

PEOPLE AND THEIR PLANET Searching for Balance

Edited by Barbara Sundberg Baudot and William R. Moomaw



People and their Planet

Searching for Balance

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First published in Great Britain 1999 by MACMILLAN PRESS LFD

Houndmills, Basingstoke, Hampshire RG21 6XS and London Companies and representatives throughout the world

First published in the United States of America 1999 by

A catalogue record for this book is available from the British Library.

ISBN 0-333-68811-2

ST. MARTIN'S PRESS, INC.,

Scholarly and Reference Division, 175 Fifth Avenue, New York, N.Y. 10010

ISBN 0-312-21715-3

Library of Congress Cataloging-in-Publication Data People and their planet : searching for balance / edited by Barbara Sundberg Baudot and William R, Moomaw : foreword by Nafis Sadik. p. cm. Includes hibliographical references and index. ISBN 0-312-21715-3 (cloth) I. Population-Environmental aspects. 2. Environmental policy. A. Population-Environmental aspects. 2. Environmental policy. A. Population-geography. 4. Human geography. 1. Baudot. Barbara Sundberg. II, Moomaw, William, 1938-HB849:415.P44 1998 304.2--DC21 98-23533 CIP

Selection and editorial matter © Barbara Sundberg Baudot and William R. Moomaw 1999 Foreword © Nafis Sadik 1999

Chapter 1 © Barbara Sundberg Baudot 1999

Chapter 4 @ William R. Moomaw and D. Mark Tullis 1999

Chapter 13 © Kluwer Law International 1997, 1999*

Chapters 2, 3, 5-12, 14-18 @ Macmillan Press Ltd 1999

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10 9 8 7 6 5 4 3 2 1 08 07 06 05 04 03 02 01 00 99

Printed and bound in Great Britain by Antony Rowe Ltd, Chippenham, Wiltshite

*First published as "Water Conflicts along the U.S.-Mexico Border: Towards a Transboundary Water Market?" in *The Searcity of Water: International, European and National Legal Aspects*, eds E.J. de Ham and E. Brans (Kluwer, 1997).

Contents

List of Tables	X
List of Figures	xi
Acknowledgements	xii
Notes on the Contributors	xiii
Foreword by Nafis Sadik	xv
Overview The Population-Environment Equation: Implications for Future Security by Barbara Sundberg Baudot	xix
1 Introduction: Dimensions of the Population-Environment Equation Barbara Sundberg Baudor	ł
Part 1 Factors in the Equation	
2 Population and Environment Relationships in Developing Countries: Recent Approaches and Methods Catherine M. Marquette and Richard E. Bilsborrow	29
3 Population, Environment and Sustainable Development: Global Issues Jeffrey N. Jordan	45
4 Population. Affluence or Technology? An Empirical Look at National Carbon Dioxide Production William R. Moomaw and D. Mark Tullis	58
5 A Multivariate Analysis of Farm Household Land-Use and Forest-Clearing Decisions in the Amazon Region of Ecuador Francisco J. Pichón	7,1

vii

viti	Contents	
8+11.		
6	Population-Environment Dynamics in Lahat:	
	A Case-Study of Deforestation in a Regency of	
	Joural Heydr	91
	Filtrance and Anna	
7	Water, Food and Population	
	Sandra L. Postel	108
8	Population as a Scale Factor: Impacts on	
.0	Environment and Development	
	Robert Engelman	126
Par	t 11 The Equation Out-of-Balance	
9	Population Dynamics Revisited: Lessons for	
	Foreign Aid and US Immigration Policy	1. 170
	Virginia Deane Abernethy	143
ŤĎ.	Population and Urbanization in the Twenty-First	
	Century: India's Megacities	
	Saj Felicia Krishna-Hensel	157
14	Mexico City: Current Demographic and	
	Environmental Trends	
	Haydea Izazola and Catherine M. Marquette	174
17	The Environmental Impacts of Refugee Settlement:	
+4	A Case Study of an Agricultural Camp in Zambia	
	Veronique Lassailly-Jacob	187
12	The Struggle over Transboundary Freshwater	
31.32	Resources: Social and Economic Conflict in the	
	Appropriation and Use of Water along the	
	US-Mexico Border	204
	Roberto A. Sánchez-Rodriguez	204
Pa	rt III Searching for Balance	
14	Factors Leading to Population Growth in	
	Bangladesh and their Impacts on the Environment	105
	Nasim Firdaus	2.2.7

