
WAITING FOR RAIN

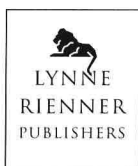
**— Agriculture
and Ecological
— Imbalance in
— Cape Verde**

**MARK LANGWORTHY
and TIMOTHY J. FINAN**

Waiting for Rain

Agriculture and Ecological Imbalance in _____ Cape Verde _____

Mark Langworthy
Timothy J. Finan



BOULDER
LONDON

Published in the United States of America in 1997 by
Lynne Rienner Publishers, Inc.
1800 30th Street, Boulder, Colorado 80301

and in the United Kingdom by
Lynne Rienner Publishers, Inc.
3 Henrietta Street, Covent Garden, London WC2E 8LU

© 1997 by Lynne Rienner Publishers, Inc. All rights reserved

Library of Congress Cataloging-in-Publication Data

Langworthy, Mark.

Waiting for rain : agriculture and ecological imbalance in Cape
Verde / Mark Langworthy and Timothy J. Finan.
Includes bibliographical references and index.

ISBN 1-55587-709-5 (hc : alk. paper)

1. Agriculture—Cape Verde. 2. Agriculture—Environmental
aspects—Cape Verde. 3. Natural resources—Cape Verde.
4. Agriculture and state—Cape Verde. 5. Food supply—Cape Verde.
6. Cape Verde—Rural conditions. I. Finan, Timothy J. II. Title.

S473.6.C25L36 1997

338.1'4'096658—dc21

96-44538

CIP

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book
is available from the British Library.

Printed and bound in the United States of America

The paper used in this publication meets the requirements
of the American National Standard for Permanence of
Paper for Printed Library Materials Z39.48-1984.

5 4 3 2 1

Acknowledgments

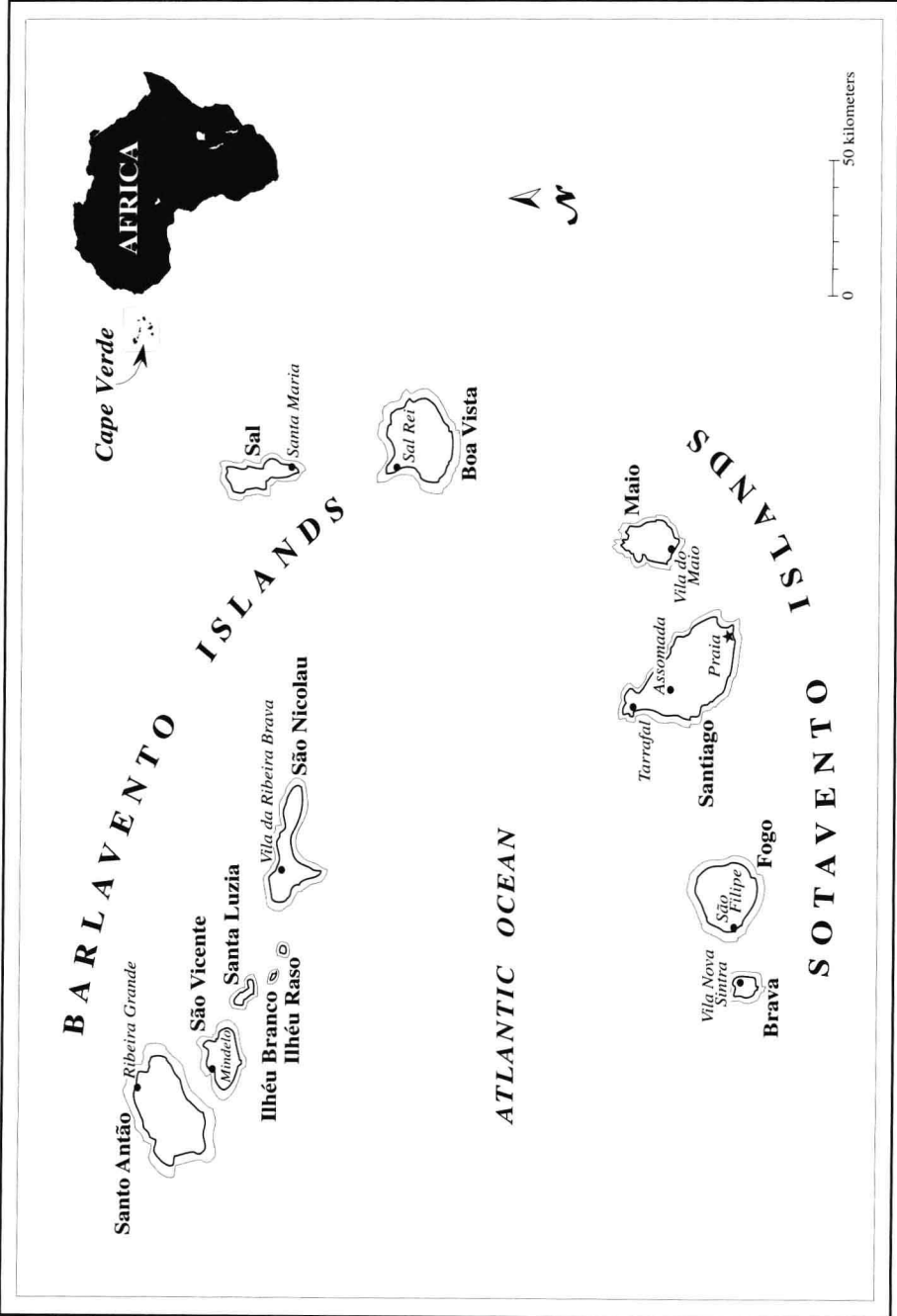
This project has been a long labor of love, as endearing as it was enduring. Over the dozen years of research and travel that generated this work, we have benefited from the assistance and wisdom of many people who guided us over unknown waters, maintained saintly patience in the face of our disingenuousness, and provided the emotional support necessary to bring this endeavor to its fruition.

