Transforming Agrarian Economies

Opportunities Seized, Opportunities Missed

Thomas P. Tomich, Peter Kilby, and Bruce F. Johnston

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Thomas P. Tomich, Peter Kilby, and Bruce F. Johnston

Cornell University Press
Ithaca and London

For Nancy, Marianne, and Harriet

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PREFACE

Can the poorest countries achieve sustained growth while alleviating hunger and other manifestations of mass poverty? The wellbeing of some 60 percent of the world's population depends on the response to this question. These men, women, and children live in the subset of developing countries where the majority of the labor force still depends mainly on agriculture. This book systematically explores the complex challenges of development to identify priorities for action for these CARLs, countries with abundant rural labor.

The authors have used a combined analytical and historical approach, which is summarized in the Introduction, with the aim of placing agricultural development in its widest context. Intense collaboration has been crucial to this effort. Each of the authors with his special skills made contributions to every chapter.

Collaboration is also the keynote for this book in a longer perspective. It continues a series of collaborative ventures begun by Johnston thirty-five years ago. Building on a 1951 paper analyzing technological change in Japanese agriculture, Bruce Johnston and John Mellor conceptually defined agriculture's "four contributions" to the process of economic development in a 1961 paper that is cited widely to this day. In the 1960s Herman Southworth and Johnston coedited a symposium volume, *Agricultural Development and Economic Growth*, sponsored by the Social Science Research Council, and Johnston examined issues related to struc-

tural transformation and labor absorption in papers with Soren Nielsen (1966) and John Cownie (1969). Following work with Kilby in the 1970s, Johnston and William Clark in 1982 published a book focused on the production-oriented, consumption-oriented, and organization programs critical to agricultural and rural development. The treatment of nutrition, health, and population in that book was strongly influenced by Johnston's work in 1974–75 as chairman and rapporteur of the Ninth Session of the Joint FAO/WHO Expert Committee on Nutrition.

Peter Kilby first collaborated with Johnston on a 1972 paper where the focus was on manufacturing—output levels, industry shares, factor intensities—under various patterns of agricultural development. This facet of intersectoral commodity flows was further developed in their 1975 book, *Agriculture and Structural Transformation*, with special attention to the producer inputs of farm equipment and fertilizer. Kilby also helped to extend the structural transformation paradigm through the articulation of technological diffusion in manufacturing, changing market organization, and social structure differentiation in the 1975 book. Over the intervening years, he has continued his research focus on entrepreneurship in developing countries and acquired substantial additional knowledge about the rural nonfarm sector and its interaction with agriculture, the genesis of informal sector technology, and the manufacture of fertilizer and farm equipment. Chapters 2, 6, and 7, which represent Kilby's most important contributions to the present volume, are enriched by those long-standing research interests.

Thomas Tomich is the newest recruit to this ongoing collaborative venture. In a 1984 study of the feasibility of small farm development strategies, he and Johnston deepened the analysis of the farm sector in terms of technology adoption, economies of scale, and farm-size effects. Their follow-up paper in 1985 emphasized a distinction between agricultural strategy and agrarian structure, in recognition not only of the interactions between strategy and structure but also of the crucial differences with respect to policy options. Those endeavors were the starting point for our task of integrating recent empirical evidence, analytical advances, and lessons from experience with the structural transformation perspective of the 1975 book by Johnston and Kilby. A distinguishing feature of the present volume is greater attention to the political economy of development strategy. Tomich introduced the concept of "strategic notions" in an annotated chapter outline for a study of the political economy of agriculture and rural development in 1986. That study grew into this book, and the strategic notions concept became the organizing theme linking our analytical and historical chapters. To the present volume, Tomich also brings the precise delineation of agrarian economies as our "countries with abundant rural labor"; that name and its apt acronym, CARL, however, are from Kilby.

One consequence of collaboration by authors from three different generations of development economists is apparent in our Acknowledgments. Thanks to the wide range of our associates, we have been privileged to draw on the experience, knowledge, and judgment of a large number of colleagues. Without their advice and the pathbreaking work of Simon Kuznets, Kazushi Ohkawa, Hollis Chenery, Yujiro Hayami, and Vernon Ruttan, we could not have undertaken so ambitious a project.

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ACKNOWLEDGMENTS

before it got better. Wallis and Manning came through with funds for the editing that all coauthored books need, but few receive. Bruce Ross-Larson and Vince McCullough filled this need superbly. They gave us the breakthroughs in clarity and the reduction in length that we wanted so that the book would be accessible to a wide audience.

FRI hosted Tomich and Kilby during a summer of work with Johnston that was a turning point in completion of the first draft. Greg Binkert prepared a survey of rural finance that was of great assistance in Chapter 5 and made many useful comments on other chapters during that summer. At FRI, Sandra Bernard managed the production of the first draft. Sandra Fraley assisted in getting the enterprise established when it moved to HIID, and Neal Reenan provided helpful research assistance. Tomich is grateful to Clyde Evans for tactical suggestions for getting the job done. Katherine Yost deserves special appreciation for her role in producing a series of "final" versions and managing this increasingly complex undertaking through to completion.

Many scholars and practitioners helped us to shape our views on political economy. During his three years as a resident advisor at the Center for Policy and Implementation Studies in Jakarta, Indonesia, Tomich was privileged to work for an extraordinary practitioner, Ali Wardhana. That work and other advisory assignments undertaken through HIID provided an opportunity to test general propositions against the realities of development problems in Asia and Africa. Carl Gotsch and Michael Roemer, by example and guidance, showed what it takes to be an effective advisor. Tomich is indebted to his colleague Merilee Grindle for her perceptive insights on political economy and her encouragement to cross disciplinary boundaries. William C. Clark gave us an extremely useful assessment of the work at a crucial stage. In an earlier collaboration, which led to their book *Redesigning Rural Development* (1982), Clark provided Johnston with an intensive tutorial on the art and craft of policy analysis and a new appreciation of the importance of organizational issues. Our conversations and correspondence with Grace Goodell also influenced our thinking on these issues.

Kilby would like to acknowledge the Woodrow Wilson Center at the Smithsonian for providing a stimulating environment for his work on Chapters 2 and 6. His colleagues Carl Liedholm and Steven Haggblade enriched those chapters far more than the specific references to their work would indicate. Dennis Anderson and Stanley Lebergott also made valuable contributions to those chapters. Wesleyan University, beyond its generous sabbatical policy, extended two project grants that greatly facilitated Kilby's fertilizer investigation presented in Chapter 7. At an early stage in the work on nitrogen fertilizer, William Sheldrick at the World Bank provided valuable help relating to the technical and economic complexities of that industry.

Johnston has accumulated many intellectual debts in the years he has spent studying agriculture's role in economic development, but he wants to ac-

Robert Hindle, Jim Ito-Adler, Nathan Keyfitz, Peter Matlon, Leon Mears, Yair Mundlak, Doug Nelson, Pauline Peters, Steven Radelet, Marguerite Robinson, Michael Roemer, Vernon Ruttan, Donald Snodgrass, Peter Timmer, Donald Warwick, and Jerry Wells.

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Transforming Agrarian Economies

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INTRODUCTION

Some developing countries have made striking progress in transforming the structure of their economies, in raising productivity, and in reducing poverty. But in fifty-eight countries the majority of the labor force is still primarily dependent on agriculture. These include all of the poorest developing countries, and their 3.1 billion people account for almost 60 percent of the world's population.