Page 91

Population-Environment Dynamics in Lahat: A Case-Study of Deforestation in a Regency of South Sumatera Province, Indonesia¹

Laurel Heydir

The World Bank estimates that Indonesia loses about 900.000 hectares (ha) (0.63 per cent) of its tropical forests each year², and according to World Resources Institute calculations, if the entire area burned by the catastrophic mid-1980s fire on Kalimantan Island is included, the annual deforestation rate reached 1.3 million ha.³ The country ranks third globally in terms of total annual forest loss.⁴ The principal forces behind tropical deforestation are thought to be agricultural expansion and unsustainable commercial logging, activities that are usually traceable to increasing population and the failure of government policies.⁵ In addition, West, Brechin and others identify common problems that affect parks and other protected areas throughout the world, including industrial pollution, excessive tourism, shrinking or non-existent conservation budgets, land fragmentation, economic development pressures and growing rural populations, as well as the technologies and cultural practices that are employed in forest use.⁶

In Indonesia, cultivation by rural farmers is a substantial cause of deforestation. Repetto and Gillis calculate that about 50 per cent of the country's deforestation is caused by slash-and-burn farming, 40 per cent is due to the government's resettlement programmes, and the remaining 10 per cent is caused by commercial logging;⁷ while the World Bank estimates that 56 per cent of Indonesia's deforestation is caused by smallholder conversion, 28 per cent by development projects, and the remainder by logging and fire loss.⁸ These figures suggest that learning about rural farmers' behaviour is essential to understanding Indonesia's deforestation (see Table 6.1).

Page 92

Table 6.1: Sources of Indonesia's deforestation

Source	Best estimate (ha)	Range (ha)
Logging and fire loss	180,000	150,000–250,000
Development projects	250,000	200,000–300,000
Smallholder conversion	500,000	350,000–650,000
Total	930,000	700,000–1,200,000

Source: World Bank, "Indonesia: Forest, Land, and Water" [Issues in Sustainable Development], 1989: xvii.

A number of international projects in Indonesia have investigated population growth and migration trends, but unfortunately these projects have not generally extended to a study of the effects of population changes on deforestation in specific forest sites. Even in a global context, only a few empirical studies have been conducted on the relationship between people and protected areas, and on the dynamics of farmer encroachment. In order to rectify this problem, this field study was conducted in Lahat regency, a highland regency located in the extreme western part of South Sumatera Province (see Figure 6.1), a rich agricultural region and a major centre for coffee production. The site was chosen because records from the Lahat Office of Forestry indicate that, compared to other regencies within the province, Lahat has the highest rate of deforestation and the largest number of forest farmers, and because Lahat receives considerable government attention due to a proposed relocation project for forest farmers in the regency.

This study starts with the question: 'how and why do small-scale coffee farmers deforest large portions of established protected forests within Lahat?' The study is not intended to examine a particular model of populationenvironment relationships, nor to defend a particular grand theory. It follows the tradition of grounded research aimed at allowing theory to emerge from the subject under observation. Primary data for the study includes direct observations and in-depth structured interviews with farmers and key informants, including government officials (local administrators and forestry officers) in provincial, regency and sub-district levels, and (informal) community leaders. Secondary data were obtained from government agencies, the association of South Sumatran coffee exporters, and from satellite images of Lahat's forests which helped clarify the field observations.

Page 93



Source: Modified from Brechin *et al.,* in Ness, Drake and Brechin (editors), *Population Environment Dynamics: Ideas and Observations* (Ann Arbor, MI: University of Michigan Press, 1993) p. 228.

According to the latest version of the national forest classification system, the *Tata Guna Hutan Kesepakatan* (TGHK),⁹ Indonesia's forests cover nearly 144 million ha or 71 per cent of the country's total land area. However, not all of this area is, in fact, still forested. According to some estimates, as much as 31 per cent of the land within the designated boundaries is no longer forested. The Forestry Department estimates that about one million families practice shifting cultivation on 7.3 million ha of the country's forest lands.¹⁰