In particular, we acknowledge Jimmy S. Hillman, project director of the Foods Crops Research Project and retired head of the Department of Agricultural Economics, and Carlos Véléz-Ibañez, former director of the Bureau of Applied Research in Anthropology (BARA) at the University of Arizona. Both provided us with the motive and opportunity to finish this long-term project. Of the many Cape Verdeans who so kindly shaped our experience, we offer special recognition to Horácio Soares, Elísio Rodrigues, Milu Lobo, António Sabino, and other professionals who have dedicated their lives to the challenge of rural development. In our research effort we benefited from the friendship and knowledge of our *manu* Raul Varela Semedo, Tito Andrade, and Vladmiro Andrade; we shall forever cherish those exciting times spent in endless fieldwork. José and Zuleika Levy and their respective families, especially Dona Milu, provided professional support and friendship.

In every rural community we visited over the years, local Cape Verdeans took us in, shared their lives, and made us aware of their awesome strength in the face of adversity. Their friendship will always be the richest reward afforded us. At the University of Arizona we received unerring assistance from our respective staffs—Connie McKay, Loretta Cosgrove, Linda Phipps, and Maria Rodriguez. From our hearths we received the quiet forbearance, encouragement, and warmth of Pat and Amélia. This book is as much their accomplishment as ours.

—M. L.

—T. J. F.



Contents

	<i>List of Tables and Figures</i>	ix
	<i>Acknowledgments</i>	xi
	<i>Map of Cape Verde</i>	xii
1	Sustainability in a Fragile Environment: An Introduction	1
2	Public and Private Resource Management: A Methodological Approach	13
3	The Natural Resource Endowment	35
4	Characteristics of Cape Verdean Rural Society	53
5	Rainfed Agriculture	79
6	Irrigated Agriculture	101
7	Household Management Strategies	131
8	Agriculture and Policy Choice	159
9	Conclusions: The Future of Agriculture in Cape Verde	187
	<i>References</i>	197
	<i>Index</i>	204
	<i>About the Book</i>	212

Tables and Figures

Tables

3.1	Annual Precipitation on the Four Major Agricultural Islands, 1970–1988	39
3.2	Groundwater Availabilities and Use on the Four Major Agricultural Islands	43
3.3	Land Quality Characteristics for the Four Major Agricultural Islands	46
4.1	Historical Record of Droughts, 1719–1996	61
4.2	Demographic Characteristics of Rural Population on Selected Islands	62
4.3	Distributions of Rainfed Cropland on Santiago and Santo Antão	70
4.4	Distributions of Irrigated Cropland on Santiago and Santo Antão	70
4.5	Distributions of Rainfed Cropland by Landownership on Santiago and Santo Antão	72
4.6	Distributions of Irrigated Cropland by Landownership on Santiago and Santo Antão	72
5.1	Comparative Estimates of Cultivated Rainfed Land on Selected Islands, 1978 and 1988	80
5.2	Yields of Corn and Beans, 1975–1990	84
5.3	Characteristics of Land and Labor Use in Rainfed Agriculture on Santiago and Santo Antão	86
5.4	Representative Budgets for Rainfed Crops	90
5.5	Outputs and Net Values of Livestock	92