Our goal is to present a comprehensive analysis of the state of the art in development strategy for these agrarian economies. Identifying important ideas that have withstood the test of time is central to this task. The relevance of these ideas to any country depends crucially on its stage of structural transformation. This is what led us to concentrate our analysis on the largest (and poorest) subset of contemporary developing countries, the fifty-eight "CARLs" we introduce in Chapter 1. For this reason, too, our pairs of historical comparisons are primarily concerned with the periods when each country fits this class.

Although CARL is an acronym for *c*ountries with *a*bundant *r*ural *l*abor, it is also a proper name, and its roots in ancient usage fit our subject: "carl" was the medieval term for "countryman" or "a man of the common people" and denoted the activities of farmers, workers, and craftsmen. If extended to include women, the economic activities encompassed by this meaning are also those that distinguish CARLs, where agriculture and the rural nonfarm economy predominate.

Why do governments seeking to transform agrarian economies sometimes seize opportunities and act with foresight? Why in other countries—or at other times—do governments not only miss opportunities but also pursue policies that hurt economic and social progress? What can be learned from experience to improve understanding of how countries with widespread, persistent poverty can increase the well-being of their people?

Early in our efforts to understand why some development opportunities have been seized and others missed, we found we had to push beyond the narrow focus on self-interest in the "new" political economy. We have adopted an eclectic view of alternative explanations of policy failures and successes, recognizing that, as with economics, politics involves opportunities as well as constraints. Our approach draws heavily on case studies and comparative historical analyses. This eclecticism was *necessary* because no single theory of political economy encompasses the range of real policy options. It was *useful* because analysis of actual experiences in developing countries demonstrates how strategies that emerge from real-world political economy reflect a mix of individual interests and what we call "strategic notions."

Since the mid-1970's development problems too often have been overshadowed by calls for direct action to alleviate hunger—and, more recently, by environmental issues. Although these are moral imperatives for all, this book will explain why CARLs need to give priority to transforming the structure of their agrarian economies and slowing the growth of their population. Famine relief efforts are rallied (rightly) by the "loud crisis" of starvation, but the effects of famine are minuscule compared with the "quiet crisis" of chronic hunger and persistent poverty. In 1987 more than 5.5 million children under age five died in India, Indonesia, and China alone (Ross and others 1988, p. 8)—deaths due mainly to chronic hunger and disease resulting from mass poverty. In 1974 the call of the World Food Conference for the eradication of hunger by 1985 was no more than rhetoric, albeit well meaning. When scarce resources are wasted on such unfeasible goals, less ambitious but more realistic programs are neglected—and poor people continue to suffer.

The structural and demographic characteristics of CARLs impose harsh constraints on the development options that are feasible. Until a CARL reaches the turning point when the absolute size of its farm population begins to decline, it must give priority to developing the rural economy. This book sets out a development strategy to raise agricultural productivity and expand rural employment—a strategy in which speeding structural transformation is but a part. With technological change, increased specialization, and growth in stocks of capital (human and institutional, as well as physical), longer-term structural and demographic changes make it possible to eliminate hunger permanently. Furthermore, the transformation of

an overwhelmingly agrarian economy into a diversified, predominantly industrial, and more productive economy eases the severe resource constraints that poor countries face in coping with environmental problems. But any such strategy needs to be supplemented by programs that give a country's population, rural as well as urban, access to education and basic health services. Moreover, these social programs complement family planning programs and thereby contribute to the slowing of population growth.

THE RURAL ECONOMY IN THE DEVELOPMENT PROCESS

Chapter 1 describes the essence of CARLs in order to come to grips with crucial issues: Why is poverty still prevalent? How can the alleviation of poverty and hunger best be accelerated?

No CARL can eliminate widespread hunger and poverty or muster the economic and scientific resources to deal with environmental problems without structural transformation—from an overwhelmingly rural economy to a diversified, predominantly industrial economy. Chapter 2 describes the patterns in this transformation of economic structure. It also emphasizes that these complex processes depend on technological change and on each nation's history, physical environment, institutions, and human resources.

Patterns of agricultural development during structural transformation are diverse, as Japan and the United States show (Chapter 3). The case study of their transformations from nineteenth-century CARLs to industrial giants in the twentieth century demonstrates the role of strategic notions—the key ideas that enabled policymakers in each of these success stories to act with foresight to seize political and economic opportunities. Indeed, certain strategic notions were crucial in shaping the effective development strategies these two countries pursued. This theme is extended to today's CARLs in the balance of the book.

FROM STRUCTURE TO STRATEGY

Part 2 analyzes sectors within the rural economy, the relationships between the farm and nonfarm rural sectors and between those sectors and the rest of the economy, and the impact of certain macroeconomic and social policies on the rural economy. These economic relationships, in turn, are the basis for assessing prevailing strategic notions and for identifying feasible development strategies.

Agriculture, of course, is crucial in the rural economy, and much attention is given to both the rate and pattern of agricultural development (Chapters 4 and 5). But nonfarm activities and policies that affect interac-

tions between agriculture and industry also are important determinants of employment and income (Chapters 6 and 7). Ultimately, the major strategic question regarding rural nonfarm activities and industrial strategy is the same as it is for agricultural development: What policies can help raise productivity and increase employment opportunities?

Any strategy to develop agriculture and the rural economy needs time. Why not attack the most serious effects of chronic hunger, as in famine relief, by targeting food and other assistance to help those most in need? Famine relief is feasible because the food and money needed to relieve the worst effects are small on a global scale, and the needs are intermittent, often concentrated in regions within countries. Political and logistical problems are the main barriers to famine relief, not food supply and financing.

Chronic hunger is dispersed across more than fifty-eight countries. Raising hundreds of millions out of chronic poverty is a far different problem from staving off famine deaths. Deciding how much direct action is feasible as a means of alleviating mass poverty is complex. The issues need to be placed in a broader context of available options (Chapter 8).

CHOICES AND CONSEQUENCES

Perhaps the most difficult challenge of development in CARLs is to strike a balance between government responsibilities and available resources. Another crucial factor in success or failure is whether opportunities are perceived and acted upon—and whether the "right" opportunities are seized, not just by government, but by farmers, traders, manufacturers, and other economic agents. Research and analysis are useful to guide policy choice; but there will remain large areas of uncertainty, and some choices will' prove wrong.

Often policy "mistakes" are simply a matter of some individuals acting out of self-interest at the expense of broader social objectives. But ill-advised actions also result from self-delusion or genuine uncertainty about consequences of particular policies. For example, misguided strategic notions—not just rent seeking—led to waste of billions of dollars in the inefficient quest by many developing countries for fertilizer self-sufficiency (Chapter 7).

Part 3 develops the links between analysis of the rural economy and the political economy of CARLs through historical analyses of development strategy in three pairs of countries: China and the USSR (Chapter 9), Taiwan and Mexico (Chapter 10), and Kenya and Tanzania (Chapter 11). Strategic opportunities and pitfalls depend on circumstances. Each case demonstrates how the interplay between ideas and action affects the opportunities seized and missed under the circumstances of specific countries. These cases illuminate the role of strategic notions—often derived from experience—in shap-

ing policy responses to opportunities and constraints. The conclusion takes a broader look at the forces shaping strategy, demonstrating the role of strategic notions within the complex political economy of CARLs.

Structural transformation takes decades. Yet, there are many pressures to respond to immediate problems. Thus it is especially important that the strategic notions held by policymakers in CARLs be consistent with the constraints and opportunities in their economies, particularly their rural economies. These notions can offer clues about where to invest attention, where to focus effort to learn, and where payoffs to enhanced capacity are likely to be highest. The last thing we wish to do is to promote more "blueprints." Our aspiration is to provide policymakers and others sharing our interest in development with a starting point for focusing, questioning, and revising their strategic notions to improve development outcomes.

