained unanswered. Until the late nineteenth century, the predominant response to malaria was basically medical. It is very likely that quinine might have been as significant a malaria medication treatment in the second half of nineteenth century Besuki as it was in other parts of colonial Indonesia.

The introduction of quinine was apparently not always smooth. In some cases, the Indonesians of Besuki doubted western medicines and showed little interest in western medication to solve their problems of health. Despite this fact, it was clear that quinine was increasingly in use and became the principal colonial response, especially during the major malaria outbreaks, as also observed in Probolinggo, west of Besuki in 1914.

In Grujugan Bondowoso, the malaria control was reported to have substantially reduced death rates. In 1929 an estate doctor working in Jember, H. Kruyne, reported that anticipating the malaria outbreak, each estate coolie worker, whether sick or not, was

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87Henley, Fertility, Food and Fever, p. 291.
88Broersma, Besoeki, pp. 90-91.
90Cinchona cultivation was also reported to occur in the region. ANRI, Arsip Banyuwangi 1691-1881, No. Inv. 31, "Dagboek Controleur Soekaradja"; In the nineteenth century North and Central Sulawesi, quinine, which was presumably available from other parts of Java, was also used in the malaria medication. Henley, Fertility, Food and Fever, p. 296.
91Onderzoek naar de Mindere Welvaart, 9 (14), p. 81; H. Kruyne, “Geneeskundige Ondernemingszorg op Java”, Bulletin van den Bond van Geneesheeren in Nederlandsch-Indië, 25, 230 (1929), p. 16; Similar responses were reported elsewhere in Java, including Purworejo and Pasuruan. See, Colin Brown, “The Influenza pandemic of 1918 in Indonesia”, in Owen (ed.), Death and Disease, pp. 244-245.
92“Malariaabstrijding door Kinine”, Tijdschrift voor Nijverheid en Landbouw in Nederlandsch-Indië, 85 (1912), pp. 115, 119; J.G. Overbeek and W.J. Stoker, Malaria in the Netherlands Indies and Its Control (Batavia-Centrum; G. Kolff, 1937), p. 26; During a malaria outbreak in Probolinggo in 1914, Dr. Terburgh was reported to have visited infested villages and distributed quinine at no charge to the villagers. “Hindia Belanda”, Pewarta Soerabaia, 7 April 1914, p. 1.
93“Malaria Bestrijding”, Besoekisch Nieuwsblad, 18 September 1914, p. 1.
subject to a two-week quinine treatment. In the Kendeng Lembu estates, Banyuwangi, to deal with a malaria explosion, quinine tablet was also reported to have been used. Another report revealed that in Panarukan regency, quinine was distributed to villagers by the village heads. On Ambulu, Jember it was reported in 1941 that quinine was sold in the local shops.

The medical response, however, was regarded as insufficient by those who were promoting malaria control through vector eradication. Prominent figures in this approach were Ross and Watson in the British empire, and Swellengrebel in colonial Indonesia. C.D. de Langen shared much of the beliefs that preventive measures, rather than curative ones, served as the most effective way to control malaria. Key among the beliefs was sanitation aiming at eliminating mosquito breeding grounds. In the Malay Peninsula and Panama this measure was already put into practice in the first decade of the twentieth century. In colonial Indonesia it started in Jakarta in 1913. In 1918, studies were reported on draining large and small swamps in several places in the Besuki region. In 1922, Resident Fessevier stated that several marshes and swamps had been successfully drained, but economic considerations made sanitation plans hard to widely put into practice.

As another alternative, rather than directed to all mosquito breeding grounds, sanitation measures were restricted to specific areas, where malaria vectors bred. Such a measure was called species sanitation, developed in colonial Indonesia by Swellengrebel on the basis of Watson’s invention in Malaya. In 1928 species sanitation was carried out in Banyuwangi. A total of f 25,000 was allocated for this

94 Kruyne, “Geneeskundige Ondernemingszorg”, p. 16.
96 Regentschapsverslagen behoorende bij het Eindverslag over het Desa-Autonomie Onderzoek: Regentschap Panaroekan (Sitoebondo) (S.I.: s.n.), p. 602.
100 Kuipers, Mathematisch-Statistisch Onderzoek, p. 15.
102 ANRI, “Memorie van Overgave van het Gewest Besoeki, Resident B. Schagen van Soelen, Juni 1918”, p. 3.
103 ANRI, Memori Serah Jabatan, p. cxvii.
project, taking the form of constructing open connections with the sea to allow tidal movement which made the ponds unsuitable as breeding grounds for the malaria vector.\textsuperscript{105} Despite the good results, the measure was considered costly due to the compensation payment made to the ponds’ owners and canal construction.\textsuperscript{106}


A different sanitation method was employed in Panarukan, taking the form of hygienic brackish pond exploitation.\textsuperscript{107} The method, involving a periodic drying of ponds to kill algae regarded as protecting mosquito larvae, was developed first by fisheries inspector Reijntjes in Pasuruan, East Java in 1922.\textsuperscript{108} Resident A.H. Neys

\textsuperscript{105}The measure was reported to have given fascinating results. “Verslagen der Afdeelingsvergaderingen: Vergadering van 3 Maart 1932”, Geneeskundig Tijdschrift voor Nederlandsch-Indië, 72, 15 (1932), p. 995; Overbeek and Stoker, Malaria in the Netherlands Indies, p. 57; Takken, Snellen, Verhave, Knols, and Atmosoedjono, Environmental Measures, pp. 67, 78; Kuipers, Mathematisch-Statistisch Onderzoek, p. 20.

\textsuperscript{106}Takken, Snellen, Verhave, Knols, and Atmosoedjono, Environmental Measures, p. 106.

\textsuperscript{107}Sanitation measures had also been taken in Sibolga (1919), Belawan Deli (1919), Cilacap (1919), Semarang (1927), Tegal (1928-1929), Batavia (1928-1932), Surabaya (1916-1920, 1930), Pacitan (1934-1936), Tuban (1931), and Tambakboyo (1935-1936). Overbeek and Stoker, “Malaria in Nederlandsch-Indië”, pp. 193-194.

reported in 1929 that such a method was planned to be employed in the region. With financial support from the Panarukan regency, a 29,000 hygienic fishpond exploitation project was undertaken in Alas Malang, Panarukan, and Besuki districts in the 1930s. The draining of brackish water areas in Bajulmati (Banyuwangi) and other sanitation measures in southeastern Panarukan were reported in 1938.

With regards to irrigated land malaria, in the 1930s in Besuki irrigated land fish cultivation was promoted. The larvae-eating fish, *Haplochilus panchax* and water plants-eating fish, *Puntius javanicus* were probably also promoted for fish farming in Besuki as observed elsewhere in Java and Sumatra. On irrigated lands, campaigns were also run to encourage farmers to undertake simultaneous planting and periodic draining. In addition, the use of mosquito nets to protect against mosquito bites was also promoted. There is no historical evidence linking such measures directly to Besuki, but the same development must have taken place in the region. It was evident from the fact that during the Japanese occupation period (1942-1945), some villagers in Jember were reported to have reused their mosquito nets for clothes due to the scarcity of clothing materials.

Malaria was certainly not the only disease for which the colonial authorities searched for solutions. A significant attempt was made to deal with water-borne diseases. One early practice was to abandon the unhealthy areas and develop new settlements in inland areas with better environment and supplies of drinking water. To a certain extent the colonial officials of Besuki shared the same responses, though probably due to other reasons too. Around 1900, the residency administration centre was relocated from the northern coast of Besuki to Bondowoso, which had better

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110"Assaineeringwerken uit het 25 millionfonds in Oost-Java", *Mededeelingen van den Dienst der Volksgezondheid in Nederlandsch-Indië*, 27 (1938), p. 457; The measure, however, was reported to have attracted only little interest from the brackish water pond owners, Overbeek and Stoker, *Malaria*, p. 46; Kuipers, *Mathematisch-Statistisch Onderzoek*, p. 20.
drinking water and cooler air, with J.R. Couperus as the resident.\(^{118}\) The colonial officials also spoke about the need for constructing artesian wells.\(^{119}\) A mining engineer-geologist, Brouwer, conducted explorations to identify places for artesian wells and water springs.\(^{120}\) In 1913 Resident Bosman reported the making of the plan for a drinking water network in Bondowoso and Banyuwangi and the chemical and bacteriological investigations of various water springs.\(^{121}\) In the Panarukan regency alone in 1924 about twenty artesian wells were in operation.\(^{122}\)

The efforts were accompanied by medical responses. In 1909, there were two hospitals in Bondowoso, and one hospital each in Jember and Banyuwangi, with one second-class hospital in Panarukan.\(^{123}\) Around 1912, the estate planters of Banyuwangi jointly established a hospital in Krikilan (Banyuwangi).\(^{124}\) In 1929, Resident Neys mentioned a private hospital in Situbondo, which was financed by eight sugar enterprises. Two polyclinics were also reported in existence, one in Asembagus managed by the Asembagus sugar industry, and the other one in Panarukan operated by a *dokter Jawa* from Situbondo.\(^{125}\) Closely linked to hospital facilities was the procurement of medical staff, including Indonesian personnel. For example, in the Banyuwangi-based Krikilan estate hospital alone there were twelve Indonesian medical personnel in 1935.\(^{126}\)

A more striking measure in terms of service scope than hospital facilities was medical responses in the form of vaccinations and serum injections. Started in the United States around 1800, smallpox vaccination reached Java from French Mauritius in 1804. It was gradually undertaken across Java, including Besuki, and became the most


\(^{119}\) Onderzoek naar de Mindere Welvaart der Inlandsche Bevolking op Java en Madoera, Vol. 7 (15): Samentrekking van de Afdeelingsverslagen over de Uitkomsten der Onderzoeken naar de Irrigatie in de Residentie Besoeki (Batavia: Landsdrukkerij, 1905), pp. 79-80.

\(^{120}\) ANRI, “Memorie van Overgave, Bosman”, p. 17.

\(^{121}\) Chemical and bacteriological investigations were undertaken in Petung and Sumbergedor water springs. “Memorie van Overgave, Bosman”, p. 17; In Wringin, Bondowoso the investigations were undertaken by Pijl. “Hindia Belanda”, Pewarta Soerabaia, 23 February 1916, p. 1.

\(^{122}\) Verslag over de Bugelijke Openbare Weken in Nederlandsch-Indië over de Jaren 1919 tot en met 1922, Deel 2 (Weltevreden: Landsdrukkerij, 1924), p. 60.

\(^{123}\) Onderzoek naar de Mindere Welvaart, 9 (14), pp. 80-81.

\(^{124}\) Broersma, Besoeki, p. 90; Kruyne, “Geneeskundige Ondernemingszorg”, p. 17; It was reported that in 1932 there were 27 estates in Banyuwangi as supporting members. Vereeniging Ziekenverpleging Krikilan, Verlag over het Jaar 1932 (Kalibaroe: Vereeniging Ziekenverpleging Krikilan, 1933), p. 1.

\(^{125}\) ANRI, Memori Serah Jabatan, p. cxxii.

widely executed vaccination programme until the end of the Dutch colonial period. Developed by Nijland, cholera vaccination was introduced from 1912 and extensively applied in Java from around 1920. The resident of Besuki reported in 1934 that vaccinations and revaccinations were regularly run, equipped with an adequate organization. In 1929 regular injections to eradicate framboesia in Prajekan, Besuki, Mlandingan, Panarukan, Situbondo, and Asembagus districts were reported. This measure started in colonial Indonesia around 1919, following the discovery of neosalversaan and the benefits of the salversaan injections enjoyed earlier in Surinam. In some cases the response was combined with more concerted efforts at quarantine and disinfection, as also observed elsewhere in Java.

Responses in the field of public hygiene steadily followed. The primary reason was that the results of medical responses were regarded as limited and only reached a tiny fraction of the population. A systematic public health education was felt vital to bring improvement and began to be executed in colonial Indonesia from 1925. The program was designed to raise awareness among the inhabitants about simple facts linked to the causes, transmission and prevention of endemic diseases. Through propaganda, demonstration and publication, the Indonesians were encouraged to adopt hygienic habits to maintain health, such as using boiled drinking water, adopting latrines, disposing of garbage properly, and also to be aware of the disease-transmitting creatures like flies, rats, and mosquitos. In terms of diet, to fight against beri-beri, the Indonesians were encouraged to have a mixed diet and to cultivate legumes on their lands to provide them with a valuable source of vitamins.

During the independence period, the Indonesian authorities practically looked back at the colonial practices for methods of disease control. In the case of malaria,
quinine medication continued to be a standard practice. In Pasanggaran, Banyuwangi, attempts were made to regularly drain irrigated lands one day a week to exterminate mosquito larvae, while in Jember, Bedodoh swamp and Tanggul swamp were drained partly for the same purpose. The measure was combined with the promotion of irrigated land fish culture, partly by arguing that such a practice resulted in no decline in rice production. One major different feature was observed in the chemical measures. From the 1950s the spraying of DDT and DLN was routinely undertaken, as part of the nation-wide campaign against malaria, with the support of the World Health Organization (WHO) and other international agencies. The satisfactory results of the campaign, however, did not last long. On April 1962, DLN resistant A. aconitus was reported to occur in Banyuwangi, and was followed by a report on DDT resistant A. sundaicus in Jember. In Bondowoso and Panarukan, in May 1964 DDT and DLN resistant A. sundaicus was reported. In response to the problem, DDT was replaced by DLN or vice versa and occasionally the same insecticide was used, but at higher dosages.