5.6	Economic Returns of Representative Rainfed Systems on Santiago and Santo Antão	93
5.7	Annual Net Returns of Livestock	97
6.1	Distribution of Irrigated Land on Santiago and Santo Antão	102
6.2	Irrigated Land by Water Source	106
6.3	Distribution of Average Irrigation Intervals	108
6.4	Various Estimated Shares of Irrigated Area by Crop	109
6.5	Production of Major Irrigated Crops, 1971–1990	114
6.6	Crop Budgets for Major Irrigated Crops	120
6.7	Characteristics of Representative Farm Systems	127
7.1	Distribution of Rainfed and Irrigated Land by Number of Adults in Household	134
7.2	Rainfed and Irrigated Landholdings	135
7.3	Average Household Labor Requirements and Availability, Annual and Peak Labor Season	137
7.4	Regression Models of Household Labor Allocation	138
7.5	Characteristics of Irrigated Farms on Santiago by Source of Water	143
7.6	Distribution of Irrigation Intervals Among Farmers Within a Surveyed Irrigation Network, Santiago	144
7.7	Household Income on Santiago and Santo Antão by Quintile	149
7.8	Characteristics of Surveyed Households on Santiago and Santo Antão by Per Capita Income Quintile	152
8.1	Cropping Patterns and Net Revenues for Irrigation Network Under Alternative Intervals	174
8.2	Simulations of Potential Increases in Agricultural Incomes of Surveyed Households	177

Figures

1.1	Population and Agricultural Production Capacity over Time	7
2.1	The Political Ecology of Cape Verdean Agriculture	15
7.1	Household Labor Demands and Supply	155

Sustainability in a Fragile Environment: An Introduction

The Republic of Cape Verde, an Atlantic archipelago off the Guinea coast of Africa, is small in both magnitude and population. Located 453 nautical miles due west of Senegal, the combined landmass of the 10 islands and 2 islets amounts to around 4,000 square kilometers. The six islands to the North (Santo Antão, São Vicente, Santa Luzia, São Nicolau, Sal, and Boa Vista) constitute the windward, or *barlavento*, islands, while the four southern islands (Brava, Fogo, Santiago, and Maio) make up the leeward, or *sotavento*, islands. The population of the country is currently estimated at about 380,000, and, as such, its population density (95/km²) is among the highest of West African nations (World Bank 1993b). Although it is perhaps a minor participant in the overall flow of world economic and political affairs, Cape Verde nonetheless shares many defining ecological characteristics with its Sahelian neighbors and faces very similar challenges of resource management. The majority of its population resides in rural areas and derives its livelihood, at least in part, from agricultural activities. And like most of the Sahel, Cape Verde is arid, its farming subject to the vagaries of highly unpredictable and often miserly weather systems. Because of the common ecology and shared history that tie the archipelago to the continent, an understanding of Cape Verdean economy and society provides insights of a broader regional significance.

Most evidence indicates that the islands were uninhabited until Portuguese explorers, venturing south from Madeira, arrived in the late 1400s and claimed them for the Crown. The motives for subsequent settlement were founded more on the central geographic location of the islands than on the richness of the local resource base. The proximity of Cape Verde to the Guinea coast and its far vaster and more diversified set of resources provided the Crown a dominant position in intercontinental trade and other commercial advantages related to centralized warehousing and transshipment facilities.

As a consequence, Cape Verde soon developed a dominant position in the Guinea slave trade to Europe and the New World.

Agriculture, conversely, never emerged as a viable economic alternative. The insular colony failed to meet the expansionist objective of the Crown, that of providing abundant agricultural land for Portugal's impoverished peasantry—as Mozambique and Angola later did. During the early years of settlement, commerce flourished, leaving agriculture to occupy the role of a subsidiary subsistence activity. It is true that, on a minor scale, the early colonists cultivated cotton, from which the utilitarian trade good *panos* (dyed measures of cloth) was woven and exchanged for slaves. They also raised livestock to supply slave ships with meat and hides. But mostly the settlement farmed to feed itself. Despite the initial success of the Guinea flesh trade and the rapid demise of agriculture, history, with its ironic flair, would eventually determine other fortunes for Cape Verde. Through time, the trade advantages of the archipelago were eroded by changing political winds and innovations in sea travel, and as commerce diminished, agriculture emerged as the primary economic activity of the islands—somewhat by default.