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PART ONE

THE RURAL
ECONOMY
IN THE
DEVELOPMENT
PROCESS

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CHAPTER ONE

POVERTY AND THE RURAL ECONOMY

T his book focuses on a particular sub-
set of developing countries: coun-
tries with abundant rural labor
(CARLs). The defining characteristic of these countries is that 50 percent or
more of their labor force is engaged in agriculture and other rural activities.
Integrally associated with their defining attribute, all CARLs manifest two ad-
ditional features: (1) low per capita income and (2) low productivity of farm
labor. Most CARLs also have high population growth rates and inequitable
distribution of land. Not all of the Third World shares these attributes, Latin
America in particular having only three countries where a majority of the labor
force is engaged in the rural economy. But all those countries that do possess
these structural and demographic features—accounting for almost 60 percent
of the world's population—face a distinctive set of problems.

LOW PRODUCTIVITY AND RURAL POVERTY

CARLs by definition are at an early stage of structural transformation—
the process by which economic activity and the distribution of labor shift
from predominantly agriculture to industry and services (see Chapter 2). For
most CARLs, it will be decades before they reach the *structural transfor-
mation turning point*, when the absolute size of the agricultural work force

begins to decline. Until then, poverty can be alleviated only if productivity and employment in the rural economy are increased. But how?

The Fifty-eight CARLs

In 1990 there were 58 countries, including all the poorest developing countries, where half or more of the work force was primarily dependent on agriculture (see Table 1.1).[1] Broadly, agricultural employment predominates where average income is low. Of 40 countries with a gross national product (GNP) of U.S.$500 or less per capita in 1990, 37 reported that 50 percent or more of the labor force was dependent on agriculture (World Bank 1992b). The three exceptions (Guyana, Sao Tome and Principe, and Maldives) each had a population of less than one million in 1990. Only one country with per capita GNP of more than U.S.$2,500 qualifies as a CARL—Gabon, whose middle-level income stems from its mineral wealth.

The 58 CARLs were home to more than 3.1 billion people in 1990, 59 percent of the world's population. Of the 3.1 billion, 84 percent lived in Asia, with 77 percent in China, India, Pakistan, Indonesia, and Bangladesh. The population density in many Asian countries is exceptionally high, and in Bangladesh and on the Indonesian island of Java population densities are among the highest in any rural area. Diminishing returns to agricultural labor are thus an especially important barrier to increasing productivity.

Only 15 percent of the people in CARLs lived in sub-Saharan Africa in 1990, even though all the region's countries are CARLs, except Namibia and South Africa. This is the one major region where fertility has remained high despite declines in mortality rates. The rate of natural increase there has risen steadily, from an estimated 2.1 percent in 1950 to 2.7 percent in 1965 and 3.1 percent in 1980.[2] For nineteen African CARLs (including Kenya and Tanzania), the projected population growth rate for 1989–2000 is between 3 and 3.9 percent per year (Table 1.1).

Few Latin American countries are CARLs. Agriculture accounts for a majority of the labor force only in Haiti, Honduras, and Guatemala. For most

[1] We do not want to suggest that economic development priorities for Indonesia or Pakistan, which both were about to pass below our 50 percent cutoff in 1990, necessarily differ significantly from, say, the Philippines or Myanmar (formerly Burma), each with 46 percent of its labor force primarily engaged in agriculture in that year. Although any cutoff has an arbitrary element, 50 percent—a simple majority—is intuitively appealing as a means to distinguish predominantly agrarian economies. Moreover, China is the only country among our fifty-eight CARLs that is likely to reach its structural transformation turning point before it passes the 50 percent cutoff. There are, on the other hand, a number of pre–turning point countries such as Mexico (Chapter 10) that are not predominantly agrarian.

[2] The *rate of natural increase* is the crude birth rate minus the crude death rate. The rate of population growth is the rate of natural increase net of migration. "Crude" rates simply are the occurrence of a particular vital event divided by the population in question, usually expressed per 1,000. Thus, unlike the total fertility rate discussed in Chapter 8, crude birth and death rates are influenced by the age structure of the population.

Table 1.1. GNP, share of economically active population in agriculture, and population for 58 CARLs in 1990 and population growth rate projections, 1989–2000

	GNP per capita (U.S. $)	Labor force in agriculture (%)	Population (thousands)	Population growth rate (% per annum, 1989–2000)
GNP/capita $500 or less				
Mozambique	80	82	15,656	3.0
Tanzania	110	81	27,318	3.1
Ethiopia	120	75	49,240	3.4
Somalia	120	71	7,497	3.1
Nepal	170	92	19,143	2.5
Guinea-Bissau	180	79	964	—
Chad	190	75	5,678	2.7
Bhutan	190	91	1,516	2.4
Lao PDR	200	72	4,139	3.2
Malawi	200	75	8,754	3.4
Bangladesh	210	69	115,593	1.8
Burundi	210	91	5,472	3.1
Zaire	220	66	35,568	3.0
Uganda	220	81	18,794	3.3
Madagascar	230	77	12,004	2.8
Sierra Leone	240	62	4,151	2.6
The Gambia	260	81	861	—
Mali	270	81	9,214	3.0
Nigeria	290	65	108,542	2.8
Niger	310	87	7,731	3.3
Rwanda	310	91	7,237	3.9
Burkina Faso	330	84	8,996	2.9
Equatorial Guinea	330	56	352	—
India	350	67	853,094	1.7
Benin	360	61	4,630	2.9
China	370	68	1,139,060	1.3
Haiti	370	64	6,513	1.9
Kenya	370	77	24,031	3.5
Pakistan	380	50	122,626	2.7
Ghana	390	50	15,028	3.0
Central African Republic	390	63	3,039	2.5
Togo	410	70	3,531	3.2
Zambia	420	69	8,452	3.1
Guinea	440	74	5,755	2.8
Sri Lanka	470	52	17,217	1.1
Comoros	480	79	550	—
Mauritania	500	64	2,024	2.8
Other "low income"				
Afghanistan	—	55	16,557	—
Cambodia	—	70	8,246	1.9
Liberia	—	70	2,575	3.0
Sudan	—	60	25,203	2.8
Vietnam	—	61	66,693	2.1

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Table 1.1.   (Continued)

	GNP per capita (U.S. $)	Labor force in agriculture (%)	Population (thousands)	Population growth rate (% per annum, 1989–2000)
GNP/capita $500 to $2,500				
Lesotho	530	80	1,774	2.6
Indonesia	570	50	179,378	1.6
Honduras	590	55	5,138	2.9
Zimbabwe	640	68	9,709	2.4
Senegal	710	78	7,327	3.1
Côte d'Ivoire	750	56	11,997	3.5
Swaziland	810	66	788	—
Papua New Guinea	860	67	3,874	2.3
Guatemala	900	51	9,197	2.8
Cameroon	960	61	11,833	2.9
Congo	1,010	60	2,271	3.3
Thailand	1,420	64	55,702	1.4
Botswana	2,040	63	1,304	2.5
Angola	—	70	10,020	—
Yemen	—	56	11,687	3.7
GNP/capita greater than $2,500				
Gabon	3,330	68	1,172	2.8

Sources: GNP per capita and projected population growth rates: World Bank 1992b. Population and agriculture's share of labor: FAO 1992, except for Indonesia, for which data come from the Central Bureau of Statistics, Jakarta.
Note: The World Bank's (1992b) cutoff for "low income" was U.S.$610/capita.

countries in Latin America, structural transformation has already reduced the share of agriculture in the labor force below one-third, for example, to less than 15 percent in Argentina and Chile.