The Lahat regency administers an area of 701,238 ha, of which about 41 per cent or 290,600 ha, are designated as TGHK forest that is technically under forest management.¹¹ Based on the TGHK classification, 79 per cent (229,100 ha) of Lahat's forest is designated as permanent forest, and the remaining 21 per cent is set aside as production forest; none of the forest can be converted for agricultural uses (see Table 6.2). Given that arable land within village areas is scarce, the implementation of this forestry policy contributes to land pressure. This is especially true within Lahat regency where farmers make up 73 per cent of the population.¹²

Page 94

Table 6.2: TGHK-classification of forest lands in Southern Sumatera and Lahat Regency

	Southern Sumatera		Lahat Regency		
Forest classification	Area (ha)	% of	Area (ha)	% of	
		total		total	
Conservation forests	871,550	17	79,500	27	
Protection forests	774,602	15	149,600	52	
Limited production	333 000	6	21 750	8	
forests	555,666	Ũ	21,700	Ŭ	
Regular production forests	2,124,000	41	39,750	14	
Conversion forests	1,111,500	21	1	0	
Total	5,214,652	100	290,600	101*	

* Does not add to 100 because of rounding.

Source: Bappeda Lahat (1989) p. 132 and *Surat Keputusan Menteri Kehutanan No. 401/Kpts-II/ 1986.*

Field observations reveal several environmental consequences of deforestation. Deforestation of mountain slopes has exposed soil to erosion from run-off during the rainy season, leading to landslides and floods after heavy rains that have occasionally killed villagers. Erosion clogs the natural waterways and rapidly silts up the Musi River, which adversely affects both commercial water traffic and fisheries. In addition, as more water is lost to rapid run-off, river flows become more irregular. Thus, the village farmers at the foot of the mountains now face flooding during the rainy season and water shortages during the dry season, problems that were previously unknown. Irregular water flow also disrupts the traditional irrigation systems used for rice cultivation.¹³

Page 95

THE IMPACTS OF FOREST MANAGEMENT POLICIES

The people of South Sumatera live in communes, called *margas*, which have been the basic native political unit for centuries. A *marga* occupies a certain area of land, known as its *adat* (traditional) territory, and forests that stand within the *marga* boundary are part of its domain. These *rimba marga* (*marga*-forests) are used as a community resource for activities such as collecting honey and gathering firewood, and they are physically protected by *marga* members from use by non-*marga* members. *Adat* rules facilitate forest preservation by, for example, banning cultivation on lands around

springs *(ulu ayek* or *ulu tulung)* and on areas within 100 metres of a stream bed. These rules are traditionally accepted as regulations from the ancestors.

The Dutch colonial administration in South Sumatera originally affirmed the traditional autonomous power of *margas* over their *adat* lands, but then it began to systematically take control of these native lands and forests. In 1874, the Dutch declared a *Domein-Verklaring* to claim all non-certified¹⁴ land as state lands, and in 1916 they issued the *Bosch Ordonantie*, or forest regulation, granting the government authority to establish *bosch reserves* (reserved forests). In order to directly supervise forest lands in South Sumatera, the Dutch established the *Bosch Wezen*, or forestry office (known popularly by its abbreviation BW) in the capital city of Palembang. The BW officers registered all existing forests within the region, including the *marga*forests, and posted BW signs along their boundaries. Three-metre zones surrounding these forest boundaries were periodically weeded to allow easy recognition of the protected areas. Armed BW escorts closely guarded the forests against violation, and patrolled the forest area borders every two months.

Marga rulers served as subordinates to the Dutch administrators in their efforts to preserve BW forests. Their routine activities included volunteering marga members to work under the supervision of BW officers to perform duties such as weeding the forest boundary. Marga rulers were also responsible for informing the Dutch administrators about any illegal occupation within the BW forests; any pasirah (marga leader) who did not carry out this duty could be punished, and a *pasirah* involved in any illegal activities within the BW forest would be dismissed from his position. Given these strict conditions, the former pasirahs that were interviewed are convinced that deforestation did not begin during the era of the Dutch administration.¹⁵ Instead, the former *pasirahs* argue that significant deforestation began only in 1942, when the Japanese military occupied South Sumatera during World War 11. Due to the need for supplies to support their war efforts, the Japanese military forced the rural peasants to cultivate forest lands, and marga rulers were unable to fend off the stream of forest cultivators who then entered these lands.

