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Foreword

The widespread increase in rural purchasing power under the Green Revolution in Asia during the 1970s was key to increased rural employment and industrialization. Studies suggested that an extra dollar of agricultural income was typically associated with an additional $0.80 of nonagricultural income from local enterprises stimulated by the spending of farm households. Studies in Africa, where the Green Revolution was harder to discern, tended to be much more pessimistic.

This report revisits these issues using especially detailed panel data sets on rural consumption and incomes, collected by IFPRI and collaborating national institutions for a variety of purposes during the mid to late 1980s in Burkina Faso, Niger, Senegal, Zambia, and Zimbabwe. Results suggest that household spending of higher rural incomes from increased exports has the potential to greatly stimulate further rural income increases, on a scale that even surpasses experience in Asia. Central to this is the claim that many of the goods and services that figure heavily in rural consumption patterns in Sub-Saharan Africa are nontradables at current transport costs and prices. These include perishable fruits, vegetables, animal products, and prepared foods, services of all kinds, local handicrafts, and some bulky local starches of too low value to bear the costs of importing or exporting.

By focusing on the nontradable nature of large sectors of African rural economies, the report evokes a theme central to many of IFPRI's fieldwork-based studies: why some development strategies are more effective at achieving both growth and poverty alleviation than others. Sustained growth in rural incomes that is widely spread across households is shown to be an effective way to furnish the sustained additional local purchasing power necessary to promote aggregate production of nontradable items, while increasing the incomes of large numbers of poor people. The report does not deal with the interventions necessary to start growth in rural areas, other than to illustrate that it must involve bringing new external funds into localities on a recurring basis, such as would be the case from expansion of agricultural exports.

The report thus also raises another major theme of IFPRI's work, the complex role of agricultural and food policy in overall economic development. Jump-starting the production of agricultural tradables is shown to have much higher returns than thought previously, because of growth linkages. Conversely, rising food staple prices are

shown to have the potential to choke off growth from demand-side linkages if the conditions for a high supply response to prices are not in place. Success in raising household incomes in rural areas will rapidly lead to greatly increased demand for wage goods such as food, many of which are nontradable in rural Africa. If increased local production is not forthcoming, the relative price of these items will rise rapidly, reducing the welfare of large numbers of poor people and eventually raising production costs for the agricultural tradables that provide the engine of growth.

Per Pinstrup-Andersen
Director General

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The project could not have been attempted without the prior existence of detailed household-level data sets collected by the International Food Policy Research Institute (IFPRI) in collaboration with various African and Consultative Group on International Agricultural Research (CGIAR) partner institutions. The close involvement in the present project of members of the original country research teams that collected the data was also essential, both to ensure that the data were interpreted correctly and to add location-specific knowledge to the analysis.

The research team also acknowledges with gratitude its debt over many years to other colleagues who were involved with the projects that originally collected the data and helped shape the views of the present authors. In particular, Thomas Reardon, currently of Michigan State University (MSU), had a key role in shaping much of IFPRI's work in the Sahel in the 1980s, most particularly on income diversification and household expenditure issues.

The Burkina Faso data set was collected in 1984/85 in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Peter Matlon, then ICRISAT's lead economist for West Africa, and Thomas Reardon, then of IFPRI, assisted by Christopher Delgado, played lead roles in designing the survey and collecting the household expenditure data used in Chapter 4.

The Niger data set was collected in 1989/90 in collaboration with the Institut National de la Recherche Agronomique du Niger (INRAN) and the ICRISAT Sahelian Center. Samba Ly of INRAN, Thomas Reardon, and Jojo Baidu-Forson of ICRISAT collaborated with Jane Hopkins on the collection of the Niger data used in Chapter 5.

The Senegal data set was collected in 1989/90 in collaboration with the Institut Sénégalais de Recherches Agricoles (ISRA). Thomas Reardon, and Bocar Diagana and Abdoulaye Fall of ISRA collaborated with Valerie Kelly in the collection of the

Senegal data used in Chapter 6. Special acknowledgment is also made of the assistance of Aliou Diagne, then of MSU and now of IFPRI, in improving the analysis of the Senegal expenditure data.

The Zambia data set was collected in 1985/86 in collaboration with the Rural Development Studies Bureau of the University of Zambia. John Milimo, then of the Rural Development Studies Bureau, Raphael Celis, then of IFPRI, and Sudhir Wanmali and Neal Bliven of IFPRI collected the Zambian data used in Chapter 7, with survey design input from Peter Hazell.

The Zimbabwe data were collected in 1987/88 in collaboration with the Department of Physical Planning, Ministry of Local Government, Rural and Urban Development, Government of Zimbabwe. Sudhir Wanmali of IFPRI and Jonathan Zamchiya of the Department of Physical Planning, Zimbabwe, collected the Zimbabwe data used in Chapter 7.

The authors would also like to acknowledge the helpful written comments received on previous drafts from Keijiro Otsuka and Dean DeRosa. They are also very grateful for the copious, detailed, and insightful comments received from Alain de Janvry. Remaining deficiencies of the report are the responsibility of the authors.

Within this team-authored document, primary responsibility was taken as follows: Christopher Delgado drafted the summary; Delgado, Jane Hopkins, Valerie Kelly, and Claude Courbois drafted the introduction; Delgado and Anna McKenna drafted the survey of the literature; Delgado and Jayashree Sil drafted the conceptual framework, the model (based on previous work by Peter Hazell), and the Burkina Faso chapters; Hopkins, Delgado, and Peter Gruhn drafted the Niger chapter; Kelly, Delgado, and McKenna drafted the Senegal chapter; Hazell and Behjat Hojjati drafted the Zambia and Zimbabwe chapter; and Delgado, Hopkins, and Kelly drafted the conclusion. Overall editing and revision in response to reviewers' comments were carried out by Delgado and Courbois.

Summary

Rural income growth from increased crop production can have multiplicative effects on a region when that income is respent on local goods and services that would not otherwise have had a market outlet. These spin-off effects on local activities from the spending of increased farm incomes are called "agricultural growth linkages," and they were shown to be an important element in the creation of rural industry in Asia following the Green Revolution in cereals production. Yet it has been hard to demonstrate the existence of such spin-offs from crop growth in Africa, since additions to farm income have typically been spent on goods that are considered to be either imports to rural localities or displacements of potential exports from them. Thus, until now, the extra effects on production of rural income growth in Africa were thought to be lost (from the standpoint of local employment) to imports, or thought to displace production that would otherwise have been exported from the local region.

After reviewing the literature on agricultural growth linkages in Africa, this report examines the mix of farm and nonfarm goods and services that rural Africans purchase, and the implications of these expenditures for rural economic growth in five African countries: Burkina Faso, Niger, Senegal, Zambia, and Zimbabwe. In the West African countries, in addition to farm and nonfarm sectors, individual commodities are sorted into tradable and nontradable categories, and by geographic zones of interest: local, national, and multicountry regional. The same process is followed in Southern Africa for Zambia, but no assumptions are made on regional tradability because of lack of data. Fully comparable data were not available for Zimbabwe, but some similarities in rural consumption patterns could be detected.

The classification of goods as tradable or nontradable is based on the judgment of those who collected the data, extensive field inquiry into what was actually consumed, judgment as to where products consumed typically originated, and whether tradable substitutes (in the sense that their price movements were in tandem) were available locally. Food was a big item in household expenditures, and, as it turned out, many foods consumed were nontradables. Earlier studies also noted the high propensity to spend increments to income on food in Africa, but mistakenly classified virtually all important foods as tradables, following the assumptions made in Asia. Thus demand for additional food in the earlier studies was considered a "leakage": spending increments to

income on tradable goods (including food) was thought to either decrease the quantity of goods available for local export or increase the amount the region spent on imports. It is not surprising that previous estimates of rural growth multipliers in Africa have generally been very low.

The results of this report are much more optimistic, largely because the underlying assumptions about tradability follow African conditions more closely, but also because of the unusually detailed data used on the flows of consumption expenditure over the year. These were from weekly or biweekly repeated interviews, which captured both food consumption patterns and total expenditures (a proxy for household income) especially well.

The way rural people spend increments to income is measured in the report as average budget shares—the percentage of total household expenditures going to a given group of goods and services—and marginal budget shares (MBS)—the percentage of the last unit of income earned that is allocated to the goods or services in question. MBSs are estimated econometrically and show the direct impact of unit income changes on consumption. The MBS for nontradables was 47 percent in Niger and about 33 percent in Senegal, suggesting that an ample share of rising incomes will be spent on items that would not otherwise have a market outlet and conversely no alternative source of supply. Examples are processed and unprocessed foods, inputs to agriculture, and services. If the new demand for these goods cannot be met because of supply rigidities, hefty price increases could result.

The MBS for nontradables as a group is the single most important determinant of the magnitude of estimated growth multipliers. In the four-sector, modified, semi-input–output model used, this was decomposed into farm and nonfarm items. Other determinants were technical coefficients of input use, value-added shares by sector, and the savings ratio. Multipliers were calculated by solving the set of regional equations that balanced consumption and availability of goods and services.

The report finds that the farm sector in Africa is better able to propagate income growth than previously thought. Growth in household income that comes from increases in agricultural production, perhaps spurred by new technology or changes in export prices, is largely spent on farm and nonfarm items that are nontradable, such as perishable foods, services, and locally produced nonfarm goods. Overall the report finds that adding US$1.00 of new farm income potentially increases total income in the local economy—beyond the initial $1.00—by an additional $1.88 in Burkina Faso, by $1.48 in Zambia, by $1.24 to $1.48 in two locations in Senegal, and $0.96 in Niger.

Given the methodology used, these are upper bounds of the potential gains. Actual gains may be as much as 30 percent less, due to possible rigidities in the supply responsiveness of nontradables to price rises under African conditions. Even so, the results are substantial, suggesting that $1.00 of initial growth in rural agricultural incomes leads to an additional $1.00 on average of income from production of rural nontradables. This implies that the overall benefit of finding a way to boost rural incomes (from additional exports, say) on the supply side is probably twice as high as the immediate return from the activity that was promoted in the first place.

CHAPTER 1

Introduction

The objective of this report is to demonstrate the extent of linkages between farm and nonfarm sectors and between nontradable and tradable goods sectors in Sub-Saharan Africa and to illustrate how these linkages can shape and accelerate rural economic growth. The farm sector is defined here to include all unprocessed agricultural goods, such as raw crops and livestock. Everything else, including processed farm items, is counted in the nonfarm sector. The term "nontradable" is used for goods that at prevailing relative prices are rarely, if ever, traded across the borders of the chosen zone of analysis. Nontradables also must not have close tradable substitutes that are available locally. This implies that the domestic price of the nontraded good is not likely to be well correlated with the domestic price of any tradable good that could play the same role in the consumption basket. By convention, services are always nontradables, since the service is completely performed locally, and it can neither be imported nor exported. Perishable foods are often nontradable because of the risk of loss in transit. Tradables, on the other hand, can in theory always be imported or exported at a constant price determined by a reference market outside the region in question.

This report contends that output growth in farm tradables that results from the alleviation of supply constraints—from technological progress or better infrastructure, for example—can potentially have major secondary growth effects via the demand created in rural areas for nontradables. Many items consumed in rural areas are in fact nontradables, and many of these nontradables are staple foods. Therefore, policies to improve the production response of producers of nontradables are important for two main reasons. First, an increase in the supply of nontradables would help capture the opportunity for additional income growth from these demand effects. Second, as incomes rise, an increased supply of nontradables that people wish to spend additional income on would help prevent price increases that would put pressure on nominal wages. Such price pressures could lead to higher production costs and reduce output growth in that sector.