Structural Transformation Turning Point

Rapid population growth in many CARLs means that they have similarities in demography, as well as in economic structure and agricultural productivity. Because there are more young people in CARLs, population growth will persist even if fertility falls sharply because a large proportion of people have yet to reach reproductive ages (Figure 1.1).[3]

[3] Especially in sub-Saharan Africa, AIDS has the potential to alter significantly these medium-term projections of growth in population and labor force because it affects "primarily prime-aged adults in their economically most productive years, who acquire HIV mainly through heterosexual intercourse and young children, who acquire it from their mothers at birth" (Ainsworth and Over 1994, p. 204).

Figure 1.1.   Comparison of age distribution of populations of developing countries
and high income countries, 1990 and 2025

LESS-DEVELOPED COUNTRIES

DEVELOPED
COUNTRIES

AGE IN YEARS

MILLIONS   MILLIONS

Rapid growth of the population of working age and the size of the rural
labor force limit the rate at which workers can be shifted to higher-pro-
ductivity, nonfarm jobs. Thus, in a mainly agrarian economy (and even with
rapid growth in urban industry and services), the relative size of the rural
labor force will fall slowly. Consider a simple two-sector model. If the labor
force is increasing at 2 percent a year, if agriculture's initial share of the
work force is 80 percent, and if nonfarm jobs are expanding at 4 percent a
year, it will take 47 years to reach the structural transformation turning
point. If the total labor force grows at 3 percent instead, it will take 142
years (Box 1.1).

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The timing of the structural transformation turning point—when the absolute size of the agricultural labor force (L_a) peaks and begins to decline—is sensitive to three parameters: (1) agriculture's initial share of the total labor force (L_a/L_t), (2) the rate of growth in the nonagricultural work force (L'_n), and (3) the rate of growth in the total labor force (L'_t)·L'_a can be expressed in the identity:

$$L'_a \equiv \left(L'_t - L'_a\right) \frac{1}{L_a/L_t} + L'_n.$$

In the table, constant rates of change are used in a two-sector framework to show the impact of these parameters on the timing of the turning point.

Initial L_a/L_t (%)	L'_n (%)	L'_t (%)	$L'_n - L'_t$ (%)	L_a/L_t at turning point (%)	Years to turning point
80	4	2	2	50	47
80	4	3	1	25	142
80	5	3	2	40	58
80	6	3	3	50	32
60	5	3	2	40	20

The higher agriculture's initial share, the longer it takes to reach the turning point. For countries such as Kenya or Tanzania, with agriculture's initial share of the labor force at 80 percent and the growth rate of the total work force at 3 percent, it would take 58 years to reach the turning point even with rapid growth of 5 percent in the nonagricultural labor force. For the same growth rates, but with agriculture's initial share at 60 percent, that point is reached in 20 years.

The difference between the growth rates of the nonagricultural labor force and the total labor force ($L'_n - L'_t$) is the coefficient of differential growth. If L'_n is less than or equal to L'_t, structural transformation will not occur. The greater the coefficient of differential growth, the sooner the turning point is reached. Yet, with 80 percent of the labor force dependent on agriculture and growth in the total work force of 3 percent per year, it still takes 32 years before the agricultural labor force peaks—even with a high rate of growth of 6 percent in the nonagricultural work force.

There are three caveats to these calculations. First, the agricultural sector is assumed to be the residual employer, so rural nonfarm activities and the urban informal sector are ignored. In general, these (diverse) activities share the low labor productivity and low returns to labor that characterize agriculture in CARLs. Second, it is assumed that labor force growth has no impact on the rate of growth in the nonagricultural work force. But in practice, this labor force growth would

generate demand for goods outside the agricultural sector and lead to some ex-
pansion in nonagricultural employment (see Chapter 6). Third, rural–urban mi-
gration responds to economic stimuli, including intersectoral wage differentials.
Even allowing for these caveats, the message is simple: for most CARLs the struc-
tural transformation turning point still is decades away.

Of all CARLs, China, Indonesia, and Thailand have the best hope of reach-
ing the structural transformation turning point before 2000.[4] The absolute
size of the rural labor force of most other CARLs will continue to increase
well into the next century. In Kenya and Tanzania the share of agriculture
will decline from more than 75 percent of the labor force in 1990 to about
two-thirds by 2010, but the size of the agricultural labor force will increase
by 50 to 80 percent (Table 1.2).[5] By 2025 the agricultural labor force in each
country could be twice what it was in 1990. Simply absorbing that many
workers at current wage levels will be a major challenge—let alone expanding
labor demand sufficiently to increase wages in the rural economy.

The number of workers dependent on agriculture will increase even with
more modest rates of labor force growth. India's labor force is projected to
grow at under 2 percent a year for 1990–2000 (Table 1.3). But because two-
thirds of its labor force depended on agriculture in 1990 and growth rates
in the rest of the economy were projected to continue at 2.5 to 3 percent,
India's agricultural labor force may not peak until 2020–25, by which time
it may have grown by more than 60 million (30 percent) over the 1990 level.
Even in countries where agriculture has fallen to almost 50 percent of the
labor force—such as Afghanistan, Pakistan, Sri Lanka, and Guatemala—the
rural work force will continue to increase for years.

In most postindustrial countries the size of the agricultural labor force began
to decline before the relative share of agricultural labor was below 50 per-
cent. But Cownie (1969, p. 303) has shown that, unless the rate of growth
of nonfarm employment is more than twice the rate of growth of the total
labor force, the structural transformation turning point will *come* after the
agricultural share of the labor force falls below 50 percent. In Mexico, for

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[4] Policy priorities and opportunities may shift after the turning point. For a review of issues
facing Indonesia as it approaches its turning point, see Tomich 1992a.
[5] The Food and Agriculture Organization (FAO) projections for all fifty-eight CARLs of the
share of the agricultural labor force for 1985–2025 are based on the actual trend in structural
transformation for 1950–80. Then, the shares projected by the FAO were used with International
Labor Organization (ILO) projections of labor force participation rates and the UN's medium
variant population projections to obtain estimates of the size of the labor force dependent on
agriculture and nonagriculture (see FAO 1986 for details).

Table 1.2.   Economically active population primarily dependent on agriculture, 1990, with projections for 2000, and 2010, and maximum size attained between 1990 and 2025, for selected CARLs

	Share of labor force (%)			Total (in thousands)			Maximum (1990–2025) total		
								(in thousands)	Total as % of 1990
	1990	2000	2010	1990	2000	2010	Year		
Tanzania	81	75	68	10,315	12,758	15,891	2025	20,948	203
Bangladesh	69	62	54	23,193	25,221	31,664	2025	34,327	148
Nigeria	65	61	58	26,577	34,259	44,319	2025	66,444	250
India	66	63	60	214,664	243,512	266,164	2020–2025	277,297	129
China	67	60	52	458,428	455,367	417,907	1995	463,070	101
Kenya	77	72	67	7,645	10,438	14,060	2025	20,536	269
Indonesia	50	40	32	35,769	34,884	32,757	1990	35,769	100
Thailand	64	57	50	18,990	19,685	19,171	2000	19,685	104

Sources: For 1990: Same as Table 1.1, except for Indonesia, for which data come from Manning 1992. For projections: UN 1988b.
Note: Countries are listed in ascending order of per capita GNP for 1990.