The vaccination and injection programmes resumed after their discontinuation during the Japanese occupation and revolution years. In Besuki, smallpox vaccination and revaccination restarted in 1949 reaching around 64,000 inhabitants. Between 1950 and 1952, the number of vaccinated inhabitants reached more than 1.3 million. In general the programmes seem to have regularly run in the following years and around 1970 there was optimism that the complete eradication of smallpox was very likely. Other vaccinations especially cholera, typhoid, and dysentery, were probably also given in Besuki and elsewhere in Java, as indirectly reflected by the steep increases in vaccine production. In addition, attempts were made by the Indonesian authorities with the

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136In the outbreak of malaria in Puger in 1947, the health service distributed 34,000 quinine tablets to inhabitants. “Terserang Malaria”, p. 1.
141Kementerian Penerangan, Republik Indonesia, pp. 596-597.
142Departemen Kesehatan, Laporan Pelaksanaan Pelita I, p. 50.
143There was a significant increase in cholera vaccin production, from 100 litre (1950-1955), to 600 litre (1956-1960), and to 19,000 litre (1961-1964). Chotypa (Cholera, Typhoid, and Paratyphoid) vaccin production was 8,500 litre (1950-1955), 18,800 litre (1956-1960), and 31,300 litre (1961-1964). Soemiatno, “Vaksin dan Sera”, in Makagiansar and Soedarmo (eds), Research di Indonesia, 1, pp. 625.
support of WHO and UNICEF to contain framboesia. In this programme, the Dutch-introduced neosalvarsan was replaced in 1950 with penicillin, which was regarded as effective to combat syphilis as well. The framboesia control was reported successful in pushing down its prevalence across Java.

No less instrumental in the disease control were hospital facilities and medical staff. In 1952, the general practitioners in Besuki conducted an initiative to built a sanatorium in Jember and attempts were also made to improve the region’s hospitals. By 1966, there were four hospitals in the Besuki residency (of which the first three hospitals were operated by the state estate company, PPN), namely Elisabeth hospital in Situbondo, Krikilan hospital in Banyuwangi, Jember hospital and Margirahayu hospital, both in Jember. The number of medical staff probably also experienced an increase as from the early 1950s medical education and training were gradually run in several places in East Java. Moreover, two of the three areas of the East Java province designated in the early 1950s for a pioneering hygienic project were the Besuki districts of Genteng (Banyuwangi) and Tamanan (Bondowoso).

Despite such developments in western methods of disease control, many Indonesians in Besuki still had to rely on traditional medicines. This trend was generally observed and even occurred as well during the 1940s when western drugs were in shortage among those who had already entrusted their health with western remedies. In this period the use of indigenous medicines was reported to have steeply grown. Medical practitioners advocated various traditional remedies for diseases such as dysentery, fever, and cough. A number of plants with valuable properties as potential substitute for imported medicines were listed. In 1954, a special institution with one of its major tasks of investigating traditional medicines was established. The position of indigenous medicines obtained strong legal support under the 1963 Pharmaceutical Ordinance. With this recognition, the government accommodated indigenous medicines, which had been part of the common practices among many Indonesians, into the national medical system. Under such circumstances, the ways in which the inhabitants responded to diseases became more complex than ever. Some Indonesians

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144 R. Kodijat, “Pemberantasan Penjakit Framboesia”, in Makagiansar and Soedarmo (eds), Research di Indonesia, 1, pp. 532, 549-551; Wasito, “Pemberantasan Penjakit Kelamin”, in Makagiansar and Soedarmo (eds), Research di Indonesia, 1, p. 585.
146 Kementerian Penerangan, Republik Indonesia, pp. 598, 610.
147 Almanak Kesehatan, p. 1004.
148 Kementerian Penerangan, Republik Indonesia, pp. 602-604.
probably were in support of one particular system, either western or indigenous, but many appear to have found them complementary, rather than contradictory.

7.4 Noxious Wild Animals

Another aspect of the environment which raised concerns both among the Indonesians and the Europeans was the nuisance caused by wild animals. The expanding settlement, agriculture and forest exploitation frontiers to new areas from circa 1870 unavoidably intensified human confrontations with wild animals. This development made people and their ventures more vulnerable to wild animal attacks as there was direct competition for food and habitat between the two parties. The competition grew not always necessarily due to the rising pressures of the human activities on wild animals. In reality, the human-induced modification of the natural environment might have led to an increase in particular wild game populations through the creation of better breeding grounds, consequently increasing the threats to humans and their interests.

There were numerous wild animals, but tigers, boar and crocodiles were regarded as the major trouble-makers. The lack of historical sources on crocodiles makes it hard to discuss these reptiles in detail. On crocodiles in Java, J.C. Koningsberger noted in 1919 that the animals posed real danger to the inhabitants. Wild boar had been seen among the Indonesians of Java as a pest and were thought to be the materialization of evil spirits, Kala Gumarang. In a Javanese folktale, the figure was described as always disturbing the goddess of rice, Sri, whose body turned to rice and other agricultural crops in order to escape from him. Although rejecting the links to mystical conceptions, the Europeans also considered wild boar a problem. A European traveller, J. Beete Jukes, depicted the abundant wild boar population in the extreme corner of East Java as a “perfect nuisance”. Commenting on the Garahan-Mrawan forest of Banyuwangi, in 1912 R. Broersma described wild boar as inflicting damage on the neighbouring estates. Other figures, such as Van den Bergh van Heinenoord,
Ottolander, Van der Heyden, and Von Schmidt, remarked on the damage inflicted by wild boar on rubber estates in Jember and Banyuwangi. Also K.W. Dammerman identified wild boar as destructive to many agricultural crops.

Compared with wild boar, tigers were seen as more dangerous to both livestock and human lives. Fear of tigers seems to have been common for those who traversed and lived in the vicinity of forests. Such a fear was said to be responsible for the abandonment of some villages in Sumberwaru, Baluran, a well-known tiger spot in the region. An 1876 general report of Besuki also linked the stagnant traffic between Banyuwangi and Panarukan to the same reason. Describing the forest of Garahan-Mrawan as “a paradise for tigers and wild boar”, Broersma portrayed the tiger as putting villages in great danger. Tigers were also considered ferocious and responsible for the declining stocks of game population. When the Netherlands Indies Societies for the Protection of Nature urged protection measures for wild animals, tiger and wild boar were excluded. Both animals, even those who lived within protected forest, were targeted for extermination. Around the mid-1930s the protection of tigers was said to remain “not urgent”.

Apart from real contact with tigers, numerous news reports of attacks by tigers certainly played a role in raising fear and shaped the portrayal of nineteenth-century Besuki as one of the tiger nests of Java. This image persisted into the twentieth century when this region was the last place in Java to support a wild tiger population.

155 "Ziekten en Plagen bij Ficus Elastica", Verslag van het Caouthouc-Congres Gehouden te Djember op 19, 20 en 21 October 1907 (Batavia: Landsdrukkerij, 1908), pp. 67-68.
159 ANRI, Arsip Residensi, Besuki 9.7, “Algemeen Verslag van Residentie Besoeki, 1876”.
160 Broersma, Besoeki, p. 61.
163 Jukes, Narrative of the Surveying Voyage, p. 31; “Lamadjang en Bezoeki”, p. 6; Bleeker, “Fragmenten”, p. 133.
and was occasionally shaken by shocking events. In the late 1940s, when fear of tigers had already abated in most parts of Java, tiger attacks struck southern Banyuwangi where in 10 months 64 fatalities were reported.\textsuperscript{164} Even in the following decades tigers continued to claim human lives in the Besuki region.\textsuperscript{165} Besides real deadly attacks, for many Indonesians fear of tigers also resulted from beliefs linking them to guardian spirits, souls of ancestors, kings, and shamans.\textsuperscript{166} This feature was also common in Java and Sumatra, and elsewhere in Southeast Asia.\textsuperscript{167}

During the independence period the perceptions of tiger- and wild boar-linked problems became essentially different. Recent studies by Wessing and Beatty demonstrate the persistence of popular beliefs relating to tigers among many Indonesians in the region, despite the declining tiger population and shrinking forest. Parallel with these phenomena, however, there was a growing shift in the perception of tigers among the forestry officials and urban middle-class groups from a dangerous and cruel species to an endangered one. The shift was clearly due to the influence of the global concerns that the tiger was on the verge of extinction and protection measures were urgently needed. A strong plea to save tigers was first voiced in 1969 during the meeting of the International Union for Conservation of Nature and Natural Resources (IUCN) held in India. Around the same time, the Smithsonian scientists, especially S. Dillon Ripley, an ornithologist, also had raised awareness among the global community about the plight of the tiger. These concerns led to a number of tiger conservation projects under the two institutions in Nepal, India, and Indonesia, including the Javan Tiger in Besuki.\textsuperscript{168} The perception of wild boar, by contrast, remained unchanged. A great number of reports in the 1950s identified wild boar as destructive and harmful.\textsuperscript{169}

\textsuperscript{164}Verslag van den Dienst van het Boschwezen in Nederlandsch-Indië, 1940-1946, p. 143; Boomgaard, \textit{Frontiers of Fear}, p. 47, footnote 30.
\textsuperscript{165}On September 1952 a tiger coming out from the Glundengan forest pounced on a villager in Sumberejo. Still in Jember, in Sucopangepok a girl was killed by a tiger coming from the Argapura mountain forest. "Harimau Mengamuk di Daerah Jember: Seorang Gadis Menjadi Korban Mangsanja", \textit{Trompet Masjarakat}, 3 September 1952, p. 3.
\textsuperscript{169}"Gangguan Celeng Meradjalela", \textit{Trompet Masjarakat}, 24 September 1951, p. 3, reporting that every day around 50 wild boar attacked agricultural crops in Curahdami, Bondowoso; "Usaha2 Djawatan Pertanian", \textit{Trompet Masjarakat}, 22 December 1952, p. 3, stating that farmers suffered considerable
The influence of Islam in proscribing wild boar apparently added cultural reasons to inculcate the perception. Even until recently wild boar was persistently seen as a problem in the region.

7.5 Noxious Wild Animal Control

Both Europeans and Indonesians developed ways to cope with the wild animal problems. With regard to the tiger, it was commonly believed that attacks usually happened at night. To avoid tiger attacks, Indonesians residing in the vicinity of forests avoided remaining outside their home during the hours from dusk to dawn. Under forced circumstances, people always made night travel in groups and with torches ablaze. Another adaptation developed to reduce tiger and other wild animal attacks was by building adequate fences surrounding houses and villages. Among the Indonesian inhabitants of Besuki, when travelling through forests, direct confrontations with tigers were also believed to be avoidable by uttering particular prayers. Such responses certainly rested on prevailing traditional beliefs and conceptions of tigers as part of the natural environment.

The Europeans, by contrast, coped with the wild animal problems by using extermination measures. From the seventeenth century, the colonial officials were already willing to get rid of tigers and other life-threatening predators and provided cash rewards, which in the nineteenth century evolved into a bounty system applying also in Besuki. Exterminating predators and the bounty system seem to have been a common practice among the European settlers in America. Under the bounty system tigers in the Besuki region were hunted down. An 1872 report from Banyuwangi mentioned the killings of 9 striped tigers, 32 leopards and 3 crocodiles in 1871 with a total paid premium of $955. The 1873 report of Banyuwangi revealed that a total premium of $570 was paid for the killings of 10 striped tigers, 24 leopards, and 24 crocodiles in crops losses from wild boar attacks; “Ama dan Kerusakan Tanaman”, Trompet Masjarakat, 9 September 1953, p. 2, reporting wild boar as causing serious crop damage in the Banyuwangi regency; together with rats they devastated 580 hectares of rice and 300 hectares of corn during the 1953 dry season; “Gangguan Hama Tanaman”, Trompet Masjarakat, 13 May 1955, p. 2, reporting that wild boar bothered extensive areas of agricultural crops.


ANRI, Arsip Residensi, Banyuwangi 31, “Algemeen Verslag der Residentie Banjoewangie 1872”.

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1872. Despite the revocation in 1897 by the Governor-General, the bounty system might have continued existence in Besuki. On 28 April 1905, the resident of Besuki still issued a bounty payment.

Despite the later possible revocation of the bounty system in Besuki, the extermination of tigers did not cease. The Ledeboer brothers hunted down tigers and other predators in order to increase the deer population in their lands on the Hyang highland. From 1915 to 1930, hundreds of tigers and leopards were reported to have been exterminated. In the 1930s, a number of tigers were still reported to have been killed. The extermination also occurred during postcolonial times. It was reported in 1952 that a giant tiger was shot dead by the supervisor of the Kalitakir estate (Banyuwangi) after it pounced on his goat. In 1953 there were five tigers killed in Banyuwangi. In 1971, David Hadikesuma, director of the Sukamade Baru estate killed an old tigress, claimed to have killed 21 goats and attacked a man.