This report presents five case studies of demand linkages in a variety of country situations in Sub-Saharan Africa. In each case, researchers examine the mix of farm and nonfarm goods and services that rural Africans purchase, the potential of these expenditure patterns for encouraging growth in rural areas by stimulating demand, and

the interventions necessary to sustain overall rural economic growth arising from initial growth in farm tradables stimulated by economic reforms such as structural adjustment programs. From these studies, it appears that the farm sector is potentially better able to propagate income growth than previously thought. Increased household incomes from exports are spent on farm and nonfarm items whose production was constrained by inadequate local demand; this spending in turn has spin-off effects that generate even more new income. The analysis in this report is based on empirical estimation of demand patterns coupled with assessment of the implications of demand parameters with respect to income, using the methodology of fixed-income agricultural growth multipliers.

Growth multipliers indicate the upper limits of the extra net income that could be had in rural areas from new production of nontradable goods and services stimulated by consumer and intermediate spending of new household income originating from the tradable sectors. These increments to income could come from technological progress in the production of tradable items, improvement in export prices, and so forth.

The actual multiplier is a numerical solution to a regional-level model of supply and demand that incorporates household demands and intermediate demands between sectors, and it explicitly models these interrelationships. Like all regional models, in computing costs and benefits, the results depend largely on what is included in the geographical area of interest and what is outside. The study takes the region of interest as "national," but occasionally also cites the results of using multipliers calculated with a more restrictive definition of the region of interest ("local") and a less restrictive one ("regional multicountry").

The choice of the region of interest defines the amount of trade "leakage," so that a larger catchment area, which implies a higher share of nontradables in consumer and intermediate demands, is associated with a higher multiplier. Therefore, there is little analytical interest in directly comparing the result of a change of assumptions. On the other hand, such a comparison is useful for illustrating the sensitivity of results to changes in assumptions about tradability. The national definition of tradability is the most useful definition for the classification procedure used in making assumptions about tradability.

Growth linkages of the type dealt with here occur only if underemployed resources are drawn into production by new local demand. This can only occur if there are underemployed resources and if those resources can be drawn into production to meet additional demand without major price increases. Resources are assumed to be underemployed if there is insufficient demand to purchase what the resources produce, typically because of remoteness and poverty. Local prices for these demand-constrained items exceed what they can be sold for locally for export but are less than would be required to make them a profitable import. Because new effective demand for these nontradable items cannot be met by imports (by definition), they have to be met by increased local production. The additional income created by respending of the initial income on nontradable goods produced by previously underemployed local resources creates a multiplier effect.

Numerical results from fixed-income multiplier models are best thought of as upper limits rather than firm predictions of how much additional growth in nontradables

will occur from the initial shock to the tradables sector. This is because they are based on an assumed infinite supply elasticity for nontradable goods: extra demand is met by increased production at a "fixed price" (hence the name for this class of model). In other words, rapid growth in demand for nontradable foods because of an export boom is assumed to result in increased production of nontradable foods, not higher prices for these items. It seems likely that in Africa, rapidly increasing demand for nontradables will be met with less than perfectly elastic supply; part of the increased local spending on nontradables will be accounted for by higher prices rather than increased output. The more local production is constrained by demand, as would be the case where underemployed labor and land are available, the closer the true multiplier effects are likely to be to estimated multipliers.

Multiplier analysis in general and this report in particular build on the tradition, established in the study of Asian development, of exploring the role of agricultural growth in promoting overall rural employment through spin-off effects (Johnston and Mellor 1961; Mellor 1966, 1976, 1986). These effects, or "growth linkages," are created by the addition of substantial new local household purchasing power in periods of rapid agricultural development. This new purchasing power under some conditions stimulates additional production and employment.

Using case studies from Burkina Faso, Niger, Senegal, Zambia, and Zimbabwe, the report demonstrates empirically the importance of rural growth linkages in stimulating rural African economies. In each case study, the research examines the mix of agricultural and nonagricultural goods and services that rural Africans purchase, the implications of these expenditure patterns for the potential to stimulate growth in rural areas, and the conditions necessary to deal with expected surges in demand from growth in tradable agriculture stimulated by economic reforms such as structural adjustment programs.[1] The investigat revealsion an agricultural sector that is better able to propagate income growth than previously thought (Hirschman 1958; Hazell and Röell 1983—the latter for West Africa), including growth in nonagricultural incomes.

Unlike planners in Asia and Latin America in an earlier era, decisionmakers on development strategy in Sub-Saharan Africa are still debating priorities for achieving rapid growth and specifically the role of agriculture (Delgado 1991). In Asia prior to the 1970s, it was clear that agriculture was a lead sector and that foodgrain production by smallholder farmers was the central priority for agricultural development (Mellor 1966). In much of Latin America, less emphasis was placed on agriculture historically than on import-substituting industrialization (Hirschman 1958). In Africa, debate continues over the role of agriculture in economic development generally, but also about priorities for export versus food crops, large versus small farms, mechanical versus biological technology, and so forth (Delgado, Mellor, and Blackie 1987; Delgado 1996).

Yet the agricultural sector accounted for 40 percent or more of GDP in a third of all Sub-Saharan African countries in 1994 (World Bank 1996). Agriculture accounted

[1] The present study is not focused on structural adjustment and therefore uses the term solely as shorthand to connote those economic reforms, recently carried out in many African countries, that are designed to improve the competitiveness of domestic production of tradable goods.

for an average of 34 percent of GDP in low-income and 8 percent of GDP in middle-income Sub-Saharan African countries in 1996 (World Bank 1998). In 1993 agricultural products made up 33 percent of the value of exports from low-income, nonoil-exporting, Sub-Saharan African countries (World Bank 1996). Of the 20 countries for which data were available for 1980–92, 13 had at least 50 percent of their economically active male population working in agriculture. Four of those countries had over 75 percent of their male population working in agriculture. For the female population, 14 out of 20 countries reported more than 50 percent working in agriculture (World Bank 1996). Agriculture remains a vital element in the structure of these economies; misconstruing its proper place in the growth process could lead to significantly lower national income levels.

This report argues that the prime entry point for investigating the true importance of agriculture to overall economic development lies in establishing empirically the nature of the linkages between agricultural growth and growth in other sectors of the economy. It also addresses how the importance of these linkages is likely to differ between open and closed economies, given the relative importance of agriculture to overall employment; reviews the growth linkages literature from Asia and Africa; examines in detail the factors that affect the magnitude of growth linkages in Africa; and draws conclusions about the key issues to consider in examining these growth linkages.

Chapter 2 outlines prior work on agricultural growth linkages. Chapter 3 presents an overview of the case study data, the formal model, assumptions, and research methods used in the country studies. Chapters 4, 5, and 6 are devoted to the Burkina Faso, Niger, and Senegal case studies, respectively. Chapter 7 discusses the Zambia case study, with sections to identify similar elements in Zimbabwe, although analysis of Zimbabwe is limited by the lack of fully comparable data. Chapter 8 presents the overall conclusions of the case studies as a group. It should be borne in mind throughout that the empirical analysis is drawn from price effects—income and other nonprice variables are the postulated determinants of demand. Furthermore, agricultural growth multipliers are a normative technique—they show what both possible and desirable, given underlying assumptions, but they do not measure the possibilities.

CHAPTER 2

Concepts, Prior Work, and Issues Pertaining to Agricultural Growth Linkages

As a concept, agricultural growth linkages has a long tradition in the literature seeking to assess the role of agriculture in economic development. It grew out of the search for ways to promote the industrialization of poor, agrarian societies. Over time, the concept has become more formalized. Debates have also increasingly tended to focus on the likely magnitudes of a few key parameters that tend to drive numerical solutions in simplified quantitative models. This chapter will review the concept and its formalization, but only briefly look at ways that it can be made much more complicated. Instead, the emphasis will be on the underlying issues and simple insights that can be gleaned from pursuing this kind of research and their significance for development strategy.

Agricultural Linkages to Overall Growth in Closed and Open Economies

In the tradition of Hirschman's (1958) work in Latin America, early studies on economic linkages between industries or sectors, focused only on production linkages. These were classified as "backward" and "forward" linkages arising from any new production activity. The demand for inputs derived from the new activity are the backward linkages; for example, new net demand for logs arising from establishment of a sawmill. New productive activities that arise as a result of having a new intermediate product on the market are the forward linkages. For example, the increased output of boards from the sawmill (or decreases in the price of boards) would stimulate the construction industry.

Agricultural growth was thought not to have strong backward and forward production linkages. It stimulated little new demand for intermediate inputs or new investment in downstream activities. This led to the conclusion that encouraging agriculture was not a high priority for fostering growth in developing countries. Hirschman

(1958) argued that public investment should be directed toward nonagricultural sectors, which typically have greater production linkages to the overall economy, resulting in higher multiplier effects (Hazell and Röell 1983). An "anti-agriculture" mindset was undoubtedly also encouraged by the elasticity pessimism debate of the time concerning agricultural exports (Prebisch 1959). This held that the demand of the developing countries for the manufactured exports of the developed countries would grow much faster than the demand of the developed countries for the agricultural commodity exports of the developing countries, leading to declining terms of trade for agricultural exporters. Perhaps a general Malthusian concern with diminishing marginal productivity in agriculture also was a factor.

Furthermore, Hirschman espoused the "unbalanced growth" hypothesis, whereby the essence of development strategy was to stimulate production in those areas, typically industrial, thought to exhibit high backward and forward linkages (that is, "growth poles"). In relatively open, small economies, pressure on the prices of food and other wage goods from growth of employment in tradable sectors can be met through increased imports of the things workers wish to consume. Thus, no particular importance was attached to having domestic agricultural output grow at the same rate as nonagricultural output.

The case for agriculture as a motor for overall growth is enhanced by focusing on the impact that growth in the agricultural sector has on incomes and hence on rural demand for consumer goods and services from outside the agricultural sector, particularly when the economy in question is largely closed to trade. Inspired by the experience of India during the Green Revolution, with a large, relatively closed economy, Mellor (1966) and Adelman and Morris (1973) point out that although production linkages from the agricultural sector (especially subsistence agriculture) may in fact be weak, having little direct effect on growth outside of agriculture, consumption linkages from the agricultural sector clearly do have major indirect effects on the rest of the economy.

The argument hinges on the view that economic development in a closed economy is a process of balanced growth between agriculture and nonagriculture (see also Nurkse 1953). Growth in one sector is quickly choked off if consumption and production of intermediate goods are inelastic. For example, industrial growth from the transfer of capital and labor out of agriculture is choked off if demand for extra food arising from extra wage income is not met with increased food production. Resulting food price increases are quickly translated into demand for higher wages, which shrink industrial profit ratios. Conversely, food production growth will quickly lead to declining producer incomes if employment, and thus food demand, is not rising fast enough to absorb the additional food produced without a drastic reduction in prices.

In Mellor's view, in addition to the marginal propensity of landlords to invest agricultural profits in nonagricultural ventures, the overall intersectoral impact of growth in food production depends on how much of the extra wage income is spent on labor-intensive, nonagricultural goods and services, and how much is spent on the increased food production itself or leaks out into savings or imports. Respending on food is in

fact a "leakage" from the growth multiplier in the original concept of linkages, since it occurs at the expense of new spending on nonagricultural products.