Table 1.3.   Projections of growth rates of economically active population, 1990–95 and 1995–2000, for selected CARLs

	Total labor force		Segment primarily dependent on agriculture		Segment primarily dependent on non-agriculture	
	1990–95	1995–2000	1990–95	1995–2000	1990–95	1995–2000
Tanzania	3.11	3.22	2.27	2.27	5.87	5.86
Bangladesh	2.94	2.83	1.78	1.56	4.97	4.74
Nigeria	2.90	2.99	2.33	2.40	3.90	3.97
India	1.88	1.69	1.37	1.16	2.86	2.64
China	1.33	0.93	0.19	−0.33	3.55	3.01
Kenya	3.69	3.74	3.08	3.07	5.62	5.61
Indonesia	2.20	1.97	0.28	−0.09	3.88	3.49
Thailand	1.70	1.42	0.56	0.17	3.63	3.23

Source: UN 1988b.
Note: The projections in this table are derived from the projections for the absolute size of the labor force and its segments. As a result, they are likely to be even more sensitive to divergences from the underlying assumptions than the aggregate projections presented in Table 1.2. In particular, the projected rates of growth in the nonagricultural segment simply reflect continuation of the trend for 1950–80 in the rate of structural transformation. They do not consider directly the economic factors that will affect the growth in manufacturing and services that will determine these rates in actuality. Thus, they indicate the growth rates necessary for trends to continue and are not economic forecasts.
Countries are listed in ascending order of per capita GNP for 1990.

example, the agricultural labor force fell below half in the 1960s, but the UN projects that its absolute size will grow until at least 2005 (see Chapter 10).

A rate of growth of employment in the nonfarm sectors of more than 4 percent would accelerate the rate of structural transformation (Box 1.1). But history shows that such growth rates are hard to sustain. With the exception

of the United States in the three decades ending in 1850 and South Korea with rates as high as 8 percent a year from the 1960s through the mid-1980s, the rate has rarely exceeded 4 percent anywhere for prolonged periods. Countries with a small industrial base, such as Bangladesh, Kenya, and Tanzania, may be able to achieve rates of growth in nonfarm jobs of more than 5 percent a year in the early stages of transformation. But it seems unlikely that these rates could be sustained for decades, much less the 6 percent needed to achieve the structural transformation turning point while their labor force remains predominantly agricultural. Furthermore, the experience of the Soviet Union, reviewed in Chapter 9, demonstrates the human costs and economic hazards of attempting to force rapid industrialization.

The UN (1988b) projections suggest that although 19 of today's 58 CARLs will have less than 50 percent of their labor force in agriculture in 2010, only 11 (including China and Indonesia) will reach their structural transformation turning point before 2025. For the rest (35 of 40 CARLs in Africa, all 3 Latin American CARLs, and 9 of 15 in Asia) there will be continuing growth in the numbers dependent on employment in the rural economy. By 2010 there is likely to be a net increase of over 100 million people (10 percent) in the agricultural labor force of the 58 CARLs, even allowing for declines of about 40 million in China and 1.8 million in Indonesia. Excluding China and Indonesia, the United Nations projects a net increase of 145 million by 2010, more than 30 percent more than those dependent on agriculture and other rural activities in 1990.

Low Labor Productivity in Agriculture

Low productivity is the root of poverty, and there is a large and growing gap in the agricultural labor productivity of rich and poor countries. Between 1960 and 1980, the rate of increase in farm labor productivity in most CARLs has not kept pace with increases in land productivity (Table 1.4). For the twelve lowest-income countries in their analysis (including CARLs such as Bangladesh, India, Pakistan, and Sri Lanka), Hayami and Ruttan (1985, p. 418) found that growth of labor productivity (that is, output per male farm worker) declined sharply from 2.3 percent a year in the 1960s to only 1 percent a year in the 1970s.[6]

An already huge gap in agricultural labor productivity between rich and poor countries is becoming enormous. Consider an extreme example,

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[6] Hayami and Ruttan restricted calculations to the *male* labor force to improve the cross-country comparability of their results. Because there is great variability in the definitions used to determine whether women members of farm households are or are not included in the farm labor force and even greater variation in actual coverage of women's activities in these surveys, reasonable estimates for a complete cross-country comparison are not available. The statistical and substantive issues of women's labor force participation are considered later in this chapter.

Table 1.4   Agricultural productivity differentials, 1960 and 1980

	Output per male worker in wheat units		Output per hectare in wheat units		Hectares per male worker		Labor force in agriculture,
	1960	1980	1960	1980	1960	1980	1980 (%)
Bangladesh	2.0	1.8	2.51	3.51	0.8	0.5	75
India	2.2	3.1	1.06	1.58	2.0	2.0	70
Egypt	4.4	4.6	6.90	9.18	0.6	0.5	46
Colombia	8.3	17.2	0.79	1.37	10.15	12.5	34
Brazil	9.3	13.2	0.56	0.72	16.7	18.3	31
Mexico	5.1	7.5	0.27	0.52	19.4	14.3	37
Taiwan	7.1	12.4	10.34	18.65	0.7	0.7	18[a]
Japan	10.3	27.8	8.64	12.23	1.2	2.3	11
United States	93.8	285.1	0.80	1.16	117.0	246.6	4

Sources: Data for Taiwan are from *Industry of Free China*, various issues, except agricultural labor force. Other data are from estimates by Hayami and Ruttan 1985 for forty-four countries. The common numerator of "wheat units" was obtained by converting the output of other crops and livestock products into tons of wheat based on their value relative to the price of wheat. See Hayami and Ruttan 1985, pp. 447–65, for details of their computations. Data on labor force in agriculture are from World Bank 1988b, pp. 282–83, except for Taiwan, which is from Chakravarty 1990, p. 141.
[a]The Taiwanese agricultural labor force figure is for 1984, not 1980.

Bangladesh and the United States. Between 1960 and 1980 agricultural labor productivity in the United States increased threefold, whereas output per male worker in Bangladesh declined from 2 to 1.8 "wheat units"—an astounding 158-fold difference in productivity in 1980 compared with 47-fold in 1960.

Both the United States and Bangladesh showed increases in agricultural output of roughly 40 percent in 1960–80. But in Bangladesh over those two decades, there was a 57 percent increase in the male farm work force, from 12.1 to 19.1 million, whereas in the United States the male farm work force declined from 3.8 to 1.7 million. The striking contrasts in the levels and changes in hectares cultivated per male farm worker—up from 117 to 247 hectares in the United States and down from 0.8 to 0.5 in Bangladesh—are attributable entirely to the contrasting changes in the size of the agricultural labor force. Efforts to raise rural incomes must address this problem of low labor productivity resulting from diminishing marginal returns to labor.

Inequitable Distribution of Agricultural Land

Because of the age profile of CARL populations (suggesting many new entrants to the rural labor force) and because of the relatively fixed supplies of agricultural land, typical farms in CARLs, already small, will become smaller. Between 1953–54 and 1971–72 there was a 66 percent increase in the number of farm households in India, but cultivated area increased by only 2 percent (Vyas 1979). The average size of farm holdings fell from 2.5

to 1.5 hectares, and the number of marginal holdings of less than half a hectare more than doubled. According to Kurian (1990), more than 75 percent of Indian farm units were smaller than 2 hectares in 1985–86, and this could rise to 80 percent by the end of this century.

Although the typical CARL farm is small, there is great variation across countries in *agrarian structure*—that is, in the distribution of farms around the mean farm size. The degree of skewness in the distribution of farms by size can range from a *unimodal structure* with most farms clustered around the mean size, to a highly skewed, *bimodal structure* in which most of the land is operated by a few large farms (Box 1.2). This bimodal structure accentuates the tendency toward small farm holdings and disparities in income among rural households.