Today, Cape Verde is an agricultural society in an arid environment, and food production and provisioning constitute the most pressing and persistent social concerns. As a rather extreme example, Cape Verde might be considered a microcosm of the political ecology of the Sahel—a laboratory where complex coping strategies are conditioned by a skein of sociopolitical institutions and played out in a delicate and vulnerable environment. A rapidly growing population—with limited opportunities outside agriculture—struggles to eke out a subsistence livelihood by slowly exhausting a fragile, increasingly degraded natural resource base. From the perspective of the local rural household, survival is the central issue that drives short-run decisionmaking. Government leaders also interpret their political success in terms of policies that direct agricultural activity toward broader goals of economic growth and national food security. Nonetheless, in this unrelenting effort to achieve critical short-run household and national goals, society runs the risk of undermining the productive capacity of the system as a whole. It is possible that household need and national intent have become incompatible with ecological reality, thus surpassing the sustainable limits of the productive base.

The small scale of Cape Verde offers a dramatic fishbowl view of a human ecological dynamic that has unfolded in large parts of Sahelian Africa and elsewhere. In this regard, Cape Verde stands neither unique nor alone; rather, it shares the critical food-security dilemma that affects the entire region. There is widespread concurrence among both technicians and inhabitants that environmental degradation has occurred and is occurring throughout West Africa. The causes of this environmental decline,

however, are hotly disputed and remain embroiled in a polemic armed with single-factor explanations. At its core, the complexity of this controversy contrasts the role of uncontrollable, cyclical phenomena such as climate against the role of human agency. Most scholars agree on the existence of patterned relationships among climatic events, rural population densities, and environmental degradation; however, the lines of causality are fervently debated. The frequent occurrences of severe drought over recent decades together with the declining trend in average annual precipitation throughout the Sahel have fed a global-warming hypothesis that suggests widespread climate change and minimizes the human hand in the causal process. Contrasting arguments assert that population growth and the expansion of agriculture into more marginal areas bear the responsibility for increasing desertification, thus reducing the role of climate as the independent causal factor.

Other participants in the debate adhere to more complex, multileveled perspectives that examine the specific forms of human activity and their respective environmental consequences (see Gorse and Steeds 1987:7–8). This approach reasons back from the household and its decisionmaking patterns to explore the external forces that determine differing strategies of production, notably, the political pressures to expand cash cropping at the household level. In their influential book on African famine, Franke and Chasin (1980) interpret the ecological problem in the Sahel in terms of the widespread adoption of inappropriate technologies related to the regional relationship of dependence on the international economy. Within the context of this argument, Ball (1976:520) directly attributes ecological degradation to the colonial efforts to “integrate peasants and herders into a monetarized, commercialized economy” primarily through national policies to increase export and livestock production.

The most comprehensive and cogent positions on environmental degradation in the Sahel draw eclectically upon the existing arguments. Ecological deterioration is a complex problem that cannot be understood solely in terms of natural events. As Boserup (1965) established, increases in rural populations result in the intensification of land use (with shorter fallowing periods), greater herd pressures on range vegetation, and the overexploitation of fuelwood. Historical realities as well as national and international forces further condition the strategies of agriculturalists and pastoralists by shaping the incentives (and disincentives) that influence their production decisions within the household. These decisions can aggravate and prolong the negative consequences of drought and create a downward spiral of environmental degradation that is difficult to reverse.

In effect, the most credible models of environmental degradation must interrelate such macrolevel variables as climatic change, population growth, and international economic trends with such microlevel variables

as household production strategies, patterns of access to agricultural resources, and technology choice. These models must account for potential contradictions in goals between household and nation-state, as well as for the inevitable fact that positive short-term returns may incur high long-run costs in terms of resource depletion.