Page 96

The forest lands 'borrowed' for this extra agricultural activity during the Japanese military occupation were less than 1 per cent of the total forest area at that time, but the impact was substantial. Rural farmers learned to look to

forest lands as alternate farming parcels, and the influx of farmers into the forest areas has never since been successfully banned. This was the situation inherited by the Republic of Indonesia at independence in 1945. The Indonesian government initially continued the *marga* system and adopted the former Dutch government's BW forestry policy and regulations. At the beginning of the independence era, forest preservation efforts served as an expression of *marga* rulers' efforts to re-establish their traditional authority. This work did not completely restore the deforested areas, but to some extent it helped to minimize the growth of cultivated areas, especially by preventing their use by non-*marga* members who were in-migrating to South Sumatera from other parts of the country.

The Republic of Indonesia has been strongly inclined to centralize its national power, and regional autonomy has gradually decreased culminating with an executive order that abolished margas and established desas (the villages system) in their place. Several administrative problems were created by the replacement of *margas* with *desas*. For example, *desas* were established from *dusuns*, which were sub-units of the *margas* that did not have fixed borders, so the territorial boundaries of the *desas* were uncertain. In addition, administrative problems arose due to the 'power-gap' that occurred when the new *desa* rulers could not fully take over the previous duties of the marga rulers, particularly with respect to forest preservation, due to their lack of experience in self-governance. As a result, the new desa rulers found it difficult to carry out their administrative duties, and the situation worsened as the villagers became aware of the weaknesses of *desa* leadership. The weak performance of the new *desa* rulers was consistent with the expectations of rural South Sumatrans, because marga leadership had been based on charisma, while *desa* leaders were appointed administratively.

Page 97

At the same time that the *desas* were established in South Sumatera, the new TGHK national forestry policy was imposed, replacing the old BW forest classification system with one that evaluated and reclassified national protected forest areas based on their purpose. As a result, within the Lahat regency the forest area expanded from 165.905 ha of BW forest to 290.600 ha of TGHK forest, a 75 per cent increase. The new, expanded TGHK-forest areas included some farming areas that were previously outside of the old BW-forest areas. The immediate consequence of this expansion was an

increased number of illegal farmers and an extension of illegal farming areas. This situation created additional work for government officers, who were responsible for preventing potential forest cultivators from entering a larger protected forest area, and for evicting farmers who were already settled on the lands within the new TGHK-forest boundaries.

In practice, this ambitious forest expansion effort has not been supported with adequate means to properly implement it, primarily because of tight forestry budgets. For example, the government had no funding to install new forest border signs, so the TGHK forests are visually indistinguishable from the surrounding unprotected areas. Even where the new TGHK-forest border signs have been posted, Lahat regency officials still face uncertainty in interpreting the fixed TGHK-forest boundaries. This situation reflects the lack of coordination in preserving the regency's forest areas between forestry officers, who place the signs, and Lahat regency officials, who administer the regency.

The government is also constrained by limits on the number of forestry personnel. Every forester must supervise three sub-districts. They are unarmed (except for a few special forest police), have no vehicles, and generally lack facilities to properly conduct their risky jobs.¹⁶ Under these circumstances corruption flourishes, undermining the government's ability even to preserve the area of the former BW forests. Local government officers reportedly protect forest cultivators from being identified as illegal farmers, change forest boundary markers, and even issue fake documents of land ownership.¹⁷ In this corrupt environment, even honest officers face internal obstacles and are powerless to change the situation. Moreover, many forestry officers and local government administrators are often indifferent about properly performing their jobs.¹⁸

Several military operations have been conducted in an effort to force illegal farmers to move outside the forest boundaries, but the government cannot afford to carry out such operations on a regular basis. Therefore, these occasional eviction forces only frighten cultivators temporarily, and illegal forest farming is gradually resumed once the patrols return to their normally insufficient levels.¹⁹ In addition, relocating forest farmers to non-protected areas has also been a difficult task for the government, since sufficiently large relocation areas are rarely available.

Page 98

DEMOGRAPHIC CHANGE IN THE REGION

As of 1990, Indonesia's population was 180.5 million.²⁰ The population of Lahat regency is nearly 600.000, having grown by 93 per cent in the last 30 years.²¹ Since the rate of natural growth is about 2.4 per cent per year, this high population increase indicates in-migration. Indeed, South Sumatera province has been a major destination site for the central government's resettlement programme. Romsan estimates that between 1934 and 1988, 741.425 individuals were relocated from densely populated areas (mostly from Java and Bali islands) to South Sumatera, and between 1980 and 1987, 296.775 trans-migrants were relocated within South Sumatera, of whom 11 per cent (31.928 individuals) were resettled in Lahat regency²² These inmigrants make up about 5.3 per cent of the total Lahat population.²³ Unfortunately, statistics are not available for migrants who in-migrated on their own.