The rural poor in CARLs, especially in Asia, also include many households with little or no land, although the difference between these "landless" households and those operating small farms may be one of degree rather than of kind (Singh 1983).

Both depend heavily on wages earned in rural labor markets. For example, in the 1970s, nearly two-thirds of the rural labor force in India depended on wages as their primary source of income (although roughly 15 percent worked primarily in nonagricultural jobs) (Singh 1983, pp. 385–86).

Landless households and those dependent on wage labor to supplement their own agricultural production are usually poorer than households with farms of a hectare or more. Estimates for India, Bangladesh, and Pakistan suggest that these poorer, wage-dependent households also are more numerous (Singh 1983, pp. 395–96). In South Asia in 1980 17 percent of rural households were landless. Another 30 percent were "near landless" or marginal farmers who depended on wages to supplement earnings, and those numbers probably are increasing in most CARLs.

HAZARDS, DIVERSITY, AND HOUSEHOLD STRATEGIES

The household is the center of economic decisions in most rural economies. Access to productive resources varies according to the size and age structure of the household, to its members' wealth and power, and to experience, skill, and luck. Households differ according to the quantity and quality of farm land they control, their agricultural and nonfarm activities, and options for use of their time and skills. Wealthy rural households control more resources—land, labor, and capital. Poor households have relatively abundant family labor but limited access to other resources.

Expenditures on chemical fertilizer, hired labor, and farm tools, or on consumer goods and services are constrained by the poor household's limited cash receipts. Farms that do not market any of their production (subsistence farms) have extremely low levels of consumption (as well as production). If

Box 1.2. Unimodal and Bimodal Patterns of Agrarian Structure

Although the average farm in most CARLs is small, the agrarian structure may be characterized by a subsector of large farms using technologies drastically different from those employed by the majority of small-scale farmers. The range can be seen by comparing the *unimodal* pattern in Taiwan (figure, Panel A) with the *bimodal* pattern in Colombia (figure, Panel B).

Distribution of number of operational units and of area cultivated by farm size.
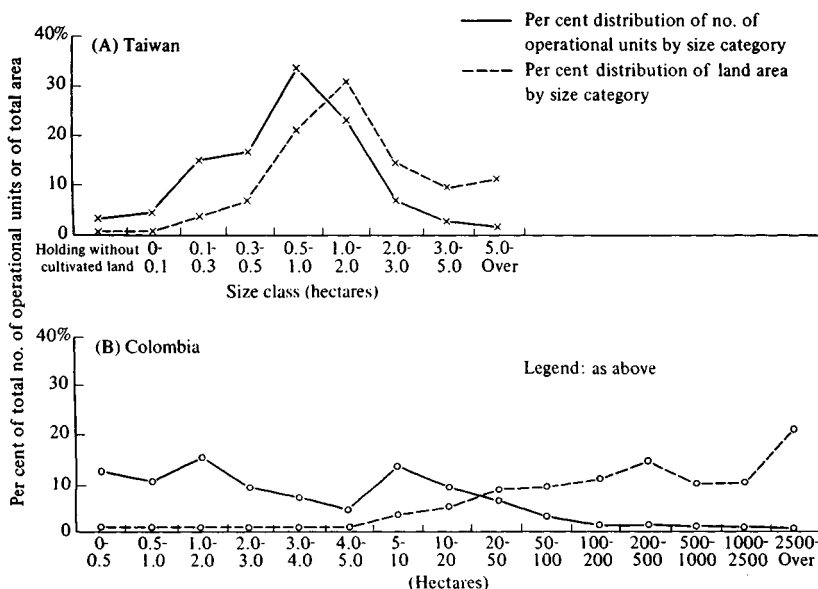
First, contrast the size distribution of land holdings in Taiwan and Colombia. The broken line showing the distribution of agricultural land by size in Taiwan lies only a little to the right of the solid line showing the percentage of farm households in each size category. Although farm units in Taiwan vary in size, most are equally small: four-fifths are within 1 acre of the average size of 3.2 acres (1.2 hectares). In Colombia the distribution of agricultural land by size is radically different from the size distribution of farm operational units. Virtually all farm households are in the size categories of 5 to 10 hectares or less, whereas nearly all of the agricultural land is controlled by a small number of large farms, ranging in size from 50 to 1,000 hectares or more.

Source: Johnston and Kilby 1975, p. 15.

market outlets exist, growth in output translates into growth in marketable surplus and, hence, growth in cash receipts. Thus, the commercialization of farming is really about increasing participation in markets for agricultural goods and for labor.

In poor households investment decisions focus on the allocation of family labor and the division of income between investment in productive assets and immediate consumption. Often investments are subtle quality shifts in the factors of production: acquiring better livestock, planting trees, or adopting new methods of production. These decisions can have a significant impact on production, even if barely perceptible to outsiders.

Hazards of Life in the Rural Economy

Poor households must devote much of their effort and income to obtaining food, and although there is a positive (but imperfect) relationship between income and calorie supply (Table 1.5), chronic hunger is only one result of mass poverty. Poor households also are the most vulnerable to disease and the least able to compensate for income lost owing to sickness or death. Thus, it is inevitable that such households incorporate risk considerations into their decisions, because a failed investment, sickness, or death of an income earner can plunge the family into financial disaster.

Average life expectancy at birth in Japan is 65 percent longer than in Tanzania (Table 1.5). In especially vulnerable groups, such as infants, preschool children, and women in their childbearing years, the hazards of poverty are even starker. Infant mortality in Tanzania or Bangladesh is twelve times the rate in the United States and over twenty times that in Japan. Of one-year-old children in India, Kenya, and Indonesia, more than one in twenty die before reaching age five. In Bangladesh, Tanzania, and Nigeria, this child mortality rate is almost one in ten (see Ross and others 1988). But these are national figures and may understate the magnitudes for rural areas. The World Bank (1990, p. 31) reports that the rural infant mortality rate in India (105) was almost twice the urban rate (57) in the 1980s.

Differences in childhood mortality result from the conditions of poverty: undernutrition, disease, and such other risks as poor sanitation and inadequate public health services. Innocuous childhood illnesses in high-income countries, such as measles, are killers for undernourished children. According to the Commission on Health Research and Development (1990, p. 38), acute respiratory infections, diarrheal diseases, and immunizable diseases kill 9 to 21 million people a year in developing countries, mostly children.