If the combined leakages away from intersectoral resource flows (understood in the early literature as transfers between agriculture and nonagriculture) are low, the net respending effect of the initial growth in incomes on aggregate income could be almost as great as the original income stimulus. In South Asia, the original income stimulus was Green Revolution technical change in rice and wheat that increased employment and landlord profits. Farmers and laborers spent increased incomes on both food and nonagricultural goods, and landlords invested in labor-intensive nonagricultural enterprises. Migration out of agriculture and lower food prices completed the elements necessary to effectively transfer resources from agriculture to nonagriculture, which grew in tandem in the late 1960s and 1970s (Mellor 1976).

Rapid urbanization and the swelling numbers of urban unemployed received great attention in the 1960s and 1970s and were central to the formulation of the linkages paradigm. The perceived need was to find a way to create jobs both outside agriculture and outside cities; this led to a focus on growth processes that would boost demand for rural nonagricultural activities. The linkages literature of the 1970s and early 1980s stresses the advantages of creating demand in rural areas for locally produced nonfood goods and services, hence the increased focus on regional linkages (Mellor 1976; Bell and Hazell 1980).

Siamwalla (1982) sought to refocus the linkages debates along the lines of emergent trade theory, at the time that the latter was gaining the high ground in development theory more generally. His main contribution was to point out that leakages from net additions to rural demand occur not only when expenditures are on imported goods, but also when incremental expenditures are on exportables (Hazell 1984). New local purchases of locally produced goods that otherwise could have been exported from the zone in question do not add to net effective rural demand, although such indirect effects do presumably create some additional value added for local traders.

Thus, the relevant categorization of expenditure for Siamwalla is tradable versus nontradable, without regard to geographic or sectoral (agriculture/nonagriculture) considerations. Only new expenditure on nontradables has the potential to create additional local income, since they are the only goods in this model that are demand-constrained. It is inherent in the notion of tradables for price-taking countries that they are constrained by their supply conditions, facing highly elastic demand (for exportables) or supply (for importables) from a larger external market.

This analysis suggests the importance of four interrelated factors for agriculture to have major extra benefits for overall growth (beyond the growth of tradable agriculture itself) in the present day conceptualization of agricultural growth linkages in Africa. First, there is the obvious but occasionally neglected condition that agriculture must account for a large share of aggregate employment, such that the problem is worth worrying about. The corollary is that no approach to growth can ignore the possibility of agricultural growth linkages if agriculture plays a large role in the economy.

Second, agricultural growth benefits that are widespread will be especially effective at capturing the growth opportunity offered by linkages by allowing the effective

demand for goods and services of a broad base of rural people to increase. The potential for an initial income shock to produce new employment depends on the initial distribution of income and who gets the increments to income.

Third, consumption patterns of the direct beneficiaries of agricultural growth must be such that large shares of increments to income are spent on labor-intensive local nontradable goods and services, stimulating demand for sectors that employ large numbers of rural people outside the agricultural tradables sector. The corollary to this is that the more open a local economy is to trade, all else being equal, the lower the estimated growth multipliers will be. This is not an argument against openness, since the ability to have a growth impulse in the first place is dependent on having a dynamic tradables sector, and a more open economy is likely to have a higher equilibrium level of income. It does point out, however, that growth multiplier effects—the extra growth from using underutilized resources—are likely to be especially important where preconditions such as high transport costs or other structural factors isolate local economies from outside sources of effective demand for local products. In other words, indirect (or consumption) growth linkages are more likely to be of major importance where a major share of the local economy consists of the production and consumption of nontradables.

The key issue is the propensity of rural households to consume nontradable goods and services out of additional income. Thus, even in the case of relatively closed economies, consumption patterns skewed toward tradables in those economies will, all else being equal, reduce growth multipliers.

Fourth, there must be a supply of underused local resources. The Asian literature pioneered by Johnston and Mellor (1961) assumes that net extra demand for local nonagricultural goods and services is fully transmitted into increased production of these items, primarily because of underutilized factors such as labor. However, if the supply of nontradables is inelastic, perhaps because of labor or capital constraints or high transaction costs, then costs of production will quickly rise with expanded demand, and the additional growth in production of local goods and services stemming from the respending of agricultural incomes will be less than would be the case if the supply of local nontradables was more elastic (Haggblade, Hammer, and Hazell 1991).

In sum, growth that only benefits either a small number of large farmers or a relatively small agricultural sector would presumably not have big rural consumption linkages for locally produced goods and services, the production of which would provide a great deal of local employment. On the other hand, growth that stimulates the incomes of large numbers of small farmers is likely to provoke widespread increased demand for local consumer goods and services. The more these goods are demand-constrained by nature (nontradables), the greater the growth impact. Finally, the net additional impact of these demand increases on production growth, and thus on rural employment and further spending, will depend on the elasticity of supply of nontradable goods and services, which in turn is principally dependent on the elasticity of supply of labor. Most empirical estimation of consumption growth multipliers to date has been done with Asian data, with few applications to Africa. Very little has been done in Latin America. The next section briefly reviews the quantitative literature from Asia and Africa that models agricultural growth multipliers.

Earlier Estimates of Agricultural Growth Multipliers

Although the concept of agricultural growth linkages goes back at least to the 1950s—drawing on Ricardo in the early 19th century and Keynes in the early 20th—quantitative estimation of multipliers incorporating consumption as well as production demand is relatively recent. Peter Hazell and Steven Haggblade have been key contributors in this regard. Much of the existing literature on modeling agricultural multipliers is reviewed by Haggblade, Hazell, and Brown (1989) and Haggblade, Hammer, and Hazell (1991). The present report draws heavily on those sources and others to summarize the magnitudes of multipliers that have been estimated to date. All such multipliers are the result of normative rather than positive analysis.

Rangarajan (1982) constructs a macroeconomic model that incorporates linkages in production, savings, and investment demand to examine historical data in India during 1961–72. In this model, national income is determined by both agricultural and industrial output. Agricultural outputs, both foodgrains and nonfoodgrains are determined exogenously; hence the main variable to be determined is industrial output. He estimates multipliers of 1.5 for industrial output and 1.7 for national income. This implies that an initial 1 percent increase in agricultural growth will lead to an additional 0.5 percent increase in industrial output and an additiona 0 .7 percent increase in overall national income.

Rangarajan (1982) also examines production and consumption linkages separately to determine the significance of each. He finds that production linkages in India are weak. Only 13 percent of total agricultural output went to nonagricultural sectors as inputs. Also, a 1 rupee increase in final demand for agricultural output increases manufacturing output by 0.09 rupee, while a similar increase in the final demand for manufactured goods increases agricultural output by 0.26 rupee.

The estimated demand linkages suggest that increases in agricultural income have significant positive effects on the demand for rural and urban nonfood products. The savings and investment linkages show that agricultural income also has a positive effect on both household and government savings (Rangarajan 1982).

Bell and Hazell (1980) and Bell, Hazell, and Slade (1982) develop variants of the semi-input–output model in their study of the effects of technological change in irrigation in the Muda River region of northwest Malaysia. They estimate a multiplier of 1.80 for the local nonagricultural economy. This is interpreted as an additional increase of $0.80 of nonagricultural income, generated through indirect spending linkages, for every dollar generated directly by a given project in the agricultural sector. The model is extended to incorporate a three-sector trade focus in Haggblade and Hazell (1989).

The models and multipliers used in these and other agricultural growth multiplier studies are reviewed in Haggblade, Hammer, and Hazell (1991). They illustrate that a vital feature of most of the models employed up to the time of their writing was the assumption that the supply of nontradables is perfectly elastic, with output constrained by effective demand. Hence the models are “fixed-price”

models (that is, the price of nontradables is constant), which have the merit of being relatively tractable and not too far out of accord with the reality of underemployed labor in countries such as India.

One of the more theoretically satisfactory yet easily computed fixed-price multipliers is derived by Hazell (1984) from the semi-input–output model of Bell and Hazell (1980). It measures increases in income as a result of an exogenous shock to agriculture, via technological change or outside investment, causing the output of nontradables to increase. Assuming that the amount of intermediate inputs used per unit of tradable output does not change as a result of the initial increase in tradable output (Haggblade, Hammer, and Hazell 1991), the multiplier (M) can be written

$$M = \frac{1 - a_{nn} + a_{nt}\left(\frac{v_n}{v_t}\right)}{1 - a_{nn} - \beta_n v_n (1 - s)}, \tag{1}$$

where

a_{nn}, a_{nt} = the share of nontradable intermediate inputs in nontradable and tradable output, respectively (between 0 and 1),

a_{tn}, a_{tt} = the share of tradable intermediate inputs in nontradable and tradable output, respectively (between 0 and 1),

v_n = a constant with a value equal to $1 - a_{tn} - a_{nn}$, the share of value added in gross output of the nontradables sector,

v_t = same as v_n, for tradables, with value equal to $1 - a_{tt} - a_{nt}$,

β_n = marginal propensity to consume nontradables, and

s = leakage, a constant proportion of total income (savings and tax rate).

Hazell's (1984) simplified version of this multiplier assumes that $a_{nn} = a_{nt} = a_n$ (intermediate demand for nontradables) and $v_n = v_t = \mathrm{v}$ (value-added shares). The multiplier then becomes

$$M = \frac{1}{1 - a_n - \beta_n v (1 - s)}. \tag{2}$$

As Haggblade, Hammer, and Hazell (1991) point out, this simplified multiplier can be easily estimated using values for the marginal budget share (MBS) for nontradable goods in household expenditure (β_n), the ratio of nontradable intermediates to gross output in total production (a_n), and the ratio of value added to gross output in total production (v). Like all fixed-price models, the model assumes that tradables are supply constrained and that nontradables are perfectly elastic in supply. It encompasses the effects of both consumption and production linkages in the economy. The effects of production linkages alone can be easily derived by setting $\beta_n = 0$.

Using the simplified model and data from Bell, Hazell, and Slade (1982), Hazell (1984) estimates a multiplier of 1.82 for the Muda River region, which is very close to the one estimated by Bell, Hazell, and Slade (1982) for this same region (1.80).

Hazell and Haggblade (1990) compare the results of a cross-sectional econometric analysis, using data from local states and districts in India, with those of a semi-input–output model fitted on national input-output data, to examine rural-urban growth linkages. The estimates from the cross-sectional econometric analysis show that on average for the whole of India an increase in agricultural income of 100 rupees will generate an additional 64 rupees in rural nonagricultural income. In high-productivity areas (Punjab and Haryana), an equivalent increase in agricultural income will generate an additional 93 rupees, and in low-productivity areas (Madhya Pradesh and Bihar), it will generate only an additional 46 rupees. Infrastructure proves to be a significant determinant of the agricultural growth multiplier. Hazell and Haggblade also find some evidence that higher consumption linkages account for the larger multipliers in the high-productivity areas.

The use of the semi-input–output model with aggregate national data allows the estimation of changes in total national demand for nonagricultural products and thus results in a significantly larger multiplier than the cross-sectional analysis estimates derived from state and district data (Hazell and Haggblade 1990). The national model estimates that for every increase of 100 rupees in agricultural income, an additional 135 rupees will be generated by the multiplier effect. This stems from both the more comprehensive "net" for observing linkages effects implicit in the data themselves and a more restricted definition of what is tradable outside of the zone of analysis.

The results from the Indian analysis by Hazell and Haggblade indicate that a greater proportion of the overall multiplier is attributable to consumption linkages than to inter-industry production linkages (Hazell and Haggblade 1990, 44, Table 16). The share of the total agricultural growth multiplier calculated by the simplified semi-input–output method attributable to consumption linkages alone is 90 percent for Sierra Leone, 84 percent for the Muda River in Malaysia, and 56 percent for Oklahoma (Haggblade, Hammer, and Hazell 1991). This supports the widely accepted view that production linkages in agriculture are relatively weak (Hazell and Röell 1983). It also reinforces Mellor's (1966, 1976, 1986) argument that including consumption linkages in the analysis gives a more comprehensive assessment of the magnitude of linkages in the agricultural sector (Hazell and Röell 1983; Bell, Hazell, and Slade 1982).