The same measure was taken to deal with wild boar. It was reported in the early 1900s that phosphorous poison was applied by estate planters of Banyuwangi to exterminate wild boar. In addition, wild boar was also hunted, partly for food consumed locally and also exported. Around 1,800 wild boar were estimated being annually hunted in Banyuwangi. The extermination of wild boar seems to have been regularly launched in the independence period as it was during colonial times. One report mentioned that in 1952 no less than 1000 wild boar were killed in Banyuwangi, partly from poison. On April 1954, 142 wild boar were reported to have been exterminated in a campaign against agricultural crop pests in Bondowoso, Banyuwangi.

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175 ANRI, Arsip Residensi, Banyuwangi 32, “Algemeen Verslag der Residentie Banjoewangie 1873”.
176 Boomgaard, Frontiers of Fear, p. 96.
180 “Radjahutan Mati Tertembak”, Trompet Masjarakat, 3 September 1952, p. 3.
184 “Is Banjoewangi Nog Een Jachtdorado?”, Het Bosch, 8, 6 (1941), pp. 257-259.
185 The poison was called fosfordeeg and distributed by the Agriculture Service, “Usaha2 Djawatan Pertanian”, Trompet Masjarakat, 22 December 1952, p. 3.
and Jember.\footnote{This number included 45 wild boar in Banyuwangi, 48 wild boar in Jember, and 49 wild boar in Bondowoso, "Keadaan Ama Tanaman", Trompet Masjarakat, 14 June 1954, p. 2.} Another report mentioned that the 1954 campaign had successfully killed more than 1,900 wild boar.\footnote{"Gangguan Hama Tanaman", Trompet Masjarakat, 13 May 1955, p. 2.} Between 1952 and 1957 more than 9,700 wild boar were killed in the Banyuwangi regency alone.\footnote{Martodarsono, "Memberantas Hama Tanaman", p. 337.} The same measure was taken in other places in Java, where wild boar posed a problem, including in areas where obedient Islamic communities existed.\footnote{Tedja S. "Berburu Babi Hutan dan Adu Bagong", Gema Perhutani, 3, 35 (1972), p. 31.}

### 7.6 Conclusion

This chapter has indicated that in the Besuki region, problems linked to diseases and noxious wild animals posed serious challenges to development. Although the problems certainly had roots in the region’s natural environment, in several cases the escalation of the problems was often caused by the influence of the expanding human activities. Malaria is the most illustrative case in point here. Besides offering socio-economic advantages, the establishment of farm irrigated lands, agricultural estates, and fish ponds also brought about unexpected results as it also created more extensive fertile breeding grounds for malaria vectors. Noxious wild animals, including tiger and wild boar, might have also benefited from the human-made environment, such as grasslands, agricultural lands and gardens, and also livestock raising, which provided them with better supplies of food and an ideal habitat for multiplication. It is clear that the growing problems of diseases and noxious wild animals were partly induced by the human pursuit of material basis of living through environment modification, rather than due exclusively to natural factors.

In regard to the disease and noxious animal control, there is some evidence for a gradual process of improvement. The growing understanding of the nature of the diseases and the scientific discoveries regarding disease treatment and prevention steadily offered more well-developed tools to address the problems. Vaccinations, serums, quinine, medical facilities and personnel became increasingly available and campaigns for improving public hygiene were also gradually run. The results, however, seem to have been uneven. Some measures had been quite successful as particularly seen in the cases of smallpox, framboesia, and to some extent, malaria. But until the early 1970s more limited results were achieved in the fight against other major killers such as typhoid, cholera, and dysentery. Different degrees of achievement apparently also applied to noxious animal control. The problem of the tiger was successfully
overcome. This result was clearly reflected in the change of view of tiger from vermin to noble and endangered species. Rather than a tiger plague, from around 1970 it is the extinction of Javan tiger that has been feared and perceived as a problem. The wild boar-linked problem, by contrast, persisted due primarily to the boar’s high reproductive capacity and partly to the disappearance of its predators including the Javan tiger.

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190 Seidensticker and Suyono, The Javan Tiger, p. 11.
CHAPTER VIII
PROTECTING NATURE

8.1 Introduction
The concern for environmental protection in Indonesia is not new. A distinctive episode in the history of the Indonesian environment already began from the late decades of the nineteenth century, marked by the adoption of conservation policy. The underlying force was the idea that special measures needed to be taken to protect the wealth of the Indies environment from irreparable losses and long-term deterioration resulting from demographic and socio-economic processes. This development had features clearly distinct from the longstanding measures that reserved parts of the environment for power-holders. The conservationists believed that the importance of nature protection was not only linked to economic values, but scientific and aesthetic ones as well, and all these values should be preserved for the interests of future generations too.

The conservation concerns, however, were not unique to colonial Indonesia, but part of a broader phenomenon emerging as a response to the ongoing deterioration in nature and wildlife on other continents. With its origins in Euro-American thought, the conservationist ideas spread and were adopted in the colonial policies through the agency of botanists and other natural scientists, who with their longstanding scientific networks, were able to generate a sense of environmental crisis. Emerging as a business of the state, the conservation measures represented what the conservationists thought as good for the interests of the people, but often not in the same way as the people did themselves.

Consequently, conservation projects were also a subject of contest over wealth and power, especially between the state and the people.\(^5\)

Besuki was one of the areas in Java where nature protection left its strongest mark. Nature protection there had its origins in colonial times and was established through a centralized legal framework imposed by the central government. The conservation practices in Besuki under the Dutch rule and in post colonial times seem to have been greatly shaped by ideas originating in the West. The conservation movement was very much part of government circles, accommodating mostly the Europeans during the colonial period and the Indonesian officials during post-colonial times. This chapter will show that challenges for nature protection were not only due to the continuing contests over resources between the state and the people, but also due to internal problems within the government.

8.2 Conservation Movement and Legislation

The early conservation movement in colonial Indonesia, including Besuki, was closely connected with the colonial economic interests in agriculture. The connection could easily be seen from the expected outcomes of the conservation regulations enforced in the 1870s and 1880s. The Gouvernementsbesluit van 1873 (Government Decree of 1873) and the Ontginningsordonnantie van 1874 (Clearance Ordinance of 1874) obliged both Europeans and Indonesians running agricultural operations on sloping areas to take anti-erosion measures. This stipulation primarily rested on the idea that upland agricultural outputs were in decline due to the washing away of fertile soils following the removal of forest cover.\(^6\)

Terracing was encouraged in order to protect soils and to maintain agricultural production, a measure highly recommended in Java by K.F. Holle, an agriculture expert working in the colonial administration. Informed by the agriculture-induced soil fertility destruction in the United States of America, Holle was the first who in 1866 warned the danger of erosion through his publication, *Een Groot Gevaar dat Sluipend Nadert* (A Great Danger that Creeps ever Nearer).\(^7\)

\(^{5}\) For a valuable discussion on contest over forest resources in Java, see Nancy Lee Peluso, *Rich Forests, Poor People: Resource Control and Resistance in Java* (Berkeley: University of California Press, 1992).


More significant progress in conservation was reflected by the 1884 Forest Ordinance, stipulating the preservation of watershed-protecting forests. According to this ordinance, no felling was allowed in montane forest above 4,000 feet in Eastern and Central Java. The underlying idea in this stipulation was to protect water catchment areas, a sensible action advocated earlier by the German naturalist Franz Junghuhn on Java around the mid-nineteenth century. This stipulation was closely linked to the sponge theory, suggesting forest cover as the best regulator of water regimes. Uncontrolled agricultural expansion towards montane peaks was seen as a serious threat to the very existence of agriculture as it would seriously affect water flows and irrigation supply. Therefore, for the sake of agricultural sustainability, such an expansion should be stopped and for this purpose a legal framework was seen as necessary.

It came as no surprise that strong proponents of the watershed forest protection were found among the engineers working in the colonial irrigation service. Some support also came from a number of officials at the Forest Service such as J.W.H. Cordes, S.P. Ham, A. de Jong and G.S. de Graaf. Between 1915 and 1930 there had been a wide debate among the Dutch scientists concerning the hydrological values of montane forest. Despite the inconclusive scientific evidence, the proponents of the sponge theory won over the other group of scientists putting forward the ideas that hydrological regimes were a function of geological formations and soil properties. Since then the sponge theory has shaped forest
policy regarding natural forest management, and only quite recently has its scientific validity come under attack again.\textsuperscript{13}

In the Besuki region, protecting the water catchment forest area was also a major issue, given the region's mountainous landscape and expanding agricultural operations. A.J.M. Ledeboer stated that the existence of 13 sugar industries in Besuki and Probolinggo, rice fields in Kraksaan and Bondowoso and all rice fields in Jember, which were also used for estate tobacco cultivation, depended for their irrigation on water originating from the Hyang Highlands.\textsuperscript{14} As elsewhere in colonial Indonesia, the activities of shifting cultivation (\textit{ladang}) were regarded by the colonial authority in Besuki as a major threat to the hydrology regulating montane forest.\textsuperscript{15} In order to protect water catchment areas, forest clearing in the Hyang mountain complex was prohibited from 1913 and from 1922 long lease (\textit{erfpacht}) lands for mountain estates were no longer granted.\textsuperscript{16}

Around 1900, there also developed a new trend in the conservation movement, desiring to preserve the natural environment for scientific and aesthetic reasons. Unlike the earlier conservation, the objective of this movement was to protect wild fauna, flora and natural landscapes and the primary reasons for protection were their aesthetic and scientific values.\textsuperscript{17} The fear that particular wild animals were in danger of extinction raised animal protection as the first issue to be addressed. The concerns about wild animal protection were greatly motivated by commercial hunting of birds of paradise in the outer islands of Indonesia,\textsuperscript{18} and of other species such as rhinoceros and wild oxen in the densely populated island of Java. The concerns were voiced among others by P.J. van Houten and M.C.


\textsuperscript{15} ANRI, “Memorie van Overgave van den Resident van Besoeki, 1931-1934”, pp. 9-10; Potter, “Forests versus Agriculture”, p. 38.


\textsuperscript{18} For a discussion on the issue, see Robert Cribb, “Birds of Paradise and Environmental Politics in Colonial Indonesia, 1890-1931”, in Peter Boomgaard, Freek Colombijn and David Henley (eds), \textit{Paper Landscapes: Explorations in the Environmental History of Indonesia} (Leiden: KITLV Press, 1997), pp. 379-408.
Piepers in the 1890s. The Ledeboer brothers were concerned particularly with the alarming decline of the population of deer on Hyang Highland.

Besides the fear of species extinction, the new conservation movement also drew on other elements in western tradition such as willingness to promote animal rights and utilitarian values of wild animal species, for example birds to control agricultural pests. The first legal achievement was the enactment of the Ordonnantie ter Bescherming van de Wilde Fauna van 1909 (Protection of Wildlife Ordinance of 1909), providing protection for all wild animals, except the harmful ones.

The 1910s saw significant progress in the conservation movement. There were two major events which marked this decade. In 1912, the first organization dealing with nature conservation, the Nederlandsch-Indische Vereeniging tot Natuurbescherming (Netherlands Indies Society for the Protection of the Nature) was established, with forester botanist S.H. Koorders as the chairman. This organization played a pioneering role in promoting scientific and aesthetic conservation. Significant achievements in the field of conservation matters, both in legal and practical terms, can be credited to the Netherlands Indies Society for the Protection of the Nature. There were enormous tasks in raising conservation awareness in the Netherlands Indies. Therefore, the Society sought close cooperation with other organizations such as the Nederlandsch-Indische Vereeniging voor Bergsport (Netherlands Indies Society for Mountain Sport), which through its publications took an active role in exposing the natural beauty of Java, including Besuki, to a broader audience.

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21Cribb, “Birds of Paradise”, p. 385; Following the development in the Netherlands, in 1896 the Nederlandsch-Indische Vereeniging tot Bescherming van Dieren (Netherlands Indies Society for Protection of Animals), concerning particularly to domestic animals, was established in Batavia and its Besuki division was formed in Bondowoso in 1897. Reglement van de Afdeeling Besoeki der Nederlandsch-Indische Vereeniging tot Bescherming van Dieren (Batavia: Javaasche Boekhandel, n.d.), p. 1.


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A close contact was also made with the Nederlandsch-Indische Natuurhistorische Vereeniging (Netherlands Indies Society for Natural History), which published a bulletin called *De Tropisch Natuur*, and with the Nederlandsche Commissie voor Internationale Natuurbescherming (Netherlands Commission for International Nature Protection).  

The second significant event was the enactment of the Maatregelen ter Bescherming van de Natuurrijkdommen in Nederlandch-Indië van 1916 (Protection of Natural Wealth Regulation in the Netherlands Indies of 1916), governing the creation of nature monuments. In Besuki this regulation provided a legal basis for nine nature conservation areas established in 1919 and 1920 (discussed in Section 8.4). With the exception of authorized scientific purposes, in these areas any form of human intervention such as collecting botanical specimens, hunting wild animals, setting fires, and herding livestock, were completely prohibited. The idea behind this prohibition was a belief that the presence of human activities in such areas would bring changes and could cause damage to the original state of nature which was considered very valuable and to be preserved for scientific or aesthetic reasons. An important improvement was made by the enactment of the Natuurmonumenten-en Wildreservaten-ordonnantie van 1932 (Nature Monuments and Wildlife Reserve Ordinance of 1932). Under the new ordinance human intervention was tolerated to a certain degree especially for the sake of habitat management. This ordinance facilitated the establishment of an extensive wildlife reserve. In Besuki, the result was the Baluran wildlife reserve established in 1937 based on the Decree of Governor General dated 25 September 1937 No. 9 (Stbl./1937/No. 544).  