Damage from poverty starts before birth. Low birth weight is a symptom of maternal undernutrition and usually means higher infant mortality and poor growth. More than 40 percent of infants in Bangladesh weigh less than 2.5 kg at birth, compared with 5 percent in Japan. Moreover, the risk of

Table 1.5   Income per capita, daily calorie supply, life expectancy at birth, and rates of infant mortality, low birth weight, and maternal mortality in selected countries

	GNP per capita (1990 U.S.$)[a]	Daily calorie supply per capita (1989)[b]	Life expectancy at birth (1990, years)[c]	Infant mortality rate (per 1,000 live births, 1990)[d]	Babies with low birth weights (%, 1980–88)[e]	Maternal mortality per 100,000 live births (1988)[f]
Tanzania	110	2,206	48	115	14	600
Bangladesh	210	2,021	52	105	47	650
Nigeria	290	2,312	52	98	20	750
India	350	2,229	59	92	30	550
China	370	2,639	70	29	9	130
Kenya	370	2,163	59	67	15	400
Indonesia	570	2,750	62	61	14	300
Egypt	600	3,336	60	66	5	300
Colombia	1,260	2,598	69	37	8	150
Thailand	1,420	2,316	66	27	12	180
Malaysia	2,320	2,774	70	16	10	120
Mexico	2,490	3,052	70	39	12	150
Brazil	2,680	2,751	66	57	8	230
Taiwan	3,897	2,969	73	6	—	19
United States	21,790	3,671	76	9	7	9
Japan	25,430	2,956	79	5	5	15

Sources: (a) World Bank 1992b, pp. 218–19, except Taiwan, which is for 1986 (in 1986 U.S.$) and is from Republic of China 1992. b) World Bank 1992b, pp. 272–73, except Taiwan, which is for 1986 and is from Republic of China 1986. (c) World Bank 1992b, pp. 218–19. (d) World Bank 1992b, pp. 272–73 (e) UNDP 1992, pp. 148–49, except for Japan and the United States, which are for 1985 and are from World Bank 1992b, pp. 272–73, respectively. *Low birth weight* means less than 2,500 g at birth. (f) UNDP 1992, pp. 150–51, except for Japan and the United States, which are for 1980 and are from World Bank 1992b, pp. 280–81.

death during childbirth or postnatally is at least sixty times greater for women in Tanzania or Bangladesh than for women in the United States. The risks in Nigeria may be even greater. Births per woman also are substantially higher in CARLs. For example, a woman in the United States typically would give birth twice in her lifetime, but in Bangladesh five births per woman is usual. Thus, the risks are even larger than these statistics suggest.

Adapting Agricultural Techniques

New agricultural technology has been the most important source of increases in agricultural productivity, but, as discussed in Chapter 4, new techniques also *may* involve greater risk. The 40 percent increase in output per hectare in Bangladesh in 1960–80 and the near 50 percent increase in out-

put per hectare in India (Table 1.4) resulted from new semidwarf varieties of rice and wheat.

The effect on yields of this seed-fertilizer technology (known as the "Green Revolution") is most striking where irrigation projects improved water control. But yield increases do not rest on new inputs alone. Technical know-how must be supplemented by experience, gained over generations and under local conditions, and by farmers' informal trials over successive seasons.

Farmers display remarkable success in working within the bounds imposed by their natural environment and available resources, which span a huge variety of agronomic conditions. They have no choice but to make the best possible use they can of the land available to them. Through a long process of natural and human selection, traditional rice types have evolved that are well suited to physical and economic conditions prevailing in a wide variety of production systems. In many areas farmers have developed varieties that are tall, profuse in their leaf growth, delayed in flowering, and of long duration to maturity. Height provides protection against floods if rains are unusually heavy. Large drooping leaves shade out weeds that would compete for limited nutrients and sunlight. Because there is considerable cloud cover in the tropics during the wet season, late flowering and delayed maturity permit grain formation—the period when greatest photosynthetic activity occurs—to take place after the rains when strong sunlight is available. Beyond a certain minimal threshold, grain yields of typical traditional varieties are relatively insensitive to variations in the level of nitrogen. Indeed, as shown in Figure 1.2, application of nitrogen fertilizer to traditional rice varieties may even lower yield because excessive growth of their stalks will lead to lodging. Nevertheless, these varieties are suited to many farmers' needs because they can accommodate limited ability to finance input purchases and soils with low average nutrient levels while keeping financial risks and yield fluctuations within generally acceptable ranges.

Farmers' adaptation of traditional varieties to adverse growing conditions is as remarkable as the scientific innovations that led to fertilizer-responsive rice varieties. Of course, a great deal of time elapsed while farmers used trial and error to adapt production systems to the specific environments they must work with; scientific research can produce faster results for specific agricultural problems. The power of science lies in meaningful abstraction, rigorous methodology, and the guidelines of theory. In contrast, the experience of farm people embodies the details of complex agricultural production systems. This understanding is particularly important in adapting techniques to adverse conditions and for exploiting unusual local opportunities. Indeed, rather than exemplifying a dichotomy between adoption of researchers' products and adaptation of traditional techniques, it is clear that the role played by farmers is important in adapting the products of scientific research. For example, Bangladeshi farmers make their

Figure 1.2.   Yield response of rice to nitrogen, by variety and type of irrigation, synthesized farm-level functions for the Philippines

Yield (t/ha)

Nitrogen (kg/ha)
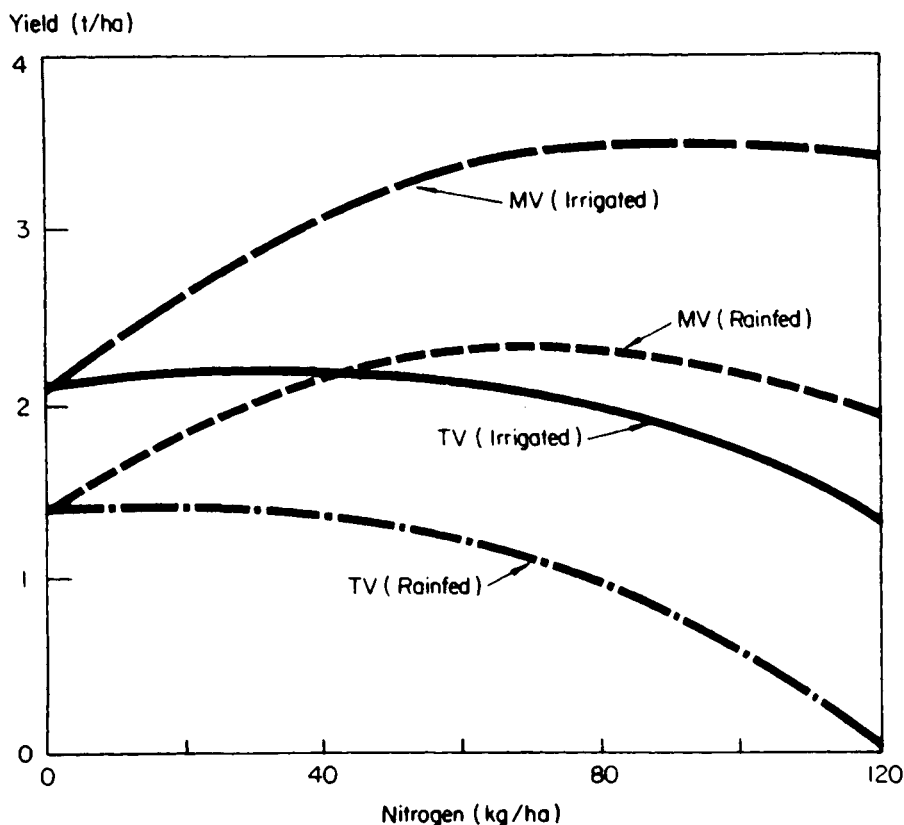
Source: David and Barker·1978, p. 183. © 1978 The International Rice Institute. Reprinted by permission.
   *Notes*: MV = modern varieties; TV = traditional varieties.

own selections from high-yielding rice varieties (Brammer 1980). Similarly, Franzel (1984) notes the impressive amount of experimentation with maize varieties by Kenyan farmers.[7]

The heterogeneity of environmental conditions and farmers' ability to adapt what they do often defies outsiders' needs to put farm activities into the neat boxes that feature in agricultural surveys. Research might be easier if all farms were operated by a single, male farmer, planting a single crop in

[7] Franzel (1984 p. 207, n. 3) cites one Kenyan farmer who had selected out a purple South American variety that was a parent of a maize hybrid released in Kenya. He preferred the milling quality of the purple variety and also liked it because his chickens did not eat it.