There is a widely-held view that trans-migrants from ill-fated transmigration projects are largely responsible for the loss of forest through slash-and-burn agricultural practices.²⁴ However, based on information from *Lahatan* officials, it appears that the forest cultivators in the regency's protected areas are not from failed transmigration projects, and field observations also demonstrate that no *Balinese* and only a small number of *Javanese* are found within the study area. Moreover, the *Javanese* involved in forest farming within the observation area were hired by local farmers, either as labourers or via share-cropping arrangements.

SOCIOCULTURAL FACTORS CONTRIBUTING TO DEFORESTATION

Traditionally, the population of Lahat is comprised of four main ethnic groups: *Lematang* (or *Gumai*), *Kikim, Pasemah* and *Lintang* peoples. These ethnic groups speak similar languages and share the same mythology.²⁵ The forest cultivators in the area have more diverse origins; they include *Semendo* people from the adjacent regency of *Kabupaten* Muara Enim, *Manna* people from southern Bengkulu province adjacent to South Sumatera, and people from Java island (see Table 6.3).

Page 99

Tanjung Saktian people, a subgroup of the *Pasemah* ethnic group, are the dominant ethnic group among the forest cultivators. They are well known among *Lahatans* as hard-working farmers and people who share the dream of

pukul agung (having a massive harvest), a dream that is probably derived from the concept of *jadi orang* (to become somebody), which can mean owning a good house, a *toko* (grocery store) at the *pasar* (market area), or a mini-truck or commuter taxi, as well as sending children to school (and perhaps to college in town, or even in Java), and, ultimately, going on a pilgrimage to Mecca to gain the religious title of *haji* (hajj). In comparison to the simple lifestyle of rural *Lahatan* farmers in the past, these 'materialistic desires' of the younger generation of *Lahatans* indicate the tremendous sociocultural changes that have occurred as the country has modernized.

Table 6.3: Forest cultivators within the area observed (by ethnic group)

Sub- district	Area of de- forestation (ha)	Number of households	Number of individuals	Origin	%
Pulau Pinang	257	185	744	Tanjung Sakti Pagar Alam Jarai Java Locals/others	50 15 10 5 20
Pagar Alam	560	273	1142	Manna Semendo	90 10
Jarai	722	518	1782	Tanjung Sakti Java	90 10
Kota Agung	295	191	1034	Semendo Pagar Alam Java Locals/others	40 20 10 30
Total	1834	1167	4720		

Source: Field-notes, 1991.

Page 100

In order to afford these materialistic desires and to fulfil the goal of being 'somebody', farmers plant coffee. After marriage they take their families to live in the forest, where they are isolated for years in hopes of achieving the dream of having a large coffee harvest. When they have enough money they return to their own village to build a house - a primary indicator of one's prestige. This is also the time when they begin to send their children to school within the village.

Semendo farmers have been leaving their traditional home in Muara Enim regency because of the scarcity of available farm land there, caused not only by land and population pressures, but also by the traditional *tunggu tubang* inheritance system, whereby the oldest daughter in a family remains in the village and maintains her family's properties after inheriting them from her parents, a transfer that begins on her wedding day. Once this transfer begins, all other family members still living in the household are essentially 'interlopers', and are expected to leave the house and find other resources. Many young *Semendo* couples are therefore forced to search for new lands outside their village, sub-district or regency, and often even outside of the province of South Sumatera. What land they do find is usually forest land, since this is the only unused land remaining.

The *Javanese* people found in the region include those who have been hired as farm labourers by *Lahatan* tenant farmers, as well as self-motivated and self-described 'adventurers' who finance their own migration to Lahat with the hope of repeating the 'success stories' of other *Lahatan-Javanese* coffee farmers. However, the *Javanese* are known for avoiding risky jobs, and since the government identifies forest cultivators as 'illegal' farmers, many *Javanese* shift to off-farm work in grocery stores or operating jeeps to transport agricultural products (but they may also earn more money from these new businesses than from farming). The only *Javanese* found workings on farms within the observation area were therefore labourers or share-croppers hired by or working on behalf of the *Lahatan* tenant farmers.