Hazell, Ramasamy, and Rajagopalan (1991) estimate the indirect effects generated by an income-increasing technological change in agriculture. They calculate the change in value-added relative to an initial change in gross output, using a regional input-output model. For North Arcot, India, they report that an increase in agricultural income of 1 rupee will generate an additional 0.87 rupee in nonagricultural income. They also report that production linkages account for 50 percent of the multiplier effects in North Arcot, which is high relative to other studies, perhaps owing to the ongoing technological change observed in North Arcot.

Hazell and Röell (1983) conduct a comparative analysis of linkages in the Muda River region of Malaysia and Gusau, Nigeria. They too provide evidence of weaker

consumption linkages in Gusau than Muda River, which would lead to smaller agricultural multipliers. In keeping with the assumptions made in the Asian literature, they assume that most nonagricultural items are not traded and that most agricultural items are traded.

Hazell and Röell (1983) find that 75 percent of the average budget share (ABS) in Gusau is accounted for by locally and home-produced foods, compared with 46 percent in Muda (Table 1). The average household in Muda also spends 62 percent of any incremental income (marginal budget share, or MBS) on nonfoods and nearly two-thirds of these are locally produced. In Gusau, these shares are 24 percent with less than half being locally produced. Hazell and Röell's "Asian" assumptions about sectoral tradability lead to a commodity breakdown that allocates 59 percent of increments to rural spending to tradables and 41 percent to nontradables in Muda, and 68 percent to tradables and 32 percent to nontradables in Gusau. Thus, increments to expenditure in Muda were thought to have a greater stimulative effect on demand for nontradables than those in Gusau.

Table 1 Consumption parameters affecting growth linkages in Malaysia and Nigeria

Commodities	Muda, Malaysia	Gusau, Nigeria
	(percent)	
Nonfoods		
Average budget share	33	19
Marginal budget share	62	24
Locally produced nonfoods		
Average budget share	18	8
Marginal budget share	37	11
Locally and home produced foods		
Average budget share	46	75
Nontradables		
Average budget share	24	25
Marginal budget share		
Whole sample	41	32
Lowest per capita expenditure decile	24	27
Highest per capita expenditure decile	55	36
Nontradables including coarse grains		
Average budget share	n.a.	70
Marginal budget share		
Whole sample	n.a.	64
Lowest per capita expenditure decile	n.a.	78
Highest per capita expenditure decile	n.a.	62

Source: Hazell and Röell 1983.

Notes: n.a. indicates not applicable. In the bottom section of the table average and marginal budget shares of nontradables, as reported by Hazell and Röell (1983), are modified to include millet, sorghum, and maize in the list of nontradables. In Muda this leads to no significant change in values since these cereals are not a significant component in food consumption patterns. Hence, only values for Gusau are reported. Marginal budget shares by per capita expenditure decile are calculated using estimates, also by Hazell and Röell (1983), for cereals and cereal products, which includes a tradable, rice, as well as millet, sorghum, and maize. In the case of Gusau, where very little rice is consumed, this will only slightly overestimate the marginal budget shares by per capita expenditure decile.

Haggblade, Hazell, and Brown (1987) estimate growth multipliers for Sierra Leone and Nigeria using the data cited and Hazell's simplified version of a semi-input–output model reported in equation (2). Because accurate estimates of the relevant parameters that determine the multiplier were not available, they used rough orders of magnitude for these values. Estimates of the MBS for nontradables in household expenditures (β_n) were derived from data by King and Byerlee (1978) in Sierra Leone. The ratios of nontradable intermediate inputs in nontradable and tradable output (a_{nn} and a_{nt}) were estimated using evidence from Botswana (Haggblade 1982) and Sierra Leone (Leidholm and Chuta 1985). The ratio of value added to gross output in total production (v) was estimated based on the rural characteristics of the area (70 percent of rural value added is thought to be derived from agriculture, with v lying in the range of 0.82 to 0.86). Given the values $a_{nn} = a_{nt} = a_n = 0.10$, v = 0.85, and $\beta_n = 0.03$, they estimate that the multiplier for Sub-Saharan Africa is about 1.5, which is significantly lower than the one in Asia.

A survey of the literature on agricultural-nonagricultural linkages in Africa by Haggblade, Hazell, and Brown (1989) concludes that estimated multipliers are significantly smaller for Africa than those estimated for Asian countries and India. They attribute this variation to differences in climate conditions, undeveloped backward production linkages in Africa, lower population density in Africa, and differences in consumption patterns. Simler (1994) computes an agricultural growth multiplier of 1.66 for Malawi, using field data from 1986/87, with a range of values from 1.41 to 3.08 depending on assumptions.

Dorosh and Haggblade (1993) provide an application of a variant of the fixed-price, semi-input–output model built around a condensed social accounting matrix (SAM) for Madagascar, consisting of six tradable and six nontradable sectors. They estimate that a small increment of value added in agriculture in Madagascar increases overall value added by as much as 2.0 to 2.7 times the initial shock, depending on assumptions made. The authors attribute the greater order of magnitude of these multipliers relative to previous multiplier estimates in Africa to having considered the full national economy, including linkages from expenditures outside the rural region. A selection of multipliers found in the literature is given in Table 2.

Limitations of Fixed-Price Multiplier Models and Some Alternatives

All fixed-price models make three basic assumptions (Haggblade, Hammer, and Hazell 1991). First, regional economic growth is driven primarily by the increased production of tradable goods. Second, production can be adequately modeled as Leontief fixed coefficients technology. Third, prices are constant for both tradable and nontradable goods and services.

The main limitations of the fixed-price model arise from its assumption that regional growth is driven by the production of tradable goods. It ignores both the possible benefits of a major technological breakthrough for nontradables and, because it is a static equilibrium approach, the dynamic aspects of savings and investment.

Table 2 Agricultural growth multipliers in Africa and Asia

Study	Location	Dollars of total income growth from $1.00 of direct growth in agricultural income
Rangarajan (1982)	India, all	1.70
Bell, Hazell, and Slade (1982)	Malaysia, Muda River region	1.83
Hazell (1984)	Malaysia, Muda River region	1.82
Hazell and Haggblade (1990)	India, all	1.64
	India, Punjab and Haryana	1.93
	India, Madhya Pradesh and Bihar	1.46
Hazell, Ramasamy, and Rajagopalan (1991)	India, North Arcot, and Tamil Nadu	1.83
Haggblade, Hazell, and Brown (1987)	Sierra Leone and Gusau, Nigeria	1.50
Dorosh and Haggblade (1993)	Madagascar	2.0–2.7
Simler (1994)	Malawi	1.66
Haggblade, Hazell, and Brown (1987) assuming millet, sorghum, and maize are nontradables	Nigeria, Gusau	2.81

Notes: All multipliers, except those used by Rangarajan (1982), Dorosh and Haggblade (1993), and Simler (1994), are derived using Hazell's simplified semi-input–output model (Hazell 1984). The multiplier listed for Gusau, Nigeria, is derived by the present authors using the same values for the ratio of nontradable intermediates to gross output in total production (a_n = 0.10) and the ratio of value added to gross output in total production (v = 0.85) used by Haggblade, Hazell, and Brown (1987) to derive the multiplier for Sierra Leone and Nigeria. The marginal budget share for nontradable goods (β_n) in household expenditure is modified to include millet, sorghum, and maize in the group of nontradables. This value, which increases from 0.32 to 0.64, is calculated using the consumption parameters for different goods and services categories estimated by Hazell and Röell (1983).

The first problem is best dealt with by noting that if such a breakthrough occurs for

become so cheap that it will then be tradable, or resources will flow out of the nontrad-

grown for self-sufficiency purposes will be reduced once its yields go up, and acreage will go to production of an exportable crop). In either case, growth is captured in the

Thus the story can be told through a linkage model, with additional explanations of the source of the exogenous growth in tradables.

model, and thus bad for growth. Investment is not considered. There is no easy way around this failure to consider savings and investment except to appeal to the rela tive absence of a large-scale landowning class in the Latin American or Asian sense in most African countries, and the consequent paucity of investment link ages. In poor and probably more egalitarian rural Africa (relatively speaking and excluding areas of European settlement), the omission of dynamic investment ef fects may be less bothersome than elsewhere.

For present purposes, the most troubling of the three basic assumptions of fixed-

(the “fixed price”). This assumption may be applicable in Asian countries, which are known to have a plentiful supply of labor. In Africa, this assumption raises concern about the existence of the required pool of underemployed nontradable goods and services needed to put in motion the multiplier effect, as discussed in greater detail in a subsequent section. If the assumption of perfect elasticity is relaxed, then the model overestimates the true multiplier.

Price-endogenous models, allowing for upward-sloping supply curves for nontradables, provide better estimates of multiplier effects in situations where the assumption of perfectly elastic supply of nontradable output must be relaxed. These models also impose no functional form on the production function, so one is not restricted to using the restrictive Leontief form (Haggblade, Hammer, and Hazell 1991).

Haggblade, Hammer, and Hazell (1991) estimate multipliers for Sierra Leone, the Muda River, and Oklahoma, to compare the extent of overestimation from fixed-price models. They investigate two possible scenarios. In the first case, both labor and other nontradables are price inelastic. They estimate that the degree of overestimation ranges from 20 to 40 percent. If either labor or “other nontradables” is inelastic, they estimate that the range of overestimation is from 10 to 25 percent. They assume that in Africa all nontradable goods and services are inelastic; therefore, on average, the degree of overestimation will be about 30 percent. In Asia, neither labor nor other nontradables are believed to be inelastic; hence, on average, the degree of overestimation will be 10 percent. Table 3 reports adjusted multipliers, accounting for too rosy a view of the elasticity of the supply of nontradables.

Computable general equilibrium (CGE) models that allow for the simultaneous interaction of price and quantity variables do away with the cumbersome need to model exogenous prices explicitly through behavioral forms, as required by semi-input–output models (Dervis, de Melo, and Robinson 1982). Constructing and running CGE models is now relatively easy with available statistical software packages. However, it typically requires the construction of a SAM, which organizes the underlying data and parameters used in CGE models. Creating a SAM is a lengthy process that requires in-depth access to data sources such as national accounts, input-output tables, and household, enterprise, financial, and labor surveys (Dorosh et al. 1991).

CGE models are not completely lacking in restrictive assumptions either. As for all neoclassical general equilibrium models, they require a set of restrictive equilibrating conditions in order to close the system of equations. Conditions are normally imposed such that excess demands are set to zero through the clearing of markets and full employment of all resources (except labor). Such market clearing assumptions may not always be appropriate for developing countries (Robinson 1989). Yet, the simple fixed-price approach has the merit of producing easily understood indicators as to why, when, and where it is important to increase the elasticity of supply of nontradables to achieve potential added growth that can be had from a given positive income shock to the local economy.