In Cape Verde, where food self-sufficiency is now remembered as part of some near-mythic past, the problem of environmental degradation displays all these levels of complexity. The resource base is fragile and under siege by an expanding population. Moran (1982), in a careful review of colonial history, presents a well-supported argument that the exploitative role of the Portuguese Crown in the formation of current agricultural patterns, especially the establishment of maize as the staple crop, created an agricultural economy inappropriate to local conditions. Today, soil conservation experts are unanimous in their assessment of the negative impacts of traditional rainfed agricultural practices (Lopes and Meyer 1993). To accept this position is not to deny, however, that climatic patterns do show a downward trend in rainfall while population growth has increased. For our purposes here, whether the root causes of the current ecological crisis lie in declining rainfall, historical patterns of resource allocation and use, the incentives presented by the international economy, or the short-run production strategies of the household itself, the critical enigma remains. How do farmers and policymakers manage resources so as to assure both the national food supply and the survival of the rural household when the expansion of agriculture could engender irreversible damage to that very resource base? At its core, the problem as we pose it is one of resource management in a complicated sociopolitical and physical environment.

Beyond the Ecological Balance

At one level, this book is about Cape Verdean food production and the welfare of farming households. As such, it offers a detailed and current description of Cape Verdean agriculture under both rainfed and irrigated regimes. Based on several years of fieldwork, these descriptions document current agricultural practices, variations in technical strategies of production, patterns of input use, crop choice and rotation, and forms of indigenous knowledge employed by local farmers. We also estimate the sources and magnitudes of rural incomes among representative rural households. No other such comprehensive documentation of Cape Verdean agriculture has been attempted since Ribeiro's (1954) study of Fogo Island and Amaral's (1964) landmark volume on Santiago Island, both works of Portuguese geographers based in Lisbon during the colonial period. At the

same time, this book represents the first effort to document the impact on agriculture of Cape Verde's independence and the dramatic social changes that occurred with this watershed event.

This book is also about agricultural sustainability and natural resource management. Cape Verde has a resource endowment that defines a set of binding environmental constraints (i.e., climate, soil, topography) on agriculture. Just as critically, however, social institutions—wrought in history—also determine the characteristics of farming. Individual households gain access to existing resources and exploit them in accordance with two categories of man-made rules: those established by local communities (i.e., “traditional institutions”) and those imposed by nonlocal forces (i.e., “public institutions”). These sets of traditional and public rules shape resource access and influence the patterns of resource management, which in turn determine the short-run and long-run impacts on the environment. Not all farmers enjoy equal access to agricultural resources, and this inequality results in significant forms of socioeconomic differentiation in rural society, which inspires the hypothesis that different classes of households adopt different strategies of resource management. Thus, in this book, we intend to describe the natural resource base available to farmers, emphasizing the nature of physical constraints to production; then to document as systematically as possible the public and traditional rules that define resource access and management, accounting for the variation due to social differentiation.

Always lurking throughout the following chapters is the shadow of the Malthusian dynamic, which is readily evidenced in Cape Verdean history. Over the first five centuries of colonial existence, the relationship of local population to the resource base was primarily determined in strict biological terms. Assailed by severe periodic droughts, population levels of the islands oscillated in direct proportion to changes in the productive capacity of the resource base. We learn from Carreira's (1984) punctilious history of Cape Verde that the regular occurrence of pluriannual drought caused the production levels of staple crops to dip below minimum survival needs. The subsequent mortality due to widespread starvation lowered the person/land ratio, thus restoring the ecological balance. When the rains returned, agricultural production increased, and the population grew rapidly. Although it is true that traditional sharing institutions mitigated some of the regional consequences of drought by redistributing available food stocks, overall food supplies were cruelly short, and stark Malthusian principles ruled the day throughout most of Cape Verdean history.