With regard to wild game protection, several regulations were issued. This development partly resulted from external pressures especially from Britain and North America as the major destinations for the animal products trade from the Netherlands.

25“Verkorte Notulen der vergaderingen van het Dagelijksch Bestuur”, in *Natuur Bescherming in Indië Gedurende het Jaar 1935: Tiende Verslag van de Nederlandsch Indische Vereeniging tot Natuurbescherming* (Buitenzorg: Archipel, 1936), pp. 28-29; For reports on the natural beauty of Besuki, see for example, *Nederlandsch-Indische Vereeniging voor Bergsport, Mededelingen No. 12* (1936) and No. 19 (1941).  
Indies. The result was the Dierenbescherming-en Jachtordonnantie van 1924 (Game Protection and Hunting Ordinance of 1924). Applied only to Java and Madura, the 1924 Ordinance contained stipulations regarding the introduction of a hunting season restricted to a certain period of time, the requirement of a hunting license obtained from the authorities for a fee, and the list of animal species under protection. The 1924 ordinance was revised with the Dierenbeschermings Verordening en Jachtordonnantie van 1931 (Game Protection Regulation and Hunting Ordinance of 1931). Apart from individually listing protected animals in colonial Indonesia, one new provision contained in the 1931 ordinance was a total ban on trade of dead and living protected animals, given ineffective protection without export prohibition. In order to overcome problems linked to the different regulations from one locality to another, by 1932 it was decided that the 1931 ordinance extended to all of colonial Indonesia.

In Besuki, hunting activities were subject to a set of rules and conditions. Hunters were obliged to equip themselves with appropriate legal documents issued by the colonial authorities and they had to undertake their activity only during the designated period. It was reported that 86 hunting permits and 214 hunting licenses were issued by the authorities in Besuki in 1934. Other regulations were also occasionally enforced. The hunting of wild ox, deer, and antelope was closed in 1937 and 1938. In general, the primary reason behind such measures was to provide the species sufficient time to rejuvenate their populations. In order to increase big game populations, in 1941, L. Berczy, on the basis of his observation in the forest of Banyuwangi, urged the government to provide a bounty for wild dog (ajak). In his belief, the declining number of big game populations was caused by the excessive number of wild dogs and the adoption of the bounty system would attract more people to get involved in the extermination of this predator.
Despite the broadening conservation ideas, the entire conservation movement during the Dutch colonial period had one major unchanged feature. The movement was still confined to government circles, rather than involving ordinary people. This feature was reflected by the fact that members of the Netherlands Indies Society for the Protection of Nature for the entire period of its existence were almost exclusively Europeans, with a few Indonesian aristocrats. Its membership was a mixture of people with different backgrounds, such as professional naturalists working in public services, ordinary nature lovers, and estate owners-hunters. Big planters from Besuki, including Birnie, Ledeboer, and Ottolander, were among the members of the Society. Both Ledeboer and Ottolander in particular became personally involved in practical conservation efforts. Ledeboer recorded good achievements in protecting deer populations in Hyang Highland, better than the protection provided by state-run conservation management. Through the adoption of strict and systematic measures, the Ledeboer brothers, passionate big game hunters and estate owners, were successful in reviving the Hyang Highland as a deer paradise.

Meanwhile, since 1903 Ottolander had preserved a plot of forest which was the habitat of rare plant species in his estate lands on the Raung mountains.

Nature conservation appears to have never attracted special interest from the nationalist movement, although its significance was not denied. The Indonesian representatives in the Council of the People (Volksraad) certainly endorsed that body’s unanimous vote to urge the government to establish more wildlife reserves and to prohibit strictly the hunting and trading of certain wild game species and their products. But among the nationalist organizations, including those with popular support in Besuki, conservation issues were hardly voiced. The major focus of their concerns was more socio-economic and political in nature. For example, in the 1920s, the Sarekat Islam and other organizations in the region, particularly Sarekat Rakjat, were reported to have had concerns with such issues as land rent, capitalist exploitation, and poor socio-economic conditions of

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proletarian workers. For the Indonesians, conservation was greatly felt as part of colonial oppression, restricting their traditional rights to utilize natural resources, for the sake of Dutch colonial interests. In Jember in 1919, Sarekat Islam complained to the government about the granting of Nogosaren and Pontang Mandiku lands for estates. Rather than using environmental arguments to reject the grants, the complaint was raised on the basis that the colonial government had previously curtailed the Indonesian farmers' access to open up the same plots of land for agricultural fields. There was literally no popular conservation movement, in contrast to the existing popular support for the nationalist movement.

Under the newly established Indonesian state after 1945, a stronger sense of environmental crisis was raised by a number of conservation officials and figures who had been active in the field during colonial times. Apart from the worsening natural environment during the 1940s, the sense of crisis was also raised by international networks of organizations and interest in conservation issues in many countries. In its congress held in Brussels in 1950, the International Union for the Protection of Nature and Natural Resources (IUCN) expressed growing concerns about the status of threatened species to the Indonesian government. The following visit to Indonesia of the vice president of the organisation, H.J. Coolidge, who also represented the Pacific Science Association and Standing Committee on Pacific Conservation, increased the global concerns about the alarming situation of particular wild game species in the country. The push grew stronger around the mid-1960s, after the IUCN launched its South East Asia Conservation Project, formulated in its meeting held in Nairobi in 1963.

To show its commitment to conservation matters, Indonesia joined the International Union for the Protection of the Nature in 1954 and its membership was represented by the Central Institute for Nature Research of the Indonesian Botanic Gardens (Bogor). This was followed by the enactment of conservation regulations, mostly inherited from the Dutch era. The Nature Protection Ordinance of 1941 was readopted in the independence
era, based on the Decree of the Minister of Agriculture and Agrarian Affairs No. 110/Um/1957. The Forest Ordinance of 1967, a revised version of the 1927 and 1932 forest ordinances, provided further legal framework, governing four types of conservation area: nature reserves, game reserves, hunting reserves, and recreation reserves. A decree by the Minister of Agriculture issued in 1970 extended legal protection, previously given to 36 wild animal species under the Wildlife Protection Regulation of 1931, to another 14 species, making a total of 50 wild animal species. Similarly, various regulations concerning hunting permits and licences, restrictions and hunting seasons were in force.

In Besuki, the Dutch-created nature reserves were recognized under the newly established Indonesian state. But the colonial regulations supporting their existence were regarded as no longer valid in an independent state. In order to secure the existing nature reserves, a new legal framework needed to be issued under the national legal system. The regulation governing the Nusa Barung Nature Reserve was renewed with a decree by the Minister of Agrarian Affairs No. 110/VIII/1957. The Baluran game reserve was legally renewed with the Decree of the Minister of Agriculture and Agrarian Affairs, No. Sk/11/PA/1962. In the late 1960s, the Commission III of the Forestry Department Workshop led by Moerdijanto further proposed to the government to designate the reserve as a national park. New regulations were also issued, concerning the nomination of the Meru-Betiri forest area as a nature reserve, stipulated in the Decree of the Minister of Agriculture, No. Kep.31/12/’66 and its designation in 1972 as a game reserve by the Decree

49 Setijodiwiirjo, “Masalah Perlindungan Alam”, 5.
of the Ministry of Agriculture No. 276/Kpts/Um/6/1972. Another new regulation was the Decree of the Minister of Agriculture and Agrarian Affairs No. 12/PA/1962, stipulating the creation of the Hyang Highland game reserve, which was previously held by the Ledeboer brothers as leased land (erfpacht).

The conservation movement during the independence period, however, remained in government circles and lacked mass support. The political parties mushrooming in the 1950s that were supported at the grass roots never used environmental arguments, but rather adopted socio-political and agrarian issues in their struggle. The Partai Sarekat Islam Indonesia (PSII), for example, maintained that the roots of political grievances in Jember, Banyuwangi, and Bondowoso were economic pressures stemming from the domination of the foreign estates over land resources, supported by federalists and Dutch collaborators working in the bureaucratic office. Although in 1957 a nature lover organization was established in four places in Java, the member numbers remained small. No such organization was found in Besuki nor did university student-linked conservation organizations exist, partly because no higher education institution was established in Besuki until around the mid-1960s. Only a few individuals had conservation concerns, and among them were David Hadikesuma, director of the Sukamade Baru estate and Lucas Hadiwinoto, director of the Bande Alit estate. Their concerns seem to have been nurtured by contact with foreign conservationists who had interest in the nature and game protection in the region, and reflected a response to problems in the immediate environment.

Unlike the issues of nature protection, pollution attracted little concern in the conservation movement during both colonial and independence periods. Nonetheless pollution did exist in Besuki and elsewhere in Java. In the early 1900s the sugar industry in
Panarukan was blamed for the pollution of Sampean River with chemically contaminated water and waste products, which led to the death of fish and declining yields in farm fields obtaining irrigation from the river. Similarly, pollution linked with the sugar industry was regarded as responsible for the poor farm crops in several parts of Banyuwangi. The problem, however, seems to have been seen as a matter of economic cost, rather than conservation. It is unclear whether particular measures were actually taken in Besuki to address the sugar industry pollution, but in nineteenth century Batavia the town government was reported to have imposed a fine for dumping pressed cane into rivers. In addition, it is very likely that there was also faecal and waste-linked pollution in Besuki, resulting from unhygienic living habits such as using rivers and canals as open latrines and sewers. But this problem was generally perceived as a matter of health and was believed to be the major cause of the prevalence of water-borne diseases such as dysentery and cholera in the region. As discussed in an earlier chapter, measures were taken by the colonial authorities in the field of hygienic measures and drinking water improvement.

Lack of concern with pollution was also reflected in the legal response. The only regulation concerning pollution was the 1926 Hinderordonnantie (Nuisance Ordinance). However, the regulation was barely in force due to the absence of political will and clear stipulations on the kinds and levels of pollution that caused public nuisance. Although pollution was already present in Java even before 1870 as shown by Nagtegaal, the scale and intensity seem not to be regarded as urgently demanding a legal framework. The unpopular pollution issues were also linked to the fact that industrial development in colonial Indonesia remained relatively limited. Motivated initially by the emerging fear of the shortages of imported supplies stemming from the First World War and exacerbated further by the influx of Japanese industrial products to Indonesian markets in the 1930s, the Dutch initiatives to industrialise colonial Indonesia had no real impact. Moreover, the Japanese occupation, the 1940s revolutionary war, and the lack of investment capital and

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62 Onderzoek naar de Mindere Welvaart, 7 (14), pp. 43-44.
political instability in the 1950s and 1960s made certain that the industrial sector and industrial pollution remained marginal.\(^67\) Only after 1970 when industrialisation began to pose considerable environmental problems were the issues of pollution to become urgent.\(^68\)

### 8.3 Organization of Nature Protection

The bureaucratic responsibility for conservation matters long remained vague, despite “the growing administrative sophistication from the second half of the nineteenth century.”\(^69\) Part of the reason was the fact that conservation issues were often closely interconnected and could not be so easily quarantined as a clear policy issue. Although concerns on soil and forest conservation had already emerged in the late decades of the nineteenth century, the responsibility still broadly rested in the hands of the Forest Service. As one of the 16 services under the Department of Agriculture, Industry, and Trade, this service alone was not established until 1897. Only in the early 1930s did it start the creation of special organs inside the Forest Service to manage forest and soil conservation matters in Java and Madura, the Bebossingcommissie (Afforestation Commission) and the Plaatselijke Reboisatie Commissie (Regional Reforestation Commission).\(^70\) The Besuki area was under the East Java Reforestation Commission, established in 1931, with Resident C.E. van Barre among the members.\(^71\)

In the field of nature and wildlife protection, the Volksraad strongly advised the government to appoint a special agency to manage nature protection, but this appeal was rejected for financial reasons. Formulated in the Congress of the high-ranking forestry officials held in 1931, the Appelman motion demanded that the management and supervision of nature reserves be given to the Forestry Service. The appeal was in part accepted and was translated in the 1932 Nature Monuments and Game Reserve Ordinance.\(^72\) According to this ordinance, nature reserves within the government forest

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71 Other members of the commission were H. Jelgerhuis Swildens, R.P. Soeroso, T.A. Kartoadiredjo, H.D. van Werkum, and W.Ch.L. Brocx, Verslag van de Reboisatie Commissie, Ingesteld door den Provinciaalen Raad van Oost-Java (Soerabaja: H. van Ingen, 1931), p. 3.
areas were the Forestry Service’s responsibility, but other reserves located outside state forest were managed by heads of the local government. An important bureaucratic step towards managing nature protection was taken in 1937 with the designation of a special official within the Botanic Gardens to handle nature conservation matters. This position was created through a long struggle by the Director of the Botanic Gardens, the Netherlands Indies Society for the Protection of Nature, and the Netherlands Commission for International Nature Protection. A. Hoogerwerf was the first who was assigned to assume the newly created bureaucratic position.