The few empirical estimates of growth multipliers for Africa suggest similarities and important differences for Africa relative to Asia. For both Africa and Asia, consumption-based agricultural growth linkages were four to five times more important to growth than production-based linkages. This suggests that neglecting the con-

Table 3 Fixed-price agricultural growth multipliers in Africa and Asia adjusted for an inelastic supply of nontradables

Study	Location	Dollars of total income growth from $1.00 of direct growth in agricultural income after adjustment
Bell, Hazell, and Slade (1982)	Malaysia, Muda River region	1.65
Hazell (1984)	Malaysia, Muda River region	1.64
Hazell and Haggblade (1990)	India, all	1.48
	India, Punjab and Haryana	1.74
	India, Madhya Pradesh and Bihar	1.31
Hazell, Ramasamy, and Rajagopalan (1991)	India, North Arcot, Tamil Nadu	1.64
Haggblade, Hazell, and Brown (1987)	Sierra Leone and Nigeria	1.05
Haggblade, Hazell, and Brown (1987) assuming millet, sorghum, and maize are nontradables	Nigeria, Gusau	1.97

Notes: Multipliers are adjusted for overestimation as determined by the estimation of price endogenous models in Haggblade, Hammer, and Hazell (1991). In Asian countries they suggest a possible overestimation on the order of 10 percent and in African countries as high as 30 percent. Multipliers are arbitrarily reduced by these assumed degrees of overestimation.

sumption side à la Hirschman is severely misleading. In both the African and Asian cases, neglecting growth linkages altogether would lead to underestimation of up to 40 percent of the potential growth that could be had from investment in agriculture. Yet, while the Asian cases suggested multipliers on the order of 1.8 ($0.80 of extra nonagricultural income for each $1.00 of new agricultural income), the two African cases yielded fixed-price multipliers on the order of 1.5.

Even so, it is difficult to interpret these numbers as suggesting that the true African multipliers are in fact lower, since the Africa cases were estimated assuming that major expenditure items such as millet and sorghum were tradable. Hazell and Röell (1983) find that households in Muda have a higher MBS for nontradables than do households in Gusau (see Table 1). Thus, in Gusau, estimated growth linkages turn out to be weaker, since there is a lower marginal propensity to spend on nontradables as they define them, leading to their pessimism about linkages in Africa.

The neglect of noninfinite price elasticities for nontradables in the fixed-price methodology was found to be more of a problem in Africa than Asia. Rectifying this omission in both cases would probably reduce African agricultural growth multipliers relative to the Asian ones. A back-of-the envelope calculation suggests that while the true endogenous price multipliers for the Asian cases studied are probably still on the order of 1.6, since labor is abundant, they would be less than 1.1 in the African cases (Table 3) if the tradability assumptions in Hazell and Röell (1983) are justified.

These points illustrate three insights for the design of policy-oriented research: (1) the tradability of rural consumer items and the factors influencing this characteristic are central to growth linkages analysis in Africa; (2) the problem of an inelastic

supply of nontradables is not a negligible concern in Africa; and (3) the first concern is likely to be far more important to results than the second concern.

The following sections integrate these insights into a broader literature to isolate key structural characteristics of Africa that affect the magnitude of agricultural growth multipliers, with emphasis on what can be done to enhance growth in Africa. Key issues are (1) the degree of openness of rural economies and the tradability of major items consumed and produced there; (2) the allocation of rural consumption expenditures between tradables and nontradables; (3) the pattern of rural income distribution, given that different income groups have different consumption patterns; and (4) evidence on the elasticity of supply of rural nontradables.

Tradability, Demand-Constrained Items, and the Sensitivity of Multipliers to the Choice of Trading Space

Other than value added from local trading, incremental local income spent on goods imported to the region does not add any additional income to the area. Potential export proceeds are also forgone when incremental income is spent on goods that could instead have been exported out of the region. Thus, to estimate agricultural growth multipliers, it is necessary to classify all intermediate goods, final goods, and services into nontradable and tradable items. The key difference between the two in the present context is that locally produced nontradables by definition have no market outside the local area. Locally consumed nontradables also have no source of supply from outside the local area. In the present simplified framework, nontradability implies that a good (and all services) is demand constrained. Tradable goods, on the other hand, by definition always have an outside market and an outside source of supply. Their local production is supply constrained.

The Asian growth linkages literature typically defines as "nontradable" those goods, inputs, and services that are neither imported to nor exported from a region around the survey area, usually within 50 to 100 miles of the point of analysis. This literature also implicitly or explicitly views locally produced nonagricultural commodities as being nontradables and locally produced agricultural commodities as being tradables. This practice is consistent with agricultural sectors where the main products are rice, wheat, and poultry. In the Muda study, for example, all locally produced nonfoods were classified as nontradable, and the only foods classified as nontradable were dairy products and food preparations. It should be noted that this classification makes for a close congruence between the earlier concern for agricultural versus nonagricultural linkages and the more recent interest in tradables versus nontradables.

The numerical results for multipliers in Hazell and Röell (1983) and Haggblade, Hazell, and Brown (1987) depend on extending to Africa two key assumptions made in the previous Asian literature. First, the definition of tradability is limited to a small area, the immediate region around Gusau. Second, millet, sorghum, and maize in Gusau are treated as tradables, just like rice in Muda River (and Gusau). It is debatable whether millet and sorghum from Gusau have an export market outside the immediate

region of northern Nigeria except in unusual circumstances. These crops are clearly not tradable in the usual sense if the catchment area goes beyond local areas in northern Nigeria. Reclassifying millet, sorghum, and maize as nontradables would almost triple the ABS for nontradables in Gusau and double the MBS. This would bring the estimated agricultural growth multiplier from Gusau to 2.8, considerably larger than the one from Muda! Even allowing for the maximum 40 percent overvaluation from using a fixed-price model, this yields an African growth multiplier of 2.0.

Thus, tradability assumptions for specific goods matter because they incorporate assumptions about whether new demand simply displaces regional exports (or increases regional imports), or whether it has the potential to draw underutilized resources into production for which there would not otherwise be a market. Labor supply insensitivity to price (if true) matters because it indicates whether demand stimulus will be channeled into higher relative prices for nontradables or increased production thereof.

The Elasticity of Supply of Nontradables in Semi-Open Africa and the Issue of Underemployed Resources in Rural Areas

Fixed-price growth multiplier estimates are clearly too high because of the embedded unrealistic assumption of a perfectly elastic supply of nontradables. But how serious is this bias? In the Asian literature referenced here it is customarily ignored, since Asia's high rural population densities are traditionally thought to imply low marginal productivities of labor, hence easy availability of labor for more lucrative new opportunities.

There are at least three reasons to be concerned that the elasticity of supply of rural nontradables is low in Africa. First, rural Africa is usually thought to be labor-constrained in relation to Asia, at least during the peak seasons for cultivating cereals (Eicher and Baker 1992). Second, since nontradables account for large shares of rural activity in the aggregate, it is probable that supply elasticities for the sector as a whole will be much lower than for individual activities (de Janvry 1994). Third, under the usual assumption of full employment of resources, benefits from demand shocks to nontradables would mostly be monetary, rather than net increments to growth, since the output gain in one sector would come in response to an output loss in another (Bigsten and Collier 1995).

Yet the issue is not so clear cut, especially in West Africa. In most of West Africa, national economies are "semi-open," exhibiting many of the characteristics of Asia with respect to the food economy and of Latin America on nonfoods (Delgado 1992). Following Myint (1975), a semi-open economy may be characterized as one where price-taking emerging countries are firmly linked to world trade, yet a large part of the domestic economy remains insulated from the impact of foreign trade because of a high rate of natural trade protection due to remoteness and undeveloped infrastructure. In the present cases, semi-openness can be thought of in terms of a farm sector producing both exportable crops and nontradable foods and mostly nontradable nonfarm services and handicrafts.

In such a stylized economy, farm exportables are potentially supply constrained by factor supplies. However, unlike most farm nontradables, they are also constrained by technology, by infrastructure, and by the reliability of supply of modern inputs such as fertilizer. Nonfarm nontradables are primarily constrained by demand. The effective constraints on farm nontradables have not been well established. However, they are likely to be constrained in production either by factor supplies or by demand. It seems likely that the productive potential for these items (such as millet in Burkina Faso and subsistence food crops in most countries) regularly exceeds effective demand, except in exceptional years.

In the aggregate, the supply of rural nontradables could be elastic either at the expense of farm exportables or, if there are underused farm resources, in equilibrium. The former leads only to monetary, not real, gains, since the initial impetus for linkages by hypothesis comes from the exportable farm sector. Therefore, the key issue for the elasticity of the aggregate supply of nontradables in rural areas in such a stylized economy boils down to the existence in equilibrium of underused resources of labor, land, and capital that can flow into new production of nontradables stimulated by demand shocks.

What evidence is there of underused resources in rural Africa? While this question has not been conclusively studied, strong anecdotal evidence suggests the existence of such resources. There are two main arguments. First, there is the clear existence of seasonal slack periods in rural areas covering much of the year, combined with varying degrees of underutilized land resources (Ruthenberg 1971; Cleave 1974; Delgado and Ranade 1987). This situation is supported in the chapters in this report on Burkina Faso, Niger, and Zambia. Second, the binding constraints on farm exportables are typically those other than the supplies of land and labor that constrain nontradable foods in much of Africa, allowing food production to expand without necessarily causing the export crop production to contract.

The first argument runs as follows. Given that labor bottlenecks are a constraint only a few weeks of the year, there is probably some slack in resource use in the system most of the time. Beyond underemployment, labor often migrates seasonally, and nonfarm activity accounts for some time during the dry season (Delgado and Ranade 1987). These resources could probably be used to produce items and alleviate excess demand during the slack periods. That the large amount of nonfarm activity observed on an annual basis in rural Africa is carried out by farmers within their own household compounds suggests that the transaction costs of switching among sectors are also relatively low—certainly lower than having to migrate (Reardon et al. 1994).

Taken together, seasonal slack periods in farm activities and low transaction costs for moving between farm and nonfarm activities suggest that the supply elasticities of nonfarm activities and farm activities that are not seasonally constrained (that is, nonfood farm activities) may potentially be fairly high, even in the aggregate, since there appears to be underused labor and land resources available most of the year. However, since so much of aggregate rural production is accounted for by the nontradable foods that also account for the seasonal labor bottlenecks, it is still reasonable to question whether farm nontradables as a group are price elastic in supply.

The second argument partially addresses this problem and is well supported in the literature. While nontradable food production is primarily a function of the land and labor allocated to its production in Africa, nonfarm exportables are primarily constrained by other factors. Seasonal labor bottlenecks for nonfarm exportables in the main field-crop growing areas of Africa tend to be different than those for the main nontradable foods in the same areas. This fact helps explain the rapid expansion of export cropping on small farms in the 1960s without much apparent loss of previous food production (de Wilde 1967; Ruthenberg 1971; Delgado and McIntire 1982; Delgado and Ranade 1987). Farm exportables in Africa, on the other hand, have tended to be highly dependent on commodity-specific organizations and resources, such as specialized export infrastructure, a reliable supply in rural areas of imported inputs such as fertilizer and pesticides, remedies for specific crop diseases and pests, and so forth (de Wilde 1967; Lele 1975, 1991; Eicher and Baker 1992). Availability of such organizations and resources may also affect food production, but presumably much less for nontradable items such as millet and cassava (grown far away from infrastructure) than for maize and rice, which are clearly tradables in most cases.

If farm exportables and nontradables are not in direct competition with each other at the margin for land and labor, then the existence of underused rural resources is much more plausible. Although arrived at by a different path, this view is in fact compatible with the philosophy of structural adjustment lending in Africa, whereby demand shocks (because of the correction of price distortions toward the farm sector as a whole) will elicit an aggregate supply response from the farm sector (see, for example, Chhibber 1989).