Figure 1.3. Rural household income, by source and farm size, in India, 1970-71
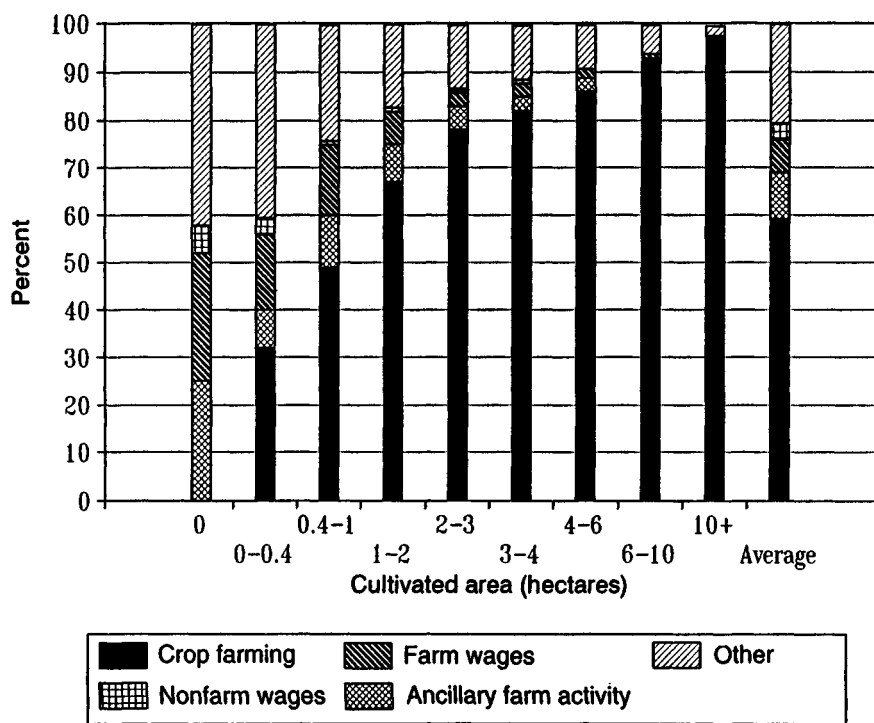
Source: World Bank 1982, Figure 7.1, p. 79.

succession, but this would neither be the best way of employing family labor nor would it be a safe means of ensuring subsistence needs. Indeed, some of the most difficult issues to study—complex intercropping combinations or noncrop options such as livestock—are among the best-adapted and most profitable options available to poor rural households. Diversity in techniques and mixes of crops and livestock activities reflect poor farm households' strategies to cope with heterogeneous conditions, risk, and restricted opportunities to earn income.

Coping with Limited Access to Land

As a consequence of rapid population growth, a growing portion of rural households have little or no access to land, whether access is considered as ownership, tenancy, or reliable employment opportunities in agriculture. The importance of family labor as the dominant factor of production under their control unites households with little land and households with no land. Together, they face a similar set of problems and a limited set of alternatives.

Development strategies designed to alleviate rural poverty must increase the productivity of agricultural labor. But there is a double bind of simultaneously increasing agricultural labor productivity and absorbing a growing rural work force. Opportunities to expand income and employment can come from a variety of sources: raising productivity of a family's own land, wage labor or tenancy on land owned by others, ancillary agricultural activities, such as dairying (Box 1.3.), poultry, and fishing—which are not necessarily limited by access to land—and nonfarm activities, such as processing agricultural products, marketing and trading, and other work in rural services and manufacturing. Neglecting this range of options—particularly noncrop, nonfarm options—overlooks many prospective sources of employment in the rural economy.

Many households with small, marginal farms are almost as dependent on labor markets for sources of income as households with no land (see Figure 1.3). The importance of wage labor in poor rural households' income-earning strategies raises another dilemma in raising agricultural productivity in CARLs. Rural families that own and operate land, provide all the labor, and finance purchases of seeds, chemical fertilizer, and other inputs with their capital will gain many of the benefits from increased yields. But when land and capital are provided by some (often richer) households and labor is provided by other (usually poorer) households, the bulk of the gains could go to landowners rather than the poor. Moreover, a relative shift in income toward richer households could allow them to buy a bigger share of the available land. Thus, even if science can identify technologies that can be adapted widely, there is the possibility that land-poor households could be made worse off. Whether or not this is likely is an issue taken up in Chapters 4 and 5. Nonfarm rural activities also are an important source of income, more so for poor households with little or no land than for households operating medium-size farms (Chapters 2 and 6).

Women's Roles in Coping Strategies

Rural women, as well as men, need to raise their productivity (and so their incomes) in agriculture and other rural activities. Social conventions in many CARLs may keep the role of women and children in agriculture almost invisible. Yet, evidence is mounting of the importance of women's contributions as workers and decision makers in agriculture, nonfarm activities, and rural trade. Although women tend to be particularly active in production of food for home use, weeding, storage and processing of crops, small-scale marketing, and tending livestock, "the division of farm tasks by sex is more rigid in cultural convention than in reality" (Buvinic and Mehra 1990, p. 292). In many CARLs, women are engaged in "male" tasks, ranging from coffee picking in Indonesia to rural construction work in India.

Box 1.3. Dairy Development in India

The distribution of ownership of buffaloes and cattle is more equitable than that of land in India. Even landless families may own one or more cows or buffaloes. But there are severe bottlenecks in milk marketing, and productivity is low—two reasons for the launch of a national dairy development program, Operation Flood, in 1970, aimed at helping 10 million rural households.

There are three tiers to this program—village producers' cooperatives, district unions, and regional federations that receive technical and financial assistance from two semiautonomous government agencies, the National Dairy Development Board (NDDB) and the India Dairy Corporation (IDC). The NDDB, which began in 1964, served 4,530 village cooperatives and had two million members in 1976. By the mid-1980s, there were 10,000 village cooperatives.

The dairy movement in India is rooted in a dairy producers' cooperative formed in the small town of Anand in 1946. Unlike official "cooperative" programs, this organization "emerged spontaneously as a movement of dairy farmers who organized themselves in an effort to protect and improve their market position." In fact, it was the response to a government scheme to establish a private milk trading monopoly (Alderman and others 1987, pp. 10, 13).

From its earliest years, the organization that became known as the Anand Milk Producers Union Ltd. (AMUL) has been well served by dedicated leadership, with a high priority given to training and service to rural communities. They benefited from economies of scale in pasteurization and the processing of milk products, together with a streamlined system for shipping highly perishable milk to Bombay and other major cities.

A decade of trial and error preceded expansion beyond Gujarat, the state in which the "Anand pattern" originally evolved (Korten 1980). The present system is simple but effective in ensuring regular milk pickups, prompt payment, and accountability to the members. Veterinary services that help reduce the risk of investment in livestock, especially for poor households, also are provided.

Controversy rages over whether Operation Flood successfully replicates the Anand pattern and even whether the circumstances underlying AMUL's success make it impossible to replicate. The risk is that a program with such promise will fall victim to unrealistic and inappropriate goals. Yet, a similar approach in Karnataka (Alderman 1987) indicates that the potential for benefits exists: all farm-size classes appear to gain, including the many landless owners of livestock. But because the share of dairying in total income tends to be largest for farmers with middle-size farms, the absolute size of their gains may be larger than for the landless. Yet, one of the most significant features of the original Anand dairy producers' association and India's National Dairy Development Board is that poor farmers—including those from the lowest castes and, more recently, increasing numbers of women—have acquired the organizational capacity to promote—and defend—their interests.