All of the forest farmers interviewed are likely to derive some sense of security from the fact that they usually begin their farming activities by asking for permission from any villagers who claim responsibility for the plots chosen. This is especially true for the *Javanese, Manna* and *Semendo* farmers. Sometimes permission comes from village or sub-district officers (always involving some kind of small compensation). To the extent that these forest farmers do have some guilty feeling about cultivating forest lands, they are not based on an awareness of environmental problems, but simply on the government prohibition of forest cultivation. Concepts like ecological equilibrium and environmental preservation are still beyond the understanding of these farmers; surviving and maintaining a livelihood are much more concrete and immediate concerns for them.

Page 101

THE EFFECTS OF COFFEE PRODUCTION

The practice of monoculture production of coffee, a lucrative cash crop, by *Lahatan* farmers indicates the strong market incentives operating within the regency. The regency is the source of nearly 60 per cent of production in South Sumatera, which is the country's leading producer, accounting for about 25 per cent of national production.²⁶ After paddy rice, the domestic staple crop, coffee production is the most important crop in Lahat with respect to both the tonnage produced and the cultivated area (nearly 19 per cent of the area of Lahat). Nearly 69 per cent of the 121.000 households in Lahat cultivate coffee.²⁷

Farmers indicate that the coffee market provides strong incentives for people to grow coffee, which is profitable despite the fact that international coffee prices are among the most unstable of the major agricultural commodities.²⁸ While coffee farmers may experience occasional losses due to price fluctuations, they may also realize major gains and typically earn enviable incomes b local standards. They also store dried coffee beans in sacks in their houses when prices are low to sell when the price rises.

Another incentive for coffee production is the limited opportunities for profitably producing other crops. Although farmers have produced good crops such as vanilla and vegetables (especially cabbage), they often do not earn a profit, especially due to transport costs. The vanilla market is distant and vegetable producers face spoilage problems if they cannot find cheap and dependable transport. As a result farmers tend to stick to paddy rice and coffee production, and some villagers have even converted their paddy rice plots to coffee.

Page 102

In response to these incentives, Lahat's farmers have increasingly cultivated highland forest land, in part because of their belief that unspoiled forest land will guarantee good harvests, whereas the soils on village lands are thought to be unfavourable for coffee production. The mountainous topography also allows cultivators to hide their illegal practices, and village lands are in any case too limited to fulfil the demand for large plots for coffee production. What little unoccupied or uncultivated land there is within the villages is often unavailable for social reasons, since surplus' lands are rarely sold, especially to people other than the owners' family members or neighbours. The shortage of farm plots in these villages has also increased the price of land beyond what common rural farmers can afford. As a result

of all of these factors, rural coffee farmers have increasingly turned towards cultivation of forest lands where the lack of guards and the relatively uncontrolled access has allowed them to develop alternate farm plots.

Lahatan forest farmers can be differentiated according to whether they are still primarily subsistence farmers, or have entered an expansionist phase. Subsistence farmers enter the forest land as they marry, and they live within the forest, at least for the first years of cultivation, in minimal conditions. They begin by planting *padi gogo* (non-irrigated upland paddy rice) and vegetables for their daily consumption, but as soon as possible they plant coffee trees as their primary crop on an average of 2 ha of forest land. They begin to have a marketable coffee harvest sometime between three and seven years after the coffee is planted. These subsistence farmers may begin to expand their farms once they have accumulated enough capital.

Farmers will also extend their coffee farms in an effort to make up for the low prices they may receive for their crop because of low quality post-harvest processing. To protect themselves from robbery and losses due to the failing and rotting of mature beans, most farmers harvest the coffee while it is still immature. They also usually dry their coffee beans on the roads, which mixes them with dirt and gravel. As a result of this improper treatment they may receive a low price for their coffee.

MODELLING LAHAT'S DEFORESTATION

The factors influencing the dynamic relationship between *Lahatan* farmers and deforestation of the regency's protected areas can be grouped into push and pull factors. The push factors are those that force rural farmers to leave their villages to farm in the forest, while the pull factors are those that entice rural farmers to enter and cultivate the forest lands. The government's activities with respect to preserving the forest areas can also be grouped into deterrent and facilitating factors. A model of the dynamic interactions among the factors influencing Lahat's deforestation is shown in Figure 6.2.