In conclusion on this issue, it is difficult to go beyond the quantitative estimates of a 20 to 40 percent overvaluation of fixed-price multipliers in Africa suggested by Haggblade, Hammer, and Hazell (1991) in speculating about the impact of inelasticity in the supply of nontradables on the true size of growth multipliers. This is primarily because the issue is hard to measure empirically other than through the type of simulations these authors used. This kind of work cannot be redone in the present study. Furthermore, there is plenty of anecdotal evidence suggesting that the problem is not more serious than in Asia, where it typically has been neglected. Therefore a rule of thumb allowing for 30 percent overvaluation will be adopted in interpreting the results, and this is judged to be conservative.

Rural Consumption Patterns and Nontradable Foods in Africa

As already noted, the consumption patterns of beneficiaries of a direct increase in agricultural income are a major determinant of the strength of agricultural growth linkages. The multiplier effect is most significant when incremental income is spent on labor-intensive, locally produced, nontradable goods and services. Infrastructure and regional characteristics in much of Africa are such that a significant range of goods and services fall within nontradables.

Household budget surveys across Africa consistently show basic foods to be the main consumer expenditure item in rural areas. Because the costs of transporting and

marketing imports and exports of food are very high, most food consumption is from domestically produced sources. Exports of starchy food staples and livestock products to points outside of Africa are negligible. It can easily cost twice the f.o.b. cost of imported grain in West African ports to transport it to markets in the interior of West Africa (Delgado 1992).

Furthermore, although grain can be imported by African price-taking countries in large quantities at a constant price, imported cereals such as rice and wheat that are consumed by urban dwellers in Africa often are much more expensive calories on a per unit basis than local grain. Since much of the population of West Africa is very poor and grain consumption is sensitive to real income, only a small share of the people can substitute expensive imported grains for local food items. Thus it is not surprising that food staple markets are characterized by prices that vary depending on domestic supply and demand conditions, in a gap between export and import price parities with little or no external trade (Delgado 1991, 1992).

Since starchy food staples represent a large share of explicit or implicit consumer budgets in Africa, it follows that the real price of labor is likely to be closely linked to the price of the main domestic starchy staple. In West Africa, Delgado (1992) finds that internationally nontraded food staples such as millet, sorghum, plantains, and root crops accounted for 20 to 40 percent of total household expenditures in rural areas, and these staples were not well correlated with domestic prices of tradable foods such as rice and wheat. Relative prices for the nontraded food items listed, in terms of tradables in the region typically fluctuate more than 25 percent across years, particularly given the severe weather fluctuations observed in the period concerned. Kyle and Swinnen (1994) report that up to 50 percent of total calories consumed in some Central African countries come from nontradable roots and tubers.

Under these conditions, the price of nontraded food is positively linked in both directions to the price of (nontradable) labor, and both food and labor are nontradables in addition to being nontraded. The implication of this is that factors that shift the supply curve for food nontradables to the right can be expected to shift the supply curve of tradables in the same direction by lowering the costs of production of tradables in terms of nontradables (Delgado 1992).

Having such a high share of food consumption in the nontraded sector in parts of Africa (especially inland West Africa) implies that exogenous rural income growth has great potential to pull underutilized resources into the food sector. Thus, potential growth multipliers are high, even if consumption of locally produced manufactures is low.

Rural Income Distribution and Growth Linkages

Consumption patterns typically change across the income spectrum, and the nontradable content of intermediate inputs and final commodities consumed varies also. Therefore, it is reasonable to wonder whether some segments of the population have persistently higher contributions to growth multipliers. Is multiplier-type growth

more likely to be concentrated among lower-income and smaller-sized farm households, or are higher-income, larger-sized farms more conducive to growth linkages?

Poor people in both Africa and Asia tend to spend a large share of their incomes and increments to income on basic starchy staples. These goods are produced locally and in most cases are labor-intensive. Higher-income rural households, on the other hand, tend to spend a greater portion of their incremental income on manufactured goods and preferred foods such as dairy products, meats, and fruits. As discussed earlier, the tradability of these items will vary greatly with infrastructure and location.

An early study by King and Byerlee (1978) estimated factor intensity and locational linkages of consumption patterns at various levels of income for a disaggregated set of goods in Sierra Leone. They estimated expenditure elasticities and marginal propensities to consume for each commodity used in the survey. Their results on factor intensities show that labor requirements arising out of consumption decrease as households' incomes increase. This supports the hypothesis that lower-income households consume more labor-intensive goods, and higher-income households consume more capital-intensive and imported goods, though only moderately so. Overall, consumption patterns appear to be relatively homogeneous, largely due to the uniformity of income distribution in Sierra Leone.

King and Byerlee's findings on locational linkages show that the marginal propensity to consume subsistence goods drops as incomes rise, rural consumers spend a greater proportion of their incremental income on rurally produced goods, the marginal propensity to consume products from urban centers is low, and higher-income groups tend to allocate a greater proportion of their income to imported goods than lower-income households do. Households at all income levels have high marginal propensities to consume rurally produced goods, with values falling slightly as incomes rise. Low-income households spend 7 percent more of their incremental income on rurally produced goods and services than high-income households (Hazell and Röell 1983).

Celis and Bliven (1991) examined consumption linkages in Zambia by estimating Engel function expenditures on various goods and services. Their estimates of marginal changes in budget shares indicate that 75 percent of incremental income went to food and 25 percent went to nonfood. This allocation of incremental expenditure to food did not vary across expenditure quintiles. They also found that improved agricultural technology did modify consumption patterns in favor of nonfood goods and services, which probably stimulated growth in the nonagricultural economy and hence increased multiplier effects.

Consistent with their assumption that cassava, millet, sorghum, and other starchy staples are tradable, and that local manufactures are nontradable, Hazell and Röell (1983) find that higher-income households in both Muda and Gusau had higher MBSs for nontradables than do lower-income households. Nontradables in Muda are nonagricultural and in Gusau they are agricultural. Consistent with this commodity difference and the usual view of preference changes with increasing incomes, higher-income households in Gusau did not have budget shares as high as low-income households in Muda.

Hazell and Röell (1983) argue that since low-income groups spend most of their income on foodgrains, which tend to be price-inelastic in supply, tradable income gains by this group may result in the generation of fewer linkages. This is because the magnitude of the true multiplier depends on there being an elastic supply of the goods and services demanded. Finally, the effects on income distribution of raising the incomes of lower-income households are not as significant as suspected, since higher-income households benefit more from multiplier effects through increases in "returns to capital, managerial skills, and skilled labor," which they have in relatively greater abundance. Hazell and Röell conclude that large-sized farms in their sample had the most desirable spending patterns for multiplied growth.

Growth Linkage Studies and Identification of Rural Growth Bottlenecks

Studies of consumption growth linkages are useful for assessing the strategic consequences of final and intermediate demand patterns. Even though prices do not enter the analysis directly, linkage analysis indicates which sectors are likely to be under price pressure once exogenous growth from the tradable sectors occurs. Furthermore, the greater the level of disaggregation, the more useful it is for this purpose.

The starting point for promoting economic growth in rural areas in almost all African countries is to alleviate supply constraints for agricultural exportables, principally through technological change that permits total factor productivity gains. Interventions to cut the unit costs of distribution of tradables will also improve the competitiveness of African economies. While the supply-side emphasis on the production cost and producer price incentives for exportables has long been accepted on the grounds of comparative advantage, the very important secondary effects that come when incomes from cash cropping are respent have tended to be ignored in the past. In any event, there has been less attention paid in the past 15 years—especially given the lackluster performance of agricultural commodities on world markets during that period—to the importance of improving the unit costs of production and distribution of both agricultural exports and nontradable foods in Africa.

The growth linkages literature shows that growth processes from successful interventions to develop areas of agricultural comparative advantage can be significantly curtailed by an inelastic supply of nontradable inputs, goods, and services. Thus, even if a country has the good fortune to have a breakthrough on the production side for an exportable, production costs will quickly rise if the ensuing demand for labor and inputs meets inelastic supply because increased labor demand has raised the cost of living significantly. This pinpoints one of the most important current areas for research on agricultural development strategy in Africa: the link between prices for the nontradable items that workers in the tradables sector consume and production costs for tradables. Although the present report cannot directly address these price effects, it will show where they are likely to be important.

Rural Economic Growth Strategy in Africa

The discussion in this chapter suggests that earlier studies, such as Hazell and Röell (1983) and Bigsten and Collier (1995), were premature in downplaying the potential for obtaining multiplied spin-off effects for regional growth, arising from the consumer spending of growing incomes of rural households under commercialization and technological change in Africa. On the contrary, it is suggested here that such spin-off effects are likely to be greatest in remote, poor areas, where the transaction costs of trade are high. Under such conditions, many local products and all local services are constrained by the level of local effective demand. Large parts of many African countries may fit this model well.

As in other parts of the world, economic growth in Africa will need an "engine"—a cut in unit production costs from technological change or a decrease in marketing costs from better infrastructure. The study of agricultural growth linkages will not help identify these engines for specific areas. However, such work does show that if supply-led growth is occurring somewhere in agriculture, if the benefits are widely spread and there are underemployed rural resources, then there is considerable scope for the stimulation of further economic activity that would otherwise be constrained by a lack of solvent local demand. However, unlike the case of Asia in the 1960s, many of the demand-constrained items in rural Africa may come from within the agricultural sector. Thus the growth problem may be less of an issue of how cities will pull the countryside along, as was previously thought, and more of how supply-side measures to start agricultural growth in rural areas can be helped to provide second-round and higher-round effects within agriculture itself. The next chapter lays out a model and a series of case studies for investigating these assertions.

CHAPTER 3

Methodology and Overview of Case Studies

The growth linkages approach introduced in the previous chapter investigates the conditions under which additions to income from sales of rural goods and services have multiplied effects through respending of the income on local products that would not otherwise have been produced. To ascertain the extent of these multiplier effects, it is necessary first to determine how people use additions to their incomes and then to distinguish the purchases that are net additions to regional income. Identification of the sectors that have the highest multiplied effects on regional income indicates where development investment has the highest potential return in overall growth.

The methodology for assessing these issues is detailed in this chapter. Since the examples used to illustrate the model are specific to the country cases that follow, the chapter begins with an overview of the country cases and data. A description of the approach for categorizing goods and services by sector and tradability follows, as well as a discussion of the implications of the existence of nontradable goods and services on growth. The final sections explain the estimation of marginal and average household budget shares and the growth multipliers.

Country Case Studies

This research uses existing household-level panel data sets that were collected by IFPRI in collaboration with various African institutions. These data sets have been jointly analyzed with these institutions in other fora but not in the way done here. This report also draws on insights from substantial household-level work by Christopher Delgado, Jane Hopkins, Valerie Kelly, and Peter Hazell with various collaborators on other projects concerning income diversification of rural households and the extent and determinants of regional agricultural trade in the areas concerned. The household data cover weekly or biweekly panels for one full year, during 1984/85 for Burkina Faso, 1989/90 for Niger and Senegal, 1985/86 for Zambia, and 1987/88

for Zimbabwe.[2] Characteristics of the study zones and samples are summarized in Table 4 and the details of previous collaborations are discussed further in the sources referenced in the table.

The present study covers diverse sites, with annual rainfall ranging from 300 to 1,200 millimeters, average household sizes ranging from 6 to 11 adult-equivalents, and labor-land ratios ranging from 0.20 to 0.91 hectares per capita. A particular advantage of this type of multicountry study is that it permits observation of locational differences in average income levels. Differences in the years of the survey and the difficulty of finding appropriate exchange rates for comparison of the West African franc zone (CFA) countries to Zambia in the periods considered complicate comparisons of income levels across countries. A rough idea is given by the last column of Table 4, which lists average sample total expenditures per capita divided by the average local consumer price of the major cereal crop in the year of survey. Generally, the Zambia sample seems to have distinctly higher purchasing power for food than the Sahelian sample, although it is probable that the Zambians' physical access to imported consumer items, such as many manufactured goods, was distinctly lower, due to foreign exchange difficulties in Zambia at the time.