Private involvement in the management of nature reserves in colonial Indonesia was limited. Despite the active role of the Netherlands Indies Society for the Protection of Nature in proposing conservation measures, the colonial government took the management of the nature reserves into its own hands, rather than entrusting them to private organisations. It was argued that the government had the management rights because the nature monuments were located in the government domain, and that no private organization was considered as having the resources to manage the reserves. The Society was only assigned to an advisory role in all matters regarding nature conservation. This feature was in contrast to the situation in the Netherlands where the role of private organisations was much stronger than that of government. The only game reserve in Besuki under private management was run by the Ledeboer brothers in the Hyang Highlands. Another privately managed game reserve was in Cekepuh, South of Sukabumi (West Java), run by a hunter association, Venatoria.

The bureaucratic responsibility for conservation in the independence period had much in common with that of colonial times. The nature reserves remained the responsibility of the Forestry Service. Working under the Indonesian Ministry of Agriculture and Agrarian

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74 *Korte Mededeelingen der Nederlandsch-Indische Vereeniging tot Natuurbescherming No. 4* (1938), p. 2; Rengers Hora Siccama, “Berichtgeving omtrent Natuurbescherming”, p. 91.
Affairs, there were two organs handling conservation matters. One organ was called the Institute of Nature Conservation at the Bogor-based Indonesian Botanical Gardens, and the other was the Division of Nature Protection of the Forestry Service. In 1961 the Institute of Nature Protection was merged with the latter organ, which continued to operate under the Forestry Service. A significant point showing organisational progress in carrying out the conservation tasks and voicing conservation issues within the state bureaucracy was the creation of the Forestry Department in 1964, separated from the Ministry of Agriculture and Agrarian Affairs, with its own division of Nature Conservation and Wildlife Management. The body kept a close contact with national and international organisations such as the Morges-based IUCN, the Hawaii-based Pacific Science Association and the Bogor-based Perkumpulan Penggemar Alam (Nature Lovers’ Association).

The competing interests, however, led to the liquidation of the Department of Forestry in 1967 and the reorganisation of the organ handling conservation matters. The result was the creation of the Directorate of Nature Protection and Conservation (Direktorat Perlindungan dan Pengawetan Alam, Direktorat PPA) within the Directorate General of Forestry, the Department of Agriculture. In 1971 a coordination body called the Consultation Board of Nature Protection and Conservation was established, accommodating multiple parties from the governmental agencies and non-governmental organisations which had concerns on conservation matters. At around the same time, the Indonesian Wildlife Fund (IWF) was established with Sultan Hamengku Buwono IX as chairman and Soedjarwo as secretary, and became involved mainly in fund-raising.

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80Setijodiwirijo, “Masalah Perlindungan Alam”, p. 8; Cribb, “The Politics of Environmental Protection”, p. 7; The heads of the two organs were respectively, Koesnoto Setijodiwirijo and R. Koesnadi Partosatmoko, see Almanak Organisasi Negara Republik Indonesia 1960 (Djakarta: Lembaga Administrasi Negara, 1960), pp. 329, 358.
85Hutabarat, “Suaka Alam”, p. 16. The body embraced representatives from the Department of Agriculture Department of Education and Culture, Department of Information, Department of Transport, Indonesian Wildlife Fund, Indonesian Institute of Sciences, Zoo Associations, and other related institutions.
programmes.86 The first true non-government conservation organization in the independence period comparable to the Netherlands Indies Society for the Protection of Nature was the Yayasan Pendidikan Kelestarian Alam (Foundation for Education on Nature Conservation). But like its colonial parallel, the Foundation’s members came mostly from the government circles.87

The bureaucratic organs to manage forest and soil conservation matters were also established. A special commission was established in 1949 under a decree (No. Stb. 30/12-1949 no. BZ/B/10/258, A.) issued by the Director of Home Affairs, Negara Jawa Timur, with tasks of improving the state of forest, soil, and water. The commission’s working area covered Besuki and Malang residencies. Under the newly established unitary state of Indonesia, an interdepartmental organ called the Committee for Forest and Agriculture Areas Development was formed in 1951, with a working area covering Java and Madura. Two primary tasks were assigned to the committee: 1) to propose regulations regarding to the forest improvement to the Minister of Agriculture and related institutions; and 2) to provide advice to a local working committee in organizing forest improvement programmes.88 As a follow-up, a provincial committee called the Panitia Karangkitri Djawa Timur was established in 1952 and led by the Governor of East Java with inspectors of the Agriculture Service, Forestry Service, Livestock Service, Irrigation Section of the Public Works Service, and the director of the East Java Estate Service as committee members. This committee was supported by similar organs at regency and district levels in charge of organising a collective movement for reforesting both private lands and state forest areas.89

An important step towards carrying out forest and soil conservation programmes was the launching of the National Greening Week (Pekan Penghijauan Nasional, PPN). It was officially recognized in the early 1950s that the problems of deforested areas and agricultural land erosion in Java were acute, due particularly to the increased forest clearing taking place from the Japanese occupation years. Therefore, in late 1952 the

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government declared the beginning of "total war" (perang tanpa ampun) against the two problems.\textsuperscript{90} The improvement of the Karangkitri approach was soon felt urgent as deforestation-linked floods and erosion continued unabated. There were thoughts especially among the forestry officials and scientists that a more regular and nation-wide approach, which combined state initiatives with mass mobilization, was required to tackle the problems.\textsuperscript{91} Informed by practices in other countries such as the United States of America and Japan, and taking recommendations prescribed by the First Indonesian Forestry Congress in 1955 and by other figures, the government adopted the National Greening Week programme. This measure was first carried out in 1961 and then became an annual event regularly held under Indonesia’s New Order.\textsuperscript{92}

### 8.4 Executing Conservation Measures

The major conservation measure in colonial Indonesia was the establishment of nature and wildlife reserves. The first conservation areas in Besuki were established in 1919, including Sungai Kolbu (Panarukan), Watangan-Puger I/V, Curahmanis-Sempolan I/VIII (Jember), Rogojampi I/II (Banyuwangi), and Pancur-Ijen I/II (Bondowoso). Altogether they covered an area of around 60 hectares. Five more nature reserves followed in 1920: Ceding and Ijen Crater (Bondowoso regency), Nusa Barung (Jember regency), Jati-Ikan and Purwo or Blambangan (Banyuwangi regency). In terms of acreage, they were larger than those established a year before, except for Ceding. This represented a structural shift from the protection of small, scenic sites to the idea of protecting larger ecosystems. The largest reserve was the Purwo reserve, covering an area of around 40,000 hectares, followed by the Nusa Barung reserve with approximately 6,000 hectares. The sizes of the Jati Ikan and Ijen crater reserves were respectively 1,950 hectares and 2,560 hectares.\textsuperscript{93} By 1937 there were eleven conservation areas across the region, following the creation of the 25,000 hectare

\textsuperscript{90}Mohd. Sardjan, “Kedudukan Pertanian Dalam Ekonomi Indonesia dan Kemungkinan2nja”, \emph{Almanak Pertanian 1953} (Djakarta: Badan Usaha Penerbit Almanak Pertanian, 1953), p. 34.

\textsuperscript{91}35 \emph{Tahun Penghijauan di Indonesia} (Jakarta: Presidium Kelompok Pelestari Sumber Daya Alam, 1997), pp. 104-105.


Baluran wildlife reserve in the year.\textsuperscript{94} Until the end of the colonial rule, Besuki had more than 75,000 hectares of conservation areas, the largest in Java, whereas in Banten, by comparison, the four conservation areas reached no more than 58,000 hectares.\textsuperscript{95}

Map 8a. Conservation areas in Besuki (Eshuis, 1939: 302)

Each conservation area in Besuki had special values, either aesthetic or scientific, which became the basis for its protection. The reasons for the Ceding nature reserve were to protect its travertine basin with beautiful surroundings built up by microscopic blue algae. The reasons for the Ijen crater protection included its marvellous greenish-milky coloured crater-lake, volcanic records, and beautiful old casuarina forest. Meanwhile, the Nusa Barung nature reserve was established because the area housed unique insular flora and fauna and in order to keep the reserve in its original state. Also remaining untouched by human activities, the Jati Ikan-Purwo reserve was designated as a reservation for the East Java plant and wild animal species.\textsuperscript{96} The 20,000 hectares of savannah west of Purwo was


\textsuperscript{95}Eshuis, “Protection of Wild Life”, pp. 305-305.

included as part of the reserve in order to strengthen its role in preserving large mammals, and its inclusion was primarily credited to the Dutch forester, F.J. Appelman. Partly different from the Jati-Ikan-Purwo reserve, the primary reason for the Baluran conservation area was to protect the big game population from extinction. The underlying reason for the Curahmanis-Sempolan reserve was due to its richness in flora, considered a representation of the East Java forest ecosystem biodiversity, while its surroundings had been converted into a more homogenous production forest.

The creation of the conservation areas, however, was only part of the broad picture of conservation measures. Another part of the story was their execution in the field, which often presented a more complicated task. The complexity was due to a set of interconnected factors including personnel, equipment, budget, and the social context within which conservation measures were taken into effect. Conflicts over resource use often characterized the conservation measures. As the conservation projects were predominantly state-centred initiatives, the emerging conflicts primarily took the form of ruler versus ruled. But they were not the only form of conflict. As a matter of fact, conflicts also occurred among the state agencies. All these factors seem to have affected the degree to which the conservation measures and the desired outcomes could be achieved. In other words, the creation of conservation areas in Besuki and their supporting legal framework were surely an important step towards protecting and preserving wild life and nature. But other things were also of importance, especially the ways in which the conservation projects were managed and supervised.

In regard to the latter issues, there were views that the outcomes did not materialize as expected. Both internal and external problems were encountered. One of the major internal problems was the lack of officials in charge of carrying out conservation measures. In Besuki, Resident H.A. Voet reported in 1926 that there were 42 officials working in the region’s Forestry Service. Most of them seem to have worked towards observations on the Nusa Barung and Blambangan reserves, see M. Jacobs, “Botanical Reconnaissance of Nusa Barung and Blambangan, Southeast Java”, Blumea, Supplement 4 (1958), pp. 68-86.


Sinaga, “Suaka Margasatwa Baluran”, p. 3.


It consisted of 1 opperhoutvester, 1 houtvester, 2 boscharchitecten, 1 leerling-boscharchitect, 3 opzieners, 11 mantris, and 23 boschwachters ANRI, “Memorie van Overgave (Voet)”, p. 81.
exploitation of the forests rather than conservation. From 1924, military patrols aided in the supervision tasks, but encroachments on reserves could have never been stopped because there seem to have been many unpatrolled tiny entrances leading culprits to the protected areas from the sea and along the Asembagus-Banyuwangi road. In some places, the absence of road created an extra obstacle for supervision and consequently, offences remained uncontrolled. In Baluran, the problem was exacerbated by the presence of estate lands in Bajulmati, which made it easier for intruders to enter the protected area.

Closely linked to the first problem was a lack of budget. Hoogerwerf stated that the allocated budget for conservation matters in colonial Indonesia was “extremely limited”. In 1931 Appelman lamented that only 8000 guilders was assigned to nature protection, insignificant compared with Belgium allocating 0.5 million francs (around 25,000 guilders) or 1 million francs (around 50,000 guilders) allocated for the Albert reserve in Congo, Africa. Even over the last three years before the Japanese invasion, the total conservation budget in colonial Indonesia was only 22,000 guilders. With the limited budget available in the Netherlands Indies, there was hardly any proper management or regular supervision undertaken in most conservation areas.

There was certainly a quality problem too. The Resident of Besuki described the enforcement apparatus from district level downward as incapable. Consisting of forest police, district and sub-district heads, and village officials, the major task of the enforcement apparatus was in the field of policing. The task was primarily translated into two main activities: patrolling protected areas and raiding villages suspected of harbouring offenders. There is little evidence to suggest that propaganda and public education to the villagers were important in preventing conservation offences. Even though such educational efforts probably existed, the scale and intensity were certainly not comparable

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with those done in the fields of agriculture and public health. In general, the use of a policing approach with “confrontational tactics” seems to have been more common. In 1930, Appelman recommended a reward system to stimulate the enforcement personnel, particularly forest police, to improve duty performance. It is unclear whether his recommendation was actually taken, but the problem persisted. Reports on the forest districts of Jember and Banyuwangi around the mid-1930s revealed that numerous offences continued to occur and the authorities were unable to act.

It came as no surprise that the enforcement of conservation regulations was generally said to be poor and few results were achieved. The conservation authorities were said to have lacked awareness and technical knowledge on how to execute their tasks or how important their tasks were. Similar observations were made by G.F.H.W. Rengers Hora Siccama and R.T.A. Soeria Nataatmadja, members of the Volksraad and the Netherlands Indies Society for the Protection of Nature. In their views, one major weakness in the field of nature and wildlife protection was that the enforcement apparatus did not act firmly against the culprits. Control against illegal hunting was said to have only been “a word”, rather than real action. Illegal hunting and wood stealing appear to have been among the major environmental crimes which the authorities found more difficult to prevent than other forms of offence such as illegal grazing and tuber roots collection. In the case of hunting, the difficulty stemmed primarily from the mobile nature of the activity, combined with the use of firearms and the collective endeavour. Meanwhile, wood stealing was not easily prevented because such an offence was often also collectively done. In many cases the lack of personnel and the fear of violent revenge made forest police either reluctant or unable to act firmly against the offenders.