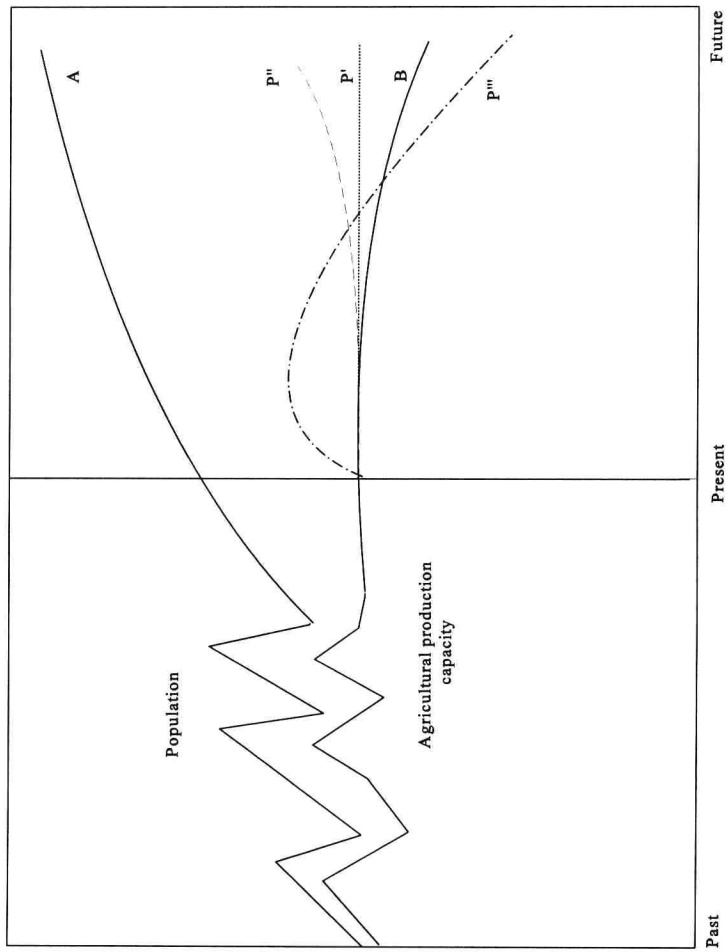
Under the colonial rule of the Portuguese governor, little was done to alleviate the horrors of drought. During these regular crises, the colonial administration vacillated between inadequate gestures of assistance and a laissez-faire approach consistent with reigning ideologies. Portugal itself

suffered from chronic impoverishment and was without the financial means to mobilize substantial mitigation activities. Moreover, long-distance communications were notoriously slow, while starvation imposed its unforgiving timetable. In the final accounting, however, historical reports suggest that the Portuguese generally lacked the collective moral resolve to save Africans from famine. So the rhythm of environmental crisis wrought its devastating legacy of population control, even up to the mid-twentieth century.

Beginning with the 1970s, however, the historical tandem of drought and decimation was severed. The wave of successful independence movements throughout Lusophone Africa, the fall of the Salazarist regime in Portugal, and the geopolitics of the Cold War all inspired a call for international intervention. As a result, drought-related starvation in Cape Verde became intolerable to both the international donor community and the many Cape Verdean emigrants residing in Europe and the United States. While the political climate improved over this decade of change, the physical climate worsened. The archipelago began to suffer its most widespread and extended drought—lasting, with only scarce interruptions, to the present day. Shored up by food-aid assistance, the population has nonetheless continued to grow since the 1970s, first at a 4 percent annual rate, then falling in more recent years to 2.4 percent (World Bank 1993a). Thus, in defiant reversal of the past Malthusian pattern, the Cape Verdean population expands while the productive capacity of the agricultural resource base declines. As the title of this book suggests, Cape Verde has moved into an ecological imbalance between sustainable production capacity of the resource base and the size of the population seeking to derive its livelihood from agriculture.

This relationship, illustrated in Figure 1.1, casts its shadow over all aspects of Cape Verdean economic and political life. Over centuries, the population line (A) roughly accompanied the subsistence capacity line (B), determined by the amount and distribution of rainfall. The short-run changes in agricultural production capacity are due to variable rainfall patterns, while the long-run decline is a function of soil loss and reduction in soil fertility. After the last great catastrophe of midcentury (1946–1947) and the onslaught of the protracted drought period of the 1970s, the respective directions of the two lines have diverged, but not independently of each other. When a rural population exceeds carrying capacity for a prolonged period of time, there arises the danger of a permanent reduction in productive capacity that will not correct itself with the return of the rains. And in Cape Verde, there are few rural employment opportunities outside of agriculture to absorb the excess rural population. The threat posed by the continuing divergence of these two lines is that of irreversibility, which raises critical and fundamental questions about household food security, national self-sufficiency and sovereignty, and social and political stability.