The Senegal sample, which includes agricultural zones of both high and low potential, is better off on average than the samples studied in other countries. Senegal has a relatively high gross national product (GNP) per capita in Sahelian terms, at US$656 per capita in 1989, compared with US$292 for Niger and US$313 for Burkina Faso. The comparable figures for Zambia and Zimbabwe are US$396 and US$654, respectively (World Bank 1992). However, purchasing power differs substantially between the two zones studied in Senegal. The central Groundnut Basin, closer to Dakar, has higher purchasing power on average than the more remote southeastern Groundnut Basin, where purchasing power is closer to that of the other West African countries studied.

Other structural differences of note between the sample countries are the relative openness of the economies and the relative importance of agriculture in national income. In 1989, imports as a share of GDP were highest in Zambia, at 34 percent, compared with 32 percent in Senegal, 29 percent in Burkina Faso, 28 percent in Zimbabwe, and 22 percent in Niger (World Bank 1992). Liquid fuel consumption per capita in 1989 also provides an indicator of the degree of transport infrastructure and internal trade: in Senegal the figure was 139 kilograms, compared with 69 kilograms in Zimbabwe, 59 kilograms in Zambia, 26 kilograms in Niger, and 20 kilograms in Burkina Faso. Agriculture accounted for more than 30 percent of GDP in Burkina Faso and Niger in the same year, just over 20 percent in Senegal, and about 12 percent in Zambia and Zimbabwe (World Bank 1992).

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[2] Unlike the other four case studies, the Zimbabwe study did not involve panel cost-route data, and the scope of analysis for detailed expenditure analysis is less. It therefore could not be used for MBS or growth multiplier analysis. However, it is used in the same chapter as the Zambia results to offer a comparison of average expenditure behavior and to better explain the differences in expenditure behavior of commercial farmers and communal-area smallholders.

Table 4—Characteristics of samples and study zones

Country, year, zone	Number of households	Average rainfall	Average number of persons/ household	Adult equivalents/ household	Land cultivated/ capita	Income from			Total expenditure in cereal equivalents[d]
						Own farm[a]	Local manufactures[b]	Local services[c]	
		(millimeters)			(hectares)		(percent)		(kilograms per capita)
Burkina Faso, 1984/85									386
Sahelian	45	300–500	8.00	7.95	0.91	63	11	12	
Sudanian	44	500–700	10.30	9.09	0.51	66	5	23	
Guinean	47	900–1,100	10.30	11.37	0.52	57	6	31	
Niger, 1989/90									553
Sudano-Sahelian	46	450–550	8.10	6.05	0.75	48	6	25	
Sudano-Guinean	67	600–800	8.30	6.40	0.69	57	6	29	
Senegal, 1989/90									
Southeastern Groundnut Basin	35	700–1,000	13.60	9.96	0.90	89	2	11	654
Central Groundnut Basin	34	500–700	11.28	10.28	0.87	81	3	13	754
Zambia, 1985/86									784
Plateau	262	850–1,050	6.01	n.a.	0.45	n.a.	n.a.	n.a.	
Valley	66	750–900	5.94	n.a.	0.16	n.a.	n.a.	n.a.	
Zimbabwe, 1987/88									n.a.
Communal	231	< 800	5.82	n.a.	0.86	n.a.	n.a.	n.a.	
Commercial	66	< 1,200	3.64	n.a.	43.70	n.a.	n.a.	n.a.	

Sources: Country chapters and other reports from the same data as follows: Burkina Faso, Senegal, and Niger: Reardon, Delgado, and Matlon 1992; Kelly et al. 1993; Hopkins and Reardon 1993; Zambia: Celis, Milimo, and Wanmali 1991; Jha and Hojjati 1993; Zimbabwe: Wanmali and Zamchiya 1992.

Notes: n.a. indicates not available.

[a]Value of crop and livestock products from own farm (excludes gathering).

[b]Local manufactured goods (excludes processed foods).

[c]Food preparation, commerce, transport, construction, wage income from work on someone else's farm, and other services. Agricultural wages are of minor importance here.

[d]Consumption expenditure only, deflated by the local consumer price of white sorghum in Burkina Faso, millet in Niger, and the central Groundnut Basin of Senegal, a weighted average of consumer millet and sorghum prices in the southeastern Groundnut Basin of Senegal, and the producer price of white maize in Zambia. The use of producer prices raises the cereal-equivalent estimate of absolute income.

In sum, on a national basis, Senegal is the most open and internally well articulated of the sample countries. Niger is relatively less open and its internal trade is limited. Burkina Faso is more open but has even less internal trade. Zambia exhibits a relatively high degree of openness and a good level of internal trade, while Zimbabwe is less open but relatively high in internal trade.

Both the Senegal and Niger samples were observed during above-average harvest years, whereas the Burkina Faso sample was observed during an extremely bad drought year, following on two other drought years. This helps explain the especially low purchasing power estimate for that country in cereal equivalents. Cereal prices were very high in the survey year. The Zambia data came from a very good harvest year, when the study zone had a year to recover from the devastating drought of the early 1980s.

Sectoral and Tradability Classification of Goods and Services

As discussed in Chapter 2, the expected magnitude of growth multipliers depends to a large extent on the assumptions about demand constraints included in the sectoral classification of goods and services into tradables and nontradables.

Since farmers in Africa typically earn half their income from activities other than the production of crops and livestock, it is misleading to define "farm" and "nonfarm" by location. In fact, farm households are also rural nonfarm households, especially in West Africa (Hopkins, Kelly, and Delgado 1994). Because rural nonfarm activity is primarily carried out on the farms, rather than in market towns as in South Asia and Southern Africa, events in West Africa that stimulate spending on nonfarm goods and services will lead to widespread income growth for farm people in rural areas. Furthermore, since the gains from increased nonfarm activity accrue to households that are also engaged in farming, nonfarm activity increases farm liquidity and spreads income risk. Thus, classifying goods into farm and nonfarm sectors, rather than into food/nonfood or rural/urban categories (which tend to be interpreted as farm and nonfarm in drawing policy conclusions), better captures the reality of the linkages between the farm and nonfarm sectors, at least in West Africa.

The impact of local income growth on further local growth through the alleviation of local demand constraints depends not only on consumption responses to income growth, but also on whether goods are in fact demand-constrained. By definition, as argued in Chapter 2, only nontradables are demand constrained. Therefore, treating a nontradable good as a tradable leads to an underestimation of the amount of additional growth that can be had through linkage effects. This is because increased demand for tradables, by definition, leads to additional imports (if the good is typically imported to the region), or to decreased exports (if the good is typically exported from the region) rather than new local production. Nontradables, on the other hand, cannot be exported or imported, by definition. Thus, any increased demand must be met by new local production (or increased prices), which creates additional growth in the local economy. Likewise, to the extent that nonfarm goods are misclassified as farm goods,

the ability of increased cash crop or livestock income to provide a demand stimulus for the nonfarm economy is underestimated.

By common definition, services in Africa are treated as nontradables, since the service is always performed locally and cannot be exported or imported. In practice, it is not easy to determine whether goods are nontradable from their physical characteristics alone. Nontradability of goods derives from the combination of high transport costs with production costs that are neither low enough to justify exports nor high enough to allow profitable imports. They are rarely traded and are not good substitutes for ones that are. It is often easier to observe the defining characteristic of nontradables: that their domestic prices are not well correlated with import prices, prices of importables, or prices in markets outside the zone of interest. Regardless of how tradability is defined, its application in the classification of goods requires the definition of what is inside the zone of interest and what is outside; the latter is the external reference market. The zone of interest is the area within which benefits are measured and where they may be expected to occur. This zone is referred to here as the "catchment area," a term that expresses the spatial notion, inherent in linkages work, of a geographic zone within which the production of nontradables occurs.

In practice, the country research teams arrived at their classifications subjectively, after much team discussion and visual inspection of price trends over time, when there were doubts. Depending on the country data available, goods consumed and produced by the sample were classified as tradables or nontradables at different levels of disaggregation, ranging from 950 individual items in Niger to two dozen composite groups of goods in Burkina Faso. These were then aggregated into about two dozen goods and services groups, each with a consistent tradability characteristic at the national level.

Because of the sensitivity of growth multiplier results to the choice of trading space, a further procedure was adopted for the West African cases, where trading zones for specific commodities are relatively well defined. An effort was made to reclassify goods from the national definition of nontradables and tradables to alternative definitions, first, with respect to the borders of a local village and then to regional borders, encompassing all of West Africa.

The three alternative definitions of catchment area—local, national, and regional—correspond to a progressively more distant reference market. The local catchment area implicit in Asian studies of agricultural growth linkages is formalized here in the African cases as an area within an approximately 100 kilometer radius of the study site, from which those goods designated as tradables are traded. National tradability means that the national catchment area trades with outside markets, and regional tradability implies that a good is traded on world markets or is a good substitute for one that is. This approach is less feasible for the data sets considered in the Southern African cases; therefore tradability assumptions for Zambia and Zimbabwe are tested for key commodity groups on a more ad hoc basis.

It should be noted that conceptual rigor requires choosing one set of tradability assumptions and sticking with them. As the size of the nontradables sector increases

with an expanding catchment area, the elasticity of the sector must fall (de Janvry 1994). Furthermore, using the same level of initial income growth with two different catchment area sizes implies different assumptions about the initial rate of growth in tradables, since the size of the tradables sector shrinks as the catchment area grows (de Janvry 1994). Therefore, the approach adopted here is to stick with the familiar national definition. The research team also feels most confident about these classifications. Results from the application of local and regional definitions are reported primarily as a guide to the sensitivity of results to tradability assumptions, although it should always be borne in mind that they cannot be directly compared, since they embody different assumptions for the same goods.

In sum, nontradables, using the national definition of tradability, are items for which national supply is equal to national demand; they are rarely if ever traded to or from points outside of national markets, and they are not close substitutes for items that are. Increases in demand for these nontradables in the national catchment area will lead to increased national production of these items, provided that production rigidities or policy interventions do not make their supply perfectly inelastic with respect to price. The more elastic the national supply for nontradables, all else being equal, the greater the increase in local production and incomes from the demand stimulus.

As suggested in Chapter 2, more elaborate models incorporating social accounting matrices capture interindustry linkages better for catchment areas larger than the local one. However, the data needs and assumptions required make this an onerous task for the study areas observed, without sufficient payoff in strategic insights gained. For the rest of the report, unless specifically identified otherwise, results and insights are reported using the national definition of tradability, even though this unfortunately ignores the impact of transport costs within countries.

An important implication of using a national definition of tradability is that more major consumer items are classified as nontradables, as is the case for millet and sorghum in parts of West Africa. Besides favoring high multipliers, this resuscitates the notion that wage goods play a strategic role in growth for countries subject to high agricultural transport costs to outside markets. Wage goods are items that account for a large share of consumer expenditure, whether or not they are tradable. As the name implies, their prices are closely correlated with wage levels. They acquire long-run strategic importance if their domestic relative prices are largely determined by domestic supply and demand factors, since the same determinants then affect wage levels. For example, if they are nontradables, they do not enter trade because they are bulky, have high transport costs relative to their final value, and no close tradable substitutes.

Surges in domestic demand for nontradable wage goods without close substitutes can raise their relative prices, putting upward pressure on wages relative to output prices and cutting profit margins. This chokes off growth in the tradables sector, unless the supply of wage goods or close substitutes is elastic. This upward pressure tends to be closely correlated with the supply price of labor. More expensive wage goods quickly imply less competitive tradable production.