The enforcement problem was compounded by other factors. First, although many offences were reported, only a small number of cases was said to have been followed up

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110 Peluso, Rich Forests, p. 147; there was a strong feeling of dislike for forest police among the villagers dwelling in or near the forests. In their eyes, the forest police were the most direct representation of the colonial oppression. D.H. Manuputty, “Pemakaian Tanah yang Tidak Syah Dalam Hutan2 di Djawa”, Rimba Indonesia, 2, 10-12 (1953), p. 486.


with legal actions. Moreover, among the few cases legally processed, there were complaints that the punishments imposed on culprits were too light.\textsuperscript{117} Such measures were feared ineffective to prevent offences from being repeated either by the same culprits or other parties. Second, in the broader context of the colonial bureaucracy, not all state agencies demonstrated high appreciation of the values of the nature and wildlife reserves. In 1936, for example, the Prison Service of the Home Affairs Department proposed the conversion of one fourth of the Nusa Barung reserve into a detention facility, as had happened to the island of Nusa Kambangan.\textsuperscript{118} Third, as the conservation responsibility involved both forest and civil officials, there were also problems of work regulations (\textit{arbeidsregeling}) and work equipment (\textit{arbeidsmiddelen}).\textsuperscript{119} In the field, the relationship between forest police and civil officials at the district level downward was not always harmonious. There often were suspicions that village officials did nothing to prevent villagers from violating forest and conservation regulations, which led to appeals for a more intensive cooperation between the two parties.\textsuperscript{120}

Besides internal problems, serious external obstacles originated from society. Violations of the conservation regulations were common as reflected in the figures on forest offences. Resident H.A. Voet reported in 1926 that the number of forest offences were 1,173 cases in 1922, 1,025 cases in 1923, and 1,817 cases in 1924.\textsuperscript{121} Considering the problem of supervision, the actual number of offences must have been higher than reported. Especially during times of hardship, an increase in the number of offences often occurred as more people saw nature and game reserves as the easiest way of escaping from subsistence crises.\textsuperscript{122} Unfortunately, there are no further details regarding the nature of the offences. Illegal hunting, timber stealing and forest clearing were among the most frequently mentioned cases, but other offences such as illegal grazing, forest burning, charcoal making, and tuber collection occurred too. Illegal hunting was reported to have been rife in the Nusa Barung reserve, Baluran reserve, and also Purwo reserve, where cases

\begin{flushleft}
\textsuperscript{117}De Voogd and Rengers Hora Siccama, "Onderwerpen van Lokalen Aard", pp. 103-104.
\textsuperscript{119}Ch. S. Lught, "De Natuurbescherming in Nederlandsch-Indië", \textit{Tectona}, 26 (1933), pp. 195-198.
\textsuperscript{121}ANRI, "Memorie van Overgave, Voet", p. 81.
\textsuperscript{122}ANRI, "Memorie van Overgave, 1931-1934," pp. 8-10; This trend was said to have taken place elsewhere in Java during the 1930s depression. Odang, "Iets over Boschpolitie", p. 116.
\end{flushleft}
of timber, bamboo, and rattan stealing were quite common too. One report revealed that the offences were mostly committed by Indonesians, but some of them also by Europeans, Chinese, and Japanese.

There were two major roots of violations of the conservation regulations. The first root was linked to the fact that the Indonesians of the region traditionally had access to forest resources. The inhabitants of Puger, for example, were reported to have traditionally undertaken collective deer hunting and other resource uses on the island. But such activities were banned by the colonial authorities and were considered illegal with the designation of Nusa Barung island as a nature reserve. The continuous hunting and resource use by the Indonesian inhabitants might have been in part an indication of rejection of the colonial claims and of continuing contest over resources. It did not necessarily mean that the culprits were always and only local, poor villagers who were forced to commit crimes in order to survive. The fact that non-Indonesians were also among the culprits might suggest another root of the offences linked to non-local people, representing a new development which the colonial authorities tried to stop. Besides individual actions, it is likely that behind some offences there were well-organized professionals who manipulated local villagers and made a living by crime. This feature might be evident from the fact that part of the stolen items were sold outside Besuki: highly valued carving wood (sawo kecik) to Bali and charcoal to Surabaya.

By the 1940s, following the Japanese invasion, the situation worsened. Instead of strictly enforcing conservation measures, the Japanese did the opposite. For the sake of meat procurement, the Japanese were reported to have shot around 10,000 deer on the Hyang Highland. In other areas, too, similar actions seem to have been carried out

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especially in the Baluran game reserve. The consequence was a steep decline in game populations in the Baluran reserve, especially wild oxen and deer.\textsuperscript{128} For promoting food production, extensive forest clearing also occurred, not only on the initiative of the Indonesians, but under government sponsorship as well.\textsuperscript{129} In Jember, the Japanese authorities provided financial support amounting to $4,500 and rewards were promised to those who worked hard on establishing agricultural fields.\textsuperscript{130} Even war detainees were employed for clearing.\textsuperscript{131} Many violations against conservation regulations continued in the late 1940s as practically no effective control was in force and this had deep repercussions in the following decades.

The core problems of conservation in the 1950s and 1960s broadly remained the same, but increased in scale and became more intense. Despite the enormous tasks to perform in conservation, the available resources to carry out the jobs across the country remained the same or even declined. The lack of personnel was still one major obstacle. Although there is no data for Besuki, in general there was a wide gap between the available and the required number of personnel to handle conservation matters. Many more personnel were actually needed, but in 1955 there were only about 250 personnel employed on conservation tasks in the whole of Indonesia.\textsuperscript{132} Since 1961 there had been attempts at overcoming personnel deficit including a wildlife course at the Forestry Police School in Salatiga, followed by nature conservation courses in the Forest School, Bogor (1963), and in the Academy of Agriculture in Bogor (1964), the Academy of Architecture and Landscaping in Jakarta (1964), and the College of Biology at Padjajaran University, Bandung (1965).\textsuperscript{133} Despite these efforts, the number of conservation personnel remained in deficit. In 1971 forestry personnel active in conservation numbered only 5 in the high ranks (30 personnel were required), 50 in the middle ranks (250 personnel were required),

\textsuperscript{130}"Serba-Serbi dari Daerah Jember", \textit{Soeara Asia}, 16 December 2603 [1943].
\textsuperscript{131}Until the middle of September, 1944, one third of the targeted area of 300 hectares of sawah lands had been finished. "Oreng Okoman ban Paperrangan", \textit{Warta Besoeki Shua}, 20 September 2604 [1944].
\textsuperscript{132}Nasution, "Recent Development", p. 18.
and 350 in the lower ranks (1,500 personnel were required). More recently, the lack of personnel was still blamed for the failure to stop illegal hunting and timber stealing in the Nusa Barung nature reserve. The situation of the region’s other reserves was not much different, and adding personnel was still seen as an important part of the improvements.

A closely related issue to the lack of personnel was budget. Adding to the number of personnel was always hard due to the limited financial ability of the Indonesian government in the 1950s and 1960s. The budget assigned to conservation matters appears to have been far from sufficient to run regular supervision of the reserves scattered widely across the country. In 1955, Appelman described nature protection in Indonesia as encountering “chronic financial shortage”. Under such circumstances, only a few reserves were well-managed, especially the Gede-Pangrango reserve (West Java). Many others, by contrast, were ill-funded and in many cases were inadequately managed by the authorities. Appelman suggested that the problem of funds might be mitigated by collecting and assigning revenue generated from hunting licenses, firearms fees, export and import taxes on various plant and animal products, and a few other sources, to nature protection rather than using it for other purposes. There was dissatisfaction about the fact that the collection of revenue from reserves was under the control of the Department of Home Affairs and also Police, while the Forest Service (Department of Agriculture and Agrarian Affairs) bore the management tasks and its incurred costs.

Hoogerwerf in the 1950s lamented that the bureaucrats in charge of conservation regulation enforcement often had little knowledge or poor appreciation to the values of

nature conservation, and were inclined to ignore violations.\textsuperscript{141} In 1950s Besuki, for example, a \textit{mantri} administering the Gintingan forest of Jember illegally leased forest plots for agriculture and wood extraction.\textsuperscript{142} A further obstacle was the fact that even inside the Forestry Service there was a battle of interests. A big blow hit the conservationists in 1954, with a withdrawal of about 20,000 hectares from the Purwo-Jati Ikan wildlife reserve and its conversion into a commercial forest producing teak and mahogany. This development seriously debilitated the reserve’s role in preserving large mammals because the excised area was in fact open terrain, which was an essential part of their living habitat.\textsuperscript{143} Full support was not always obtained from other state organs. In the Baluran wild life reserve in the 1960s, violations against the conservation regulations were in fact also committed by the armed forces in the form of hunting and conversion of part of the reserve into a military training centre.\textsuperscript{144}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Plate_8i.jpg}
\caption{Forest Clearing in the Area Withdrawn from the Purwo-Jati Ikan Nature Reserve (Hoogerwerf, 1971: Appendix)}
\end{figure}

But serious obstacles also emerged from society, resulting from the contest over resources, especially between the state agencies and the people, when conservation measures were in force. In Jember, a conservation plan in 1951 for afforestation of 500 hectares of cleared forest lands situated in Silo-Mandiku, which was expected to reduce

\begin{thebibliography}{9}
\bibitem{Hoogerwerf} Hoogerwerf, “Perlindungan Alam”, 1954, pp. 196-197.
\bibitem{Beudels} Around 40 hectares were used for dry agricultural practice and about 100 hectares rented out to 4 Chinese entrepreneurs, and others were illegally felled, see “Banjak Tanah Kehutanan Disewakan?”, \textit{Trompet Masjarakat}, 11 October 1957, p. 1.
\bibitem{Sedhana} Sedhana, “Kondisi Ekologik”, p. 22; in South Banyuwangi, a number of village policemen were reported to have committed illegal loggings, “Pentjurian Kaju Besar-an”, p. 2.
\end{thebibliography}
flood threats in the Mayang and Wirolegi areas, led to a conflict between the Forestry Service and the farmers who had been occupying the area since the Japanese occupation. The Forestry Service was also in conflict with farmers occupying 34 hectares of land in Puger. In Pasanggaran of the Banyuwangi regency, afforestation measures by the Forestry Service were also opposed by farmers of Kesilir village. No further details regarding these cases are available, but it is sure that the contest over resources made reforestation measures hard to carry out without compromises and time-consuming negotiations. Tensions emerged when the Forestry Service demanded the return of 296 hectares of the former Pringgodani forest located in Alasbuluh, which was to be reforested. Only through a series of negotiations could the conflict eventually be settled. The farmers agreed to return the lands in exchange for the Forestry Service’s willingness to cede 50 hectares for their interests.

While conflicts over forest lands in several places were gradually solved, encroachments on the nature and wildlife reserves continued unabated, stimulated by the rising demographic pressures and limited employment opportunities. As partly indicated by recent observations, in Baluran the offences took a variety of forms, such as timber stealing and other forest products collection, livestock grazing, setting of fires, and temporary settlement construction by milkfish fry capturers. The other reserves, too, suffered more or less from the same forms of illegal activities. If more recent observations are any indication, in the Meru Betiri area, cases of timber, bamboo and rattan stealing, sugar palm tapping, and swidden farming by the nearby villagers were also common. In particular, part of the conservation areas next to settlements was reported to have been seriously damaged, and together with estates, the adjacent settlements continued to exert enormous pressure on the reserves.

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146 “34 ha Tanah Dihutankan Kembali”, Trompet Masjarakat, 2 October 1953, p. 2.
148 The agreement was reached at the last meeting held in the police office of Banyuwangi which was attended by 204 farmers and R. Soma, the head of the North Banyuwangi forest district, “Banjuwangi: Penjelesaian Tanah Pringgodani”, Trompet Masjarakat, 4 August 1958, p. 4.
The Indonesian government certainly did not turn a blind eye to the problems. Especially from the late 1960s, the government showed a more serious attitude to nature conservation. At the macro level, more budget was allocated to improve nature protection management, from around US $ 27,000 in 1969 to US $ 250,000 in 1970. In Besuki, this positive attitude was reflected by the decision made in 1968 to transfer the area previously withdrawn from the South Banyuwangi reserve used for commercial forest from Perhutani to the Direktorat PPA. Unlike bringing the area back for conservation functions on paper, doing this in the field seems to have been difficult to realize and consumed more time for enforcement due to several reasons, especially technical details regarding the existing commercial forest and the workers employed for its establishment. But the fact that this agreement was made at all was a landmark, reflecting stronger interest in conservation matters. At around the same time, government-financed afforestation was also carried out. The regent of Jember claimed in 1973 that around 4,100 hectares of degraded areas had been reforested. The Commission IV of the People’s Representative Council (Dewan Perwakilan Rakyat) also indicated the fulfillment of the afforestation target in East Java in 1970/1971, reaching 21,000 hectares.