Figure 1.1 Population and Agricultural Production Capacity over Time



Agricultural sustainability implies resistance in the face of change and resilience under stress. Most scholars concur that sustainable activities are those that meet economic objectives without compromising biological ones. Thus, in theory, a sustainable food-production system utilizes a natural resource base without diminishing its availability to the next generation (see Repetto 1986; Beets 1990:16–18). As the complexity of the real world asserts itself, we see that the sustainable systems may not meet domestic food-security needs (Ruttan 1988), as is the case in Cape Verde.

The complex nature of sustainability ultimately requires difficult decisions involving uncertain trade-offs, hence this book is also about food and resource policy. It describes past and current policies that Cape Verdean leaders have enacted to promote national and household food security in a fragile ecosystem. Here we focus primarily on two basic policy approaches through which Cape Verde has sought to redress the ecological imbalance. The first approach wagers a technological solution and seeks to identify and encourage alternative practices that reduce environmental degradation and increase the output efficiency of the resources currently being utilized—primarily soil and water. To achieve this end, the government has invested in research and extension activities and has played a major role in the management of natural resources. The second approach attacks the population side of the imbalance. The dilemma that Malthus so aptly described for Cape Verdeans presents little choice but to stabilize population growth by either reducing the birthrate or facilitating out-migration from rural areas. A combination of reduction in the number of rural people, improvements in the basic value of human capital through education and training, and, over the long run, the development of non-agricultural economic alternatives defines the ultimate strategy.

National self-sufficiency in food production is not a realistic goal for a country in which 90 percent of its foodstuffs is either imported or donated by the donor community. On the other hand, the current ecological imbalance constitutes a critical threat to economic and political stability, and some level of sustainable agricultural production must eventually be established in order to avoid disaster. The overarching challenge facing policymakers in Cape Verde is how to narrow the gap between lines A and B (in Figure 1.1) and to achieve a sustainable balance over the long run. This imperative is depicted as lines P', P'', and P''', which represent the vectors of possible policy interventions that would conceptually work toward the establishment of a reasonable and sustainable system of production. The policy alternative depicted by line P' establishes a sustainable production level under current climatic conditions; line P'' represents a policy initiative that promotes rapid agricultural growth over the short run, but that ultimately results in the severe depletion of the natural resource base. The third alternative, line P''', seeks a policy set that would move gradually to lessen the food-deficit situation in a sustainable way.

These alternative policy approaches will be discussed in the context of the public role in agricultural resource management. Over the short run, however, policymakers in Cape Verde face the urgent problem of feeding the rural population. The lack of nonagricultural alternatives leaves more people practicing agriculture than the resource base can support. At the same time, the government understandably fears an uncontrolled exodus of rural inhabitants to urban areas, which are already extended beyond their ability to provide either employment or basic infrastructural services. Moreover, the current short-run strategy that depends—almost entirely—on international largesse and emigrant remittances is clearly vulnerable. In essence, Cape Verdeans find themselves challenged to redefine the role of agriculture, to relocate its place in the general economy, and to confront the issue of sustainable resource utilization. But what are the specific policy issues that will shape the future of agriculture in Cape Verde? To address this question, we need to discriminate between dryland and irrigated farming.

Policy Issues in Dryland Agriculture

The majority of agricultural lands in Cape Verde are cultivated under a rainfed regime, and only a small minority of farmers has any access to irrigated lands. Numerous technical reports have directly associated farming practices with environmental degradation (Freeman et al. 1978; USAID 1984; IFAD 1990; Lopes and Meyer 1993). The widespread dryland cultivation of maize has been implicated as a major cause of soil erosion and high rainfall runoff rates. Soil and crop technicians argue that maize is an inappropriate cultigen for the environmental conditions of Cape Verde, which are better suited for more drought-tolerant and higher-producing crops, such as millet and sorghum. In addition, current population growth encourages the expansion of maize cultivation onto more marginalized lands, particularly the steep, volcanic hillsides of the valleys. The conventional argument denounces traditional production practices: farmers do not adopt systematic measures of erosion control, such as contour planting, and actually accelerate soil loss by removing all competing vegetation from the sloping fields. Nevertheless, maize, which was introduced by the Portuguese from Brazil, has been totally woven into the cultural fabric of rural society and has been the preferred staple of consumption.

Under existing precarious conditions, yields are too low to assure household food security, and the responsibility for provisioning the rural population has fallen upon the public sector. Public work fronts are a common feature of rural Cape Verde and provide the employment that injects cash into the rural economy and reduces the attraction of rural-urban migration. The public work system is financed by food aid that has been