Page 103

A classical Malthusian approach emphasizes the push of population growth that interacts with the pull of the coffee market and the forest coffee production cycle. However, in practice it is difficult to causally separate the effects of population pressure from those of market incentives. It has, in fact, been demonstrated in several other cases that market centres develop in the areas of highest population density, and that agricultural production intensifies in those areas that are simultaneously near market centres and that support the densest populations,²⁹ and this pattern is also apparent in Lahat. Furthermore, it is also apparent that rural farmers' economic activities closely interact with social characteristics and the physical environment, and farmers adapt to changing population and market forces. The combination of existing push and pull factors suggests, therefore, that the failure to adequately protect forest areas is not the direct cause of deforestation, but rather a facilitating factor, and that activities to prevent further deforestation must not only be concerned with protecting the forest areas, but with development of the rural areas as a whole, so that the rural people in the region have other alternatives besides forest cultivation for sustaining themselves.

Figure 6.2: A model of relationships between population and environment in the case of Lahat's deforestation



Page 104

Even so, the effect of the government's administrative deficiencies on deforestation in Lahat is also significant. The decision to abol ish margas and replace them with *desas* critically weakened the government's ability to protect the region's natural resources. As a result, village territories, including the forest areas, have been left beyond the effective control of the regency, the province, and even the central government. The appearance of such a 'power-gap' due to the replacement of older, established traditional institutions with newer, modern state agencies is not an unfamiliar factor affecting the destruction of natural resources as states seek to modernize. But this practice has frequently left natural resources unprotected at a time when traditional community norms and practices for protecting them have been weakened or abolished. In addition, the new forestry law has failed to gain community acceptance. The causes of deforestation in Lahat must therefore be seen as a complex interaction of push and pull factors, in combination with weak government capacity for protecting these resources and a failure to provide access to other alternatives for securing a livelihood.

Notes

- 1. This study of Lahat's deforestation is part of a project called Population-Environment Dynamics initiated by faculty from the University of Michigan School of Natural Resources and Environment, and from the School of Public Health (Department of Population Planning and International Health), in research collaboration with the Sriwijaya University Population Research Centre. The project involved conducting a series of field observations in South Sumatera Province.
- 2. World Bank, *Indonesia Forest, Land and Water: Issues in Sustainable Development*, Washington, DC: World Bank (1989), p. 157.
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- 5. WRI, *World Resources 1990-1991;* and R.C. Repetto, *The Forest for the Trees? Government Policies and the Misuse of Forest Resources,* Washington, DC: WRI (1988).

Page 105

- P.C. West and S.R. Brechin, *Resident Peoples and Natural Parks: Social Dilemmas and Strategies in International Conservation*, Tucson: University of Arizona Press (1991); and S.R. Brechin, S.C. Surapaty, L. Heydir and E. Roflin, 'Protected Area Deforestation in South Sumatera, Indonesia', in *Population-Environment Dynamics: Ideas and Observations,* G.D. Ness, W.D. Drake and S.R. Brechin (editors), Ann Arbor, Michigan: University of Michigan Press (1993), p. 226.
- 7. R.C. Repetto and M. Gillis (editors), *Public Policies and the Misuse of Forest Resources*, Washington, DC: WRI (1988).
- 8. World Bank, Indonesia (Note 2 above).
- 9. The TGHK classifies the national forests into five categories: (1) *hutan suaka alam* (conservation forests), which are set aside for conservation and include wildlife reserves, national parks and tourism forests; (2) *hutan lindung* (protection forests), which are intended primarily for watershed protection; (3) *hutan produksi terbatas* (limited production forests); (4) *hutan produksi tetap* (regular production forests), in which selective cutting is allowed; and (5) *hutan konversi* (conversion forests), which can be converted to agricultural or other uses. The first two categories are called 'permanent forests', which are designated for preservation. The previous criteria for identifying protected forest areas were elevations over 700 meters and a slope of 45 degrees or more. The new criteria employed in the TGHK system take slope, soil type and rainfall into account by calculating indices weighted as follows:

Slope x 20 + Soil x 15 + Rainfall x 10

Forests that score greater than 175 are classified as protection forests; limited production forests score between 124 and 174; and regular production forests are those that score less than 124.