The appeals and support of the international organizations especially the World Wildlife Fund (WWF) and the UNDP/FAO contributed significantly to the changing attitude of the government towards nature conservation. From 1965 the WWF was already active in Indonesia and granted financial assistance to carry out conservation activities mostly in the Ujungkulon reserve, West Java. In 1968 the WWF also provided financial support to improve the management of the Baluran game reserve. Given the enormous challenges to bring about improvements, in his official visit in 1971, the WWF president directly urged President Soeharto to personally issue a statement expressing his strong concerns with flora and fauna protection to all authorities within the bureaucracy, from the

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152 De Boer, Joncheere, van Beunigen, and van de Velde, *Report on a Study-Tour*, p. 149.
Minister of Agriculture down to bupati (regent).158 In the 1970s a number of conservation projects were undertaken. The Meru Betiri reserve became a WWF project in 1973 designed especially to save the endangered Javan Tiger.159 With a donation of US $22,130 the Meru Betiri conservation project was part of the WWF international programme broadly called “Operation Tiger”, which had also been executed elsewhere in Asia, particularly India.160

8.5 Conclusion

Environmental politics were not something new to post-1970 Indonesia, and Besuki was an important element of the colonial and post-colonial environmental politics. Besuki had the largest, and greatest number of nature and game reserves in Java. The reasons for this were in part its position as frontier region and its later socio-economic development compared with many other areas of Java. But the region’s environmental politics were hardly unique. What happened in Besuki was a reflection of trends and processes taking place in a broader context. As elsewhere in Java, Besuki experienced the broadening environmental protection movement from hydrology- and soil-linked conservation for the sake of agriculture to aesthetic- and scientific-linked conservation, speaking on behalf of nature and future generations. Pollution, however, remained a marginal issue and was regarded more as a matter of economic cost or health, rather than a conservation matter. The legal framework and measures regarding environmental protection set in place in Besuki were greatly credited by the colonial conservationists affiliated with the Netherlands Indies Society for the Protection of Nature and from a long term perspective, nature protection in Besuki clearly suggested strong colonial origins.

In the two periods, the primary problems for nature protection lay mostly in the enforcement, rather than in the legal framework. A significant attempt was made by the colonial authorities to improve the conservation regulations. But the lack of budget and qualified personnel posed serious obstacles in the enforcement of conservation regulations, despite the existence of organizational structure to handle the matters. Moreover, within the colonial government itself, contests over resource use were also present. Independence did

little to solve the problems and the situation even worsened as illustrated by the removal of an extensive part of the Purwo and Jati-Ikan reserve for commercial forest in the early 1950s. Another setback was reflected by the conversion of part of the Baluran game reserve into a military training area, and the involvement of some state officials in violations of conservation regulations. Externally, the conservation regulations and measures also faced a significant challenge. Part of the challenge arose from the longstanding traditional activities linked to forest land and forest resource use, which continued to take place in spite of being banned under the conservation regulations. Another challenge emerged from a group of individuals making a living by crimes, partly through cooperation with the local people. The fact that conservation measures often restricted direct advantages the people traditionally enjoyed, helped to explain the unpopularity of conservation issues among the Indonesians. Unsurprisingly, both the nationalist movement during colonial times and the mass-based political parties in post-colonial times hardly used the issues in their struggle. This reality also explained why the conservation movement in Besuki and elsewhere in colonial and post-colonial Indonesia remained very much a part of the government circles, state-centered, and with stronger international push, rather than having popular support.
CHAPTER IX
CONCLUSION

In the preceding chapters, the interrelations between humans and the environment in Besuki residency from 1870 to 1970 have been elaborated. Many scholars have depicted this period as an age of social change. Although such a depiction contains some truth, it reflects only one part of the complex historical reality and encapsulates only historical processes taking place in the context of human relations both among and within social groups. The structural relationship between humans and their environment remains unrepresented in this depiction. The case of Besuki shows that the same period was also an age of environmental change. Here the human role as an increasingly strong agent of environmental change materialized in different arenas: settlement, agriculture, and forest and marine resource extraction. Although there has been a growing historiographical interest in diverse forms of resource extraction, little has been done to bridge the sectoral divide and to look more systematically at how demographic and socio-economic processes collectively changed the environment and how the people responded to the changing environmental realities.

9.1 The Creation of the Frontiers
The historical development of Besuki reflected basic features characterising a frontier region. One major frontier characteristic is the availability of vast apparently empty areas with abundant untapped resources. Besuki around 1870 was one of the few regions in Java where one could observe vast, sparsely populated and cultivated lands and abundant little-exploited forest and marine resources. However, in Besuki there was no simple frontier succession, of the kind suggested by the American historian Turner. Besuki instead fits more closely to the frontier concepts employed by Timothy Flannery and John Butcher, which focus on the process of extracting relatively under-used natural resources and on the movement of people into new areas with resources to exploit.

The advance of the Besuki frontier from 1870 reflected a combination of three major factors: population growth, market demand, and technological innovation. In demographic terms, the expansion of the frontier was made possible by the inflow of Madurese and Javanese migrants. This feature suggests some similarity of Besuki’s frontier to the Turnerian frontier model, which emphasizes how European migrants entered and
transformed the American "wilderness". The increasing population stimulated the conversion of forests into agricultural lands. The process was facilitated by the growing number of large livestock, especially cattle, which helped farmers in preparing soils and in bringing more lands under cultivation and in reshaping the environment. The requirement of livestock for food appears to have also contributed to the alteration of the environment through the creation of grasslands. The result of all this was the enlargement of the human-made environment. Incoming migrant loggers from outside Besuki facilitated the exploitation of forest timber, adding an extra force which progressively pushed back the natural forest boundaries. In this case the link between population growth and deforestation was straightforward. In marine fisheries, however, the link between population growth and the advance of the fishing frontier was less clear, as it also depended upon another crucial factor, technology. Under less developed fishing technologies, the effect of the growing number of fishers and fishing fleets until the mid-1920s seems to have been increased fishing in the traditional fishing grounds, rather than an expansion of operations to new fishing areas (Chapter VI).

Technological innovation was an indispensable factor in Besuki's frontier development. This innovation took place in a number of sectors. All forms of resource exploitation and people's geographical mobility increased greatly as a result of the gradually improved public transport facilities. Of importance here was the opening up of the railway network linking the major towns of Besuki to the other parts of Java (Chapter III). There were some sector-specific technological innovations too. The most illustrative example was in agriculture. Innovations were seen in almost all aspects of crop cultivation: soil preparation, irrigation, seedling technologies, planting and nursery techniques. The construction of the irrigation network facilitated the intensification of land use because with the better supply of water more frequent plantings became possible and the risk of crop failures from water shortage was minimised. Maize and tobacco, which were introduced from the Americas in the earlier centuries, equipped farmers in their advance towards the uplands where irrigation posed a major challenge. Coffee and rubber played similar roles in the context of mountain estate agriculture (Chapter IV). In other words, diverse crop technologies facilitated the creation of frontiers within the agricultural frontier.

Technological innovations also proceeded other forms of resource exploitation. The rail system became important for timber transport from the 1920s. Roads were already used for timber transport. From the 1950s trucks and the road network grew in popularity and gave access to new forest areas where use of the railway was economically and topographically not feasible. Meanwhile, the adoption of firearms by amateur and professional hunters among both the Europeans and the Indonesians facilitated the intensification of hunting activities. In the marine fishery, significant technological innovation took place with the presence of foreign fishers, the Japanese and Dutch, from around the mid-1920s. The use of motorised vessels and better gear made it possible for them to run operations to new fishing grounds, which had previously been inaccessible to local fishers. The expansion of the frontier of fishing led to the emergence of Besuki as a major centre of marine fisheries in Indonesia and the shift of the region’s major fishing complex from the Madura Strait to the Bali Strait with Muncar in Banyuwangi regency as the centre of the industry.

If technology had facilitated the intensification of resource extraction and extended the frontier of resource exploitation, it was market demand which became the engine generating the process. Demand from the international market had been the major force in the development of estate crops like tobacco, sugar, coffee and rubber, while the cultivation of farm food crops was induced both by subsistence need and by the domestic market in Besuki and elsewhere in Java. The extraction of teak, bamboo, and jungle wood was largely induced by the domestic, rather than the international, market. An exception was in fauna extraction where both domestic and international markets appear to have played significant role. The expanding frontiers of agriculture and settlement created demand for construction timber and firewood, thus accelerating the felling of the region’s forest. A significant demand for timber for sleepers also came from the railway service. The major importance of domestic demand in inducing logging differed strikingly from the post-1970 phenomena concerning the exploitation of the outer island dipterocarp forests, which have been linked largely to the demand for timber from the rich countries. The growing market for fish resulting from the increasingly large population stimulated the increased fishing operations,

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which also sat easily in the emerging political will to reduce Indonesia’s reliance on fish imports from around 1930. The rapidly expanding frontiers of settlement and land-based resource use left deep marks on the physical environment of Besuki.

9.2 Environmental Change

Comparing the discussions of the region’s population in Chapter III and agriculture in Chapter IV with the background of pre-1870 Besuki features in Chapter II illustrates that radical environmental change had taken place in Besuki. Not only was its scale remarkable, but the speed of environmental change was also incomparable. In many parts of Java, radical change in the environmental realities was frequently generated through centuries of demographic and socio-economic growth. In Besuki, by contrast, in only one century a radical change in physical environment strikingly came into reality.

Chapter III confirms the suggestion of Turner and others that pioneer migrants have been a significant factor in the environmental transformation of this frontier region. Before 1870, the region’s major centres of population settlement and agricultural production were the northern coastal districts, while the inland districts of Jember and Banyuwangi, by contrast, were nearly uninhabited and mostly still under forest cover. With the inflow of Madurese and Javanese migrants, the inland districts, especially Jember, gradually emerged as the major settlement centres of Besuki. This position continued to strengthen in the following decades and even until the present. Similarly, before 1870, the northern coastal districts were the major area where more developed agricultural operations was initially found, while the inland districts remained economically less important. But the opening up of the inland districts transformed the inland areas of the residency of Besuki into a leading centre of agricultural production in Indonesia both in the colonial and post-colonial periods. On the environment, the expanding frontiers of agriculture and settlement progressively pushed back the region’s natural forests and brought about the creation of human-made environmental landscapes, which were radically different from the original ones. These features confirmed the suggestion by Reid that in nineteenth and twentieth century

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Southeast Asia, agriculture expansion and population pressure caused a profound environmental change in the form of natural forest loss.\(^5\)

The changing environment of Besuki partly resulted from forest exploitation, which drove farther back the region’s natural forest boundaries (Chapter V). But unlike in the Australian frontier where forest extraction was described by Flannery as wasteful due to the European settlers’ optimism about its infinity, in Java as the case of teak indicated, the Dutch already realized the limit of the island’s forest resources from the eighteenth century and were forced to adopt measures to secure timber supplies.\(^6\) Regardless of these concerns, the extraction also had a considerable impact in Besuki, especially with the adoption of clear felling. In order to secure supplies for the future, the original, diverse forest vegetation was often replaced with more homogenous, human-made production forests. Some places which suffered from illegal felling turned into degraded lands. Notable increase in forest plantations occurred from 1910s onwards and became more significant in the 1950s and 1960s, while extensive deforested lands were added from the 1940s. The shrinkage of natural forest stemming from timber extraction accounted for almost one-fourth of the size of forest converted into agricultural lands from 1870 to the late 1960s. The more dominant role of agriculture in deforestation compared with logging has also been documented by David Henley in North and Central Sulawesi, and appeared to have been common in the tropics before 1970, but differed from North America where logging had been the most important factor since 1860.\(^7\) Similarly, Ann Young suggested that in Australia agriculture has been the most striking element shaping the environmental landscape.\(^8\) It is clear, however, that in Besuki logging was already part of the threat to the natural forest before 1970. The draining of swamps and brackish-water areas as anti-malaria measures, the creation of the brackish water ponds for fish culture, and the construction of railway and road networks also contributed to the alteration of the natural environment in Besuki.

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8 Causing greater problems associated with soil degradation, the development of agriculture provoked wider debates on land use and sustainable strategy issues particularly with the forestry and conservation interest. Ann R.M. Young, *Environmental Change in Australia since 1788* (Melbourne: Oxford University Press, 2000), pp. 63-64, 92-93.
The changes in the physical environment created new environmental conditions favourable for various diseases. The information and arguments in Chapter VII confirm the view of J.R. McNeill on the case of tropical America that environmental transformation opened a new episode in the history of disease. Unlike in tropical America, where African and European diseases were described by McNeill as helping the Spanish settlers to build an empire, in Bessuku diseases presented a serious problem that hampered frontier expansion. The creation of irrigated fields (sawah) and brackish-water ponds expanded the breeding grounds for malaria vectors, Anopheles sundaicus and A. aconitus, and appears to have increased the threat of “man-made malaria” to the region’s inhabitants. Although there were other major diseases, including water-born gastrointestinal diseases, malaria was the scourge of the Bessuku region. In addition to the disease environment, another serious problem arising from the changing environment, especially for agriculturalists, was the rising threat of noxious wild animals, including wild boar and tiger, which greatly benefited from the creation of human-made habitats. The link between the creation of human-made habitats and greater nuisance by wild boar was also parallel with one of the Han Knapen’s findings in Southeast Borneo. Together with control measures to fight environment-linked diseases, the attempt to contain the problem of noxious wild animals has been an integral part of the story of frontier expansion in the Bessuku region.