- 10. Departemen Kehutanan, *Statistik Kehutanan Indonesia*, Jakarta: Departemen Kehutanan Republik Indonesia (1985/1986), p. 118.
- 11. Bappeda Lahat, *Lahat Dalam Angka*, Lahat: Pemerintah Kabupaten Daerah Tingkat II Lahat (1989), p. 1-2.
- 12. Departemen Pendidikan dan Kebudayaan, *Dampak Modernisasi Terhadap Hubungan Kekerabatan Daerah Sumatera Selatan*, Palembang: Proyek Inventarisasi dan Dokumentasi Kebudayaan Daerah (1986/1987), p. 33 and 36.
- 13. Brechin *el al., Deforestation* (Note 6 above); Departemen Pendidikan dan Kebudayaan, *Sistem Gotong-Royong Masyarakat Pedesaan Daerah Sumatera Selatan*, Palembang: Proyek Inventarisasi dan Dokumentasi Kebudayaan Daerah (1981), p. 82; W. Donner, *Land Use and*

Environment in Indonesia, Honolulu: University of Hawaii (1987); M.T. Naning *et al., Evaluasi Dampak Pengembangan Perkebunan Rakyat Terhadap Potensi Sumberdaya Air di Kecamatan Jarai, Kabupaten Lahat, Indonesia*, Palembang: Pusat Penelitian Universitas Sriwijaya (1988); *Tempo*, Jakarta Magazine (15 September and 15 December 1990).

- 14. A written land-title is a Western legal concept that is not shared by the native population of Indonesia. Rather, the *hukum adat* of right to land is based on actual occupation.
- 15. Other factors that contributed to the preservation of BW forests included low population density, the very simple lifestyle of the old-time *Lahatan* farmers, and the commitment of rural people to abide by the law.

Page 106

- 16. Brechin *et al.* (Note 6 above), p. 242.
- 17. One forest cultivator interviewed indicated that he has paid the amount of six sacks (600 kilograms) of coffee beans to occupy his farming plot for the last seven years.
- 18. *Sriwijaya Post,* Palembang Newspaper (21, 22 August and 20 November 1990); and *Tempo* (13 April and 11 May 1991, and 5 December 1992).
- 19. Based on *Peraturan Pemerintah* (the Government Regulation) No. 28 of 1985, articles 9 and 10, one who illegally cultivates, cuts or burns trees within the protected forest lands is liable to imprisonment for ten years, or to a fine of 100 million rupiahs (US\$ 50,000).
- 20. WRI, World Resources 1990-1991, op. cit.
- 21. Brechin et al. (op. cit.), p. 233.
- 22. A. Romsan, *The Future Role of Public Participation in Environment and Decision Making Process: A Case Study of Indonesian Transmigration Sites in the Province of South Sumatera*, Nova Scotia, Canada: MA-Thesis for Dalhousie University (1989), p. 54.
- 23. Departemen Pendidikan, *Sistem Gotong-Royong;* and Kantor Statistik Provinsi Sumatera Selatan, *'Data Statistik Provinsi Sumatera Selatan'* in *Sumatera Selatan dalam Angka*, Palembang: Pemerintah Provinsi Daerah Tingkat I Sumatera Selatan (1990).
- 24. C. Secrett, 'The Environment Impact of Transmigration' in *The Ecologist* (1986); A.J. Whitten, 'Indonesia's Transmigration Program and its Role in the Loss of Tropical Rain Forests' in *Conservation Biology* (October 1987); and WRI, *World Resources 1992-1993.*
- 25. Departemen Pendidikan (Notes 12 and 13 above).

- 26. Asosiasi Eksportir Kopi Indonesia (AEKI), 'Data 1990' in Study of Population and Environment Dynamics in Kabupaten Lahat, South Sumatera, Indonesia, S.C. Surapaty et al. (editors), Palembang: Sriwijaya University Centre for Population Studies (1991); and L. Heydir, M.Y. Gani and A. Candrawati, Identifikasi Berbagai Aspek Perladangan Liar di Kawasan Hutan di Kabupaten Lahat, Sumatera Selatan, Indonesia (Research Report), Palembang–Lexington–Ann Arbor: the Sriwijaya University Centre for Population Studies and the University of Michigan School of Natural Resources (1990).
- 27. Dinas Pertanian Kabupaten Lahat, 'Data Pertanian Kabupaten Lahat' and Kantor Statistik Kabupaten Lahat, 'Data Statistik Kabupaten Lahat' in Bappeda Lahat, Lahat dalam Angka.
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Page 107

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