9.3 The Closing of the Frontiers

The closure of the Bessuku frontiers did not occur uniformly. Despite the rapidly growing population, there was still space available for the extension of settlement in the Bessuku region through land use conversion from forest and agricultural lands. The conversion of forest into settlement was still observed in the 1960s, but after 1970 the major trend was a conversion of agricultural lands into settlements. The case of the agricultural frontier was different. After decades of accelerated expansion, the movement into new agricultural areas in Bessuku had practically come to an end in the 1950s. The closing of the agricultural frontier came much later than around 1920, which was the suggestion of Anne Booth for Java as a whole. The closing of the agricultural frontier was evident from the absence of

any notable increase in cultivated lands, the rising number of outgoing migrant farmers to outer islands of Indonesia from the 1950s, and the escalating incidents of conflict over land. Although there was still a possibility of extending agricultural operations to new areas, the higher socio-economic and environmental costs, including legal restrictions imposed for the sake of nature conservation, provided people with little incentive to pursue such an endeavour.

Unlike agriculture, forests contain renewable resources, which give the possibility of continuing extractions if the extraction process is well managed. But under commercial extraction, natural rejuvenation of resources could hardly keep up with demand and local depletion was inevitable. Separate findings by Knapen on Southeast Borneo’s ironwood and by Henley on North and Central Sulawesi’s ebony and sandalwood were examples of this process. In Besuki a similar process was seen in the cases of teak, sadeng palm, and bamboo. In the northern districts of Besuki the supply of slowly-growing teak already dwindled before 1870, while in Jember the sadeng palm began to grow scarce around 1890 and bamboo around 1900 despite its fast regenerative power. The frontier of forest extraction was actually still open, but it could not quickly be extended due to poor transport and lack of loggers. Only with the gradually improved transport facilities and the incoming migrant loggers from outside did movement to new forest areas become possible before virtually ending in the 1960s. In Banyuwangi where the last forest bamboo stands remained, sustainable extraction was no longer possible in this decade. Meanwhile, the frontier of hunting was already closed earlier, around the 1930s. The forest of Banyuwangi was said in 1941 to be no longer a golden place for hunting and experienced a serious decline in game populations.

Fisheries shared similarities with the forest in terms of renewal ability. But unlike most land-based resources, fish resources are mobile. This characteristic makes it hard to accurately determine the exact fish stocks and the effects of fishing operations. However, it might be said that until 1970 the region’s frontier of fishing was still open. The case of Besuki does not corroborate the suggestions of Pudjo Semedi and Masyhuri that there had been a problem of overfishing in Java before 1900. In Banyuwangi small-scale

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technological innovation in the 1960s still brought a substantial increase in catches. Further expansion taking place from mid-1970 confirmed that until the end of the period covered in this thesis, the closure of the fishing frontier had not yet come. The distinct frontier of fishing compared with land-based resources partly reflected its later development in terms of large-scale commercial exploitation. In agriculture and forestry, the large-scale commercial exploitations had already begun in pre-1870 Besuki and accelerated from 1870. In fisheries, by contrast, such operations began only around the mid-1920s with the arrival of foreign fishers in the region’s waters. Another reason for the distinctiveness of the fishing frontier was a combination of factors: shorter commercial exploitation by foreign parties, a small proportion of the population engaging in marine extraction, and limited extraction capacity resulting from less efficient fishing technologies, and apparently faster fish stock rejuvenation in comparison with forest timber.

9.4 Responses to the Changing Environment

Apart from changing the environment, the demographic and socio-economic processes exerted higher pressure on usable natural resources. In areas where the resource frontier could no longer be extended, people were forced to develop strategies to deal with the new realities. The fact that the timing of responses was by no means uniform across the residency reflected local variations, in terms of population size, resource stocks, and resource use intensity.

Agriculture provided an illustrative example of how land shortage led to the land use intensification through more frequent planting. On irrigated lands this response was reflected by the growing adoption of maize and cassava as secondary crops. The process resulted in an increase in the sawah cropping ratio in the region. In areas where land use intensification offered little hope, some people saw migration to new areas as an option, as illustrated in the Wringin upland of Bondowoso (Chapter III). The populating of new areas in Banyuwangi was partly generated by the flow of local migrants from the more densely populated northern districts of Besuki. But when the possibility of moving to new agricultural lands came to an end around the 1950s, a growing number of people migrated to the urban areas of East Java, particularly Surabaya, and to outer islands of Indonesia.

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where there were still uncultivated lands to exploit. The emerging trend of out-migration partly reflected the limited non-agricultural employment opportunities in the region. With the evidence presently available, however, it is hard to establish whether demographic adaptations, such as birth control, marriage postponement or smaller family size orientation, were already an important part of the responses to agricultural land shortage.

In forestry too, resource depletion in accessible areas led to the creation of forest plantations both by forest conversion and by replanting the same plots of lands that had been extracted. In Besuki this kind of response was illustrated in the case of teak, sadeng palm and bamboo. The planting of teak had been adopted before 1870 and continued during the period under consideration. Forest plantations grew in importance with the planting of sadeng palm from the 1900s and bamboo from the 1910s, and other tree species from the 1930s. From the 1950s, bamboo and teak plantings grew considerably, and were followed and or replaced by other tree species in the 1960s. This development brought a new character to the nature of forest exploitation by transforming it from pure extraction into a form of agriculture (agro forestry). This shift meant that harvest depended on what species was planted, rather than on what nature provided.

Only in the marine resource sector, was no response to resource depletion noticeable until 1970. Although there were technological innovations, they more likely constituted measures to increase fishers’ low incomes stemming from their limited technological capacity to run an effective extraction, rather than reflecting a reality of resource depletion. Butcher argued that the conversion of extensive mangrove forests into brackish water ponds for shrimp culture from around the 1970s was a response to depletion of marine shrimp populations from overfishing. But the growing size of brackish water ponds cultivated with milkfish before 1970 was unlikely to have been an indication of a resource depletion stemming from the same cause. The practice was an old phenomenon, already present in the pre-colonial era when one could hardly imagine a problem of overfishing. The pre-1970 expansion of brackish water ponds more likely constituted a response to market opportunity for milkfish and to natural catch fluctuation in marine capture fishing, rather than a response to catch decline from overfishing.

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9.5 Nature Protection

Another major factor accelerating the closure of the frontiers in Besuki was the establishment of conservation areas. This measure represented a radically different way of responding to the new environmental realities compared with the above responses. Rather than searching for opportunities to expand resource exploitation to new areas or to intensify the use of the existing resources to achieve sustainable yields, nature conservation advocated the restriction or stoppage of exploitation. Such a measure was seen as necessary to prevent damage and irreparable losses being inflicted by the demographic and socio-economic processes on the natural environment. Chapter VI challenges popular imagination that in Indonesia environmental problems all have recent origins. It provided local evidence that deforestation, with its complex causes from fires, illegal felling, to agricultural practices, and also its related consequences including erosion, floods, water shortage, and biodiversity loss, has been a long term process.

Concerns with environmental problems were not something new in contemporary Indonesia. Chapter VIII confirmed the suggestion by Boomgaard and S. Robert Aiken that in Southeast Asia nature conservation had predominantly colonial origins.17 In Besuki almost all conservation areas were established during the Dutch colonial period. Having strong colonial origins, the conservation areas in the region reflected the broadening of the conservation movement from narrow, hydrological interests for the sake of agriculture to the idea of protecting nature for aesthetic, scientific and moral values for future generations, and also a shift from the protection of small, scenic sites to the idea of protecting larger ecosystems. The shift not only imposed immense management tasks, but also drew conservation interests into a contest over resource use, not only against the longstanding practices by the rural people of using natural resources but also against outsiders who were more interested in reaping immediate benefits from nature. The case of Besuki is in support of the argument by Cribb and Boomgaard, that the impetus to

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conservation in colonial Indonesia was most strongly felt in government circles, rather than being part of a mass-based movement.18

The fact that the advance of the Besuki frontiers occurred not long before the emergence of the conservation movement gave the region an opportunity to avoid becoming one of the frontier societies, which destroyed "their all-important environmental base".19 The conservation movement and the establishment of conservation areas prevented the closure of Besuki's frontiers from happening simply because all natural resources had gone. It must be acknowledged, however, that part of the nature could no longer escape from damage or extinction, as seen in the case of the Javan tiger and crocodile, because the concern with their protection came too late. Another problem was the fact that effective protection to the conservation areas was also hard to implement because of a lack of funds and personnel, and unresolved contest over resource among different parties, which continued to be a serious problem until the late 1960s. Despite these facts, post-1970 Besuki still inherited remnants of nature, which is worthy of struggle for its protection and too valuable to let it disappear permanently from the region's environment.

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GLOSSARY

*Acacia nilotica* an exotic plant species used as a part of the fire resistant belts
*adat* custom, customary law
*agel* fibres made from *Corypha* palm
*ajak* wild dog, *Cuon alpinus*
*alang-alang* hardy grass, *Imperata cylindrica*
*ancar* one of the poison-producing trees/the upas, *Antaros toxicaria*
*ANRI* *Arsip Nasional Republik Indonesia*, Jakarta
*aren* sugar palm *Arenga sp.*
*babad* traditional literature containing origins of kingdom, places, or figures
*bagan* lift-net
*bandeng* milkfish, *Chanos chanos*
*bandol* broker
*belantik* fish trade brokers
*bendo* *Artocarpus elastica*
*berglandcultures* mountain land cultivations
*beroepsjagers* professional hunters
*blandongstelsel* a system of timber extraction by employing forced labour
*bouw/bau* A measurement unit, 1 *bouw* = 0.71 hectare
*dendeng* jerky
*dokter Jawa* western-educated indigenous medical specialist
*erfpacht* long-term land lease from the colonial government up to 75 years
*gadung* *Dioscorea hispida*, a tuber-producing plant used as a buffer food when staple foods are in short supply
*gangangan* *Tetrameles nudiflora*
*gropyokan* mechanical method of eradicating rats
*ingas* *Gluta renghas* (rengas)
*jukung* outrigger canoe
*juragan darat* fishing boat and gear owners
juragan laut    skilled fishing leaders
kethoprak    a Javanese traditional drama performance with stories from
history or folktales
kratok    *Phaseolus lunatis* (butter pea)
kunstmatige verjonging    artificial regeneration applied in afforestation
ladang    shifting cultivation
landak    a type of weeding implement
larikan    checkrow planting applied in rice cultivation
layang    scads, *Decapterus kurra*
Lebaran    Islamic festivity after the fasting month of *ramadhan*
lemuru    *Clupea longiceps*, Bali Sardinella
luxe jagers    amateur hunters
manol    fish-transporting coolies
mantri    foreman, in this thesis specifically a forest guard having
territorial and some management responsibility
mayangan (kolek)    large size boat used in offshore fishing
NA    *Nationaal Archief*, The Hague
nagari    kingdom
natuurlijke verjonging    natural regeneration applied in afforestation
non-mayangan    various types of boats used in inshore fishing
nyamplung    *Callophyllum inophyllum* (Alexandra laurel)
Oosthoek    eastern salient of Java
opkooper    wholesaler
Oising    indigenous population of Blambangan
paceklik    a period when staple food was in short supply
padi dalem    Long-ripening rice varieties
padi genja    quick-ripening rice varieties
palawija    non-rice food crops
pandhega    unskilled fishing crew
Pax Neerlandica    relatively stable political conditions created under the Dutch
rule
payang    a large sack-like net with two long wings used to catch
<table>
<thead>
<tr>
<th>term</th>
<th>definition</th>
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<tbody>
<tr>
<td>pelagic</td>
<td>fish living and feeding in the open sea, associated with the surface or middle depth of a body of water. Usually used in contrast to demersal</td>
</tr>
<tr>
<td>pengambil</td>
<td>big money lenders in fishing operations</td>
</tr>
<tr>
<td>picol/picul</td>
<td>a measurement unit, 1 picol = 61.7 kilograms</td>
</tr>
<tr>
<td>rayoneering stelsel</td>
<td>a system regulating western planters an exclusive right in certain areas for tobacco cultivation</td>
</tr>
<tr>
<td>rojo koyo</td>
<td>large livestock</td>
</tr>
<tr>
<td>ronggo</td>
<td>regent, administrative head of a regency</td>
</tr>
<tr>
<td>rumpon</td>
<td>a floating fish lure consisting of a long rope with sinkers along one edge and floats on the other to support it upright in the water. Along the rope were bound coconut leaves, as hiding places to attract fish.</td>
</tr>
<tr>
<td>sabe mamandung/yoso</td>
<td>lands obtained by opening up forest</td>
</tr>
<tr>
<td>sadeng</td>
<td><em>Livistona rotundifolia</em>, footstool palm.</td>
</tr>
<tr>
<td>sawah</td>
<td>irrigated field</td>
</tr>
<tr>
<td>soga</td>
<td><em>Peltoporum pterocarpum</em>, a tannin-producing plant</td>
</tr>
<tr>
<td>stervend land</td>
<td>dying land</td>
</tr>
<tr>
<td>tambak</td>
<td>brackish-water pond fish cultivation</td>
</tr>
<tr>
<td>tanah tingalan/sangkolan</td>
<td>lands inherited from ancestors</td>
</tr>
<tr>
<td>tegalan</td>
<td>dry field</td>
</tr>
<tr>
<td>tumpangsari</td>
<td>a reforestation system under which farmers are allowed to plant food crops between the rows of primary tree species for one or two years</td>
</tr>
<tr>
<td>wayang kulit</td>
<td>a Javanese shadow puppet</td>
</tr>
<tr>
<td>wayang wong</td>
<td>a Javanese traditional drama with story from the Indian literature, Mahabharata or Ramayana</td>
</tr>
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