Summary of Classifications in Country Reports

The detailed data sets used in this report and the field experience acquired in collecting the data allowed the authors to consider the sectoral placement and tradability of specific goods and services in detail. Locally produced food is sometimes equated with the farm sector in computing multipliers. In the Sahelian studies, processed food items such as beer, breads, cakes, processed vegetables, and processed meats are placed in the nonfarm sector, since much of the value added of these items occurs postharvest and is service related. Consumption durables (such as kitchen utensils, furniture, and clothing) and nondurables (such as fuelwood, kerosene, soap, and services) are also classified as nonfarm services. Raw goods that originate on farms, such as unprocessed cereals and pulses, fresh vegetables and fruits, milk, and live animals, are classified as farm goods. Prepared foods that are not packaged for transit (for example, sorghum beer and millet cakes) are local nontradables, as are fresh meat and dairy products.

More items become nontradable at the national level of tradability. Examples would be fruits and vegetables, most prepared foods (such as peanut butter), and some starchy staples, including millet and sorghum in Burkina Faso and Senegal, and cassava, sweet potatoes, and *fonio* (a wild grain crop of West Africa in the millet family) in all cases. Further examples on the input side include crop by-products used for fodder and domestic varieties of seeds retained for sowing.

Major food staples, such as millet and sorghum in Burkina Faso and Senegal, are classified as nontradables because of their independent price behavior. Adding to this judgment, the interior regions of West Africa cannot import coarse grains from the world market on a consistent basis, at unsubsidized prices, because of high transfer costs. Furthermore, there is a substantial body of evidence, partially reviewed in Chapter 2, suggesting that world market grains such as rice and wheat are not good substitutes for millet and sorghum in the landlocked countries, particularly because their calories are much more expensive.

The issue of the tradability of coarse grains at the national level in Senegal and Burkina Faso depends on whether they are occasionally imported or exported (a rare event), and whether their prices are closely linked to items that are traded. This mainly boils down to whether rice imported from the world market is a good substitute for millet and sorghum. In Senegal, in particular, coarse grains are seldom imported as food. Rice accounts for an especially large share of staple food consumption in Senegal, and most of it is imported from the world market. However, the correlation between retail prices for rice and coarse grains is low. This is only partly the result of policy interventions that stabilize rice prices but not coarse grain prices. Rice prices are fundamentally determined by relatively stable world prices, while local coarse grain prices fluctuate according to local supply and demand, greatly influenced by erratic weather fluctuations. It is probably correct to say that in Senegal, unlike Burkina Faso and Niger, massive rice imports provide an effective ceiling for coarse grain prices, but typically the coarse grains trade at half to two-thirds the price of rice. Substitution will occur at the margin, but the real income penalty of switching to rice is high in a

low-income area. Therefore, the elasticity of substitution is low; coarse grain prices have plenty of latitude to fluctuate without inducing additional large stabilizing inflows of rice. Overall, Sahelian millet and sorghum are classified as nontradables with respect to world markets, except for Niger, where an active coarse grains trade with Nigeria suggests that this would be inappropriate.

West African maize is a close substitute for millet and sorghum. It could reasonably be classified as a world tradable in West Africa, as is implicitly the case in Zambia. Yet, while maize is clearly a tradable across national borders within the west and southern African regions, high transport costs relative to value and taste and preference factors make it an unconvincing tradable vis-à-vis the world market. Farmers in Niger trade significant quantities of coarse grains commercially with markets in coastal countries, especially Nigeria. Millet and sorghum are therefore tradables at the national level in Niger. Since the issue of the substitutability of local cereals and non-African maize is unclear (and assuming nontradability could bias the results favorably), maize is also assumed to be a full tradable vis-à-vis world markets in the Niger study. In Niger, consumption of maize from Nigeria is important, and the data are not clear on country of production. However, maize is classified as a nontradable vis-à-vis the world market in Burkina Faso and Senegal.[3]

At the regional level of tradability, important tradable products consumed in the West African study areas are rice, groundnuts, coffee, tea, wheat, and sugar. Imported or importable nonfood commodities consumed include matches, cigarettes, kerosene, flashlights, batteries, ready-made clothing, bicycles, and radios.

Although most locally produced nonfood goods in the Sahelian study zones are nontradables in the national catchment area, as well as world markets, there are exceptions. In Niger, for example, a number of locally produced nonfarm goods, such as palm-frond woven mats, are exported to Burkina Faso.

In Zambia, on the other hand, many farm commodities and processed foods are tradables, either regional imports or exports. They include roller meal (maize), breakfast meal (maize), white maize, rice, dry groundnuts, livestock, margarine, butter, cooking oil, white sugar, and salt. The predominance of maize and the urban processing of grain in Zambia make it structurally different from the other West African countries in this regard. Like West Africa, however, there is little reason to believe that locally produced nonfood goods and services are exported from the study zone. They are mostly local services that are nontradable by definition. Moreover, many locally produced nonfood goods cannot compete outside the local catchment area because of transport costs.

Analysis of Household Expenditure Patterns

The country case studies estimate rural consumption responses to income changes for disaggregated commodity groups. In these groups, goods are clustered that are either

[3] Some of the maize consumed in the northern zone of the Burkina Faso sample in 1985 was food aid of non-African origin. It would be a mistake, however, to classify items provided on concessional terms as "tradables," since consumers cannot increase their access to these items at will.

reasonable substitutes for each other or are likely to have similar responses to income changes for some other reason. They are also grouped to maintain consistency on tradability assumptions.

The parameters of interest are the ABS and MBS. ABSs measure the percentage of total household expenditures going to a group of goods. A high percentage suggests that the income response for that group is relatively important. Even if marginal income changes have only a small percentage effect on consumption of a good, the absolute change in quantity demanded is significant.

MBSs measure the percentage of additions to income that are allocated to the group of goods in question. Being the practical equivalent of the marginal propensity to consume a given group, they measure the direct impact of income changes on the consumption of the group of goods in question. Unlike ABSs, which are derived directly from the expenditure data for each subsample of interest, MBSs are based on the coefficients of a demand or income-consumption model that takes into account behavioral factors influencing household expenditures.

An MBS that is lower for a given group of goods than the ABS for the same group implies that the relative importance of that commodity in the consumption basket decreases as income (that is, total expenditure) increases.[4] In such cases demand is income inelastic. A nice property of both ABSs and MBSs is that they are additive. A complete classification of goods yields ABSs and MBSs that sum independently to 100 percent. Commodity groups can be aggregated easily from separate estimates of ABSs and MBSs.

A variant of the Working-Leser model is used to estimate the income-consumption relationship for individual commodities consumed by sample households and to establish how these relationships change as household income changes (see Hazell and Röell 1983, for a complete description). Use of annualized cross-sectional data helps control for the fact that household expenditures on some goods and services are seasonal, while others (such as clothes and durables) tend to be purchased infrequently or only after the harvest. Using total expenditure (E) as a proxy for income, Engel functions of the following form are estimated:

$$E_i = a_i + b_i + E + c_i E \log E + \sum_j (\mu_{ij} Z_j + \lambda_{ij} E Z_j), \qquad (3)$$

where E_i is expenditure on commodity i, E is total consumption expenditure, Z_j are household characteristic variables, and a_i, b_i, c_i, μ_{ij}, and λ_{ij} are constants. This functional form allows for nonlinear relationships between consumption and income. It also controls for household characteristics (for example, farm and family size, education, and wealth) that may affect both the intercept and slope of the Engel function.

[4] This is equivalent to saying that the commodity faces inelastic demand with respect to income, since the expenditure elasticity of demand is MBS/ABS. In what follows, total household expenditure and income will be used synonymously. This does not alter the conclusions, provided that savings are a constant share of income across households. Even if this assumption is violated, low average savings ratios in rural Africa suggest that any distortion arising from using total expenditures as a conceptual proxy for income is low.

To mitigate potential heteroskedasticity problems, the model is estimated in share form. Dividing (1) by E gives,

$$S_i = b_i + a_i / E + c_i \log E + \sum_j (\mu_{ij} Z / E + \lambda_{ij} Z_j), \quad (4)$$

where $S_i = E_i / E$ is the share of commodity i in total expenditure.

The MBS_i, ABS_i, and expenditure elasticity (ξ_i) for the i^{th} commodity are

$$MBS_i = \partial E_i / \partial E = b_i + c_i (1 + \log E) + \sum_j \lambda_{ij} Z_j, \quad (5)$$

$$ABS_i = S_i, \text{ and} \quad (6)$$

$$\xi_i = MBS_i / ABS_i. \quad (7)$$

The share equations are estimated by ordinary least squares (*OLS*). Adding up, ($\Sigma_i b_i = 1$ and $\Sigma_i c_i = \Sigma_i a_i = \Sigma_i \mu_{ij} = \Sigma_i \lambda_{ij} = 0$ for all i), is automatically satisfied when the equations are estimated in this way (Hazell and Röell 1983).

Equation (4) is estimated using OLS for (1) each of four sectors (farm tradables, farm nontradables, nonfarm tradables, and nonfarm nontradables), and (2) each of one-to-two dozen commodity categories, depending on the country (local food and livestock products, for example). MBSs are computed for the overall sample and for sample subgroups by evaluating the coefficients at the sample subgroup means. The coefficients derive from the additive properties of MBSs, which permit estimation of the model parameters for the entire data set but estimation of results for specific strata using subgroup averages of data on the right-hand side.

Rural Growth Multipliers

As discussed in Chapter 2, growth multipliers estimate an upper bound for how much extra net income growth can be had from stimulating the nontradable (demand-constrained) sectors with a stream of new income from the traded sectors. The actual multiplier is a numerical derivation from a regional model that incorporates household demands and intermediate demands between sectors and explicitly models these interrelationships.

The multiplier model employed for the empirical estimation presented in this study is a four-sector variant of the semi-input–output model of Bell and Hazell (1980) and Haggblade and Hazell (1989). The latter study modeled a regional economy with a tradables sector producing agricultural goods, and a nontradables sector producing both agricultural (farm) and nonagricultural (manufactures and services) goods. By splitting the tradables sector, to allow for both agricultural and nonagricultural goods, the model presented here makes it possible to examine the effects of technological change or other supply shifters for both agriculture and nonagriculture on rural growth linkages.

An important qualification of this model is the embedded assumption that the supply of nontradables is perfectly elastic with respect to price. Where this assumption does

not hold strictly, some of the estimated multiplier is monetary rather than real: producers of nontradables reap higher unit prices in addition to real income gains from expanded output. The net gain for growth is less than in the case of a perfectly elastic supply of nontradables, since producers' gains come at the expense of other producers and consumers. Multiplier estimates that assume a perfectly elastic supply will exaggerate total growth effects. The specific numerical effects of less than perfectly elastic supply on the multiplier estimates was discussed in Chapter 2 and will be discussed in the country chapters as well as the conclusions.

As in Haggblade and Hazell (1989), household consumption expenditure on farm and nonfarm nontradables is assumed to be linearly related to income, with savings proportional to income, as follows:

$$H_{an} = \alpha_{0an} + \beta_{an}(Y - S), \tag{8}$$

$$H_{mn} = \alpha_{0mn} + \beta_{mn}(Y - S), \text{ and} \tag{9}$$

$$S = sY, \tag{10}$$

where

H_{an} = household consumption of farm (a) nontradables (n),
H_{mn} = household consumption of nonfarm (m) nontradables,
Y = total household income,
S = total savings,
β_{an} = MBS of farm nontradables,
β_{mn} = MBS of nonfarm nontradables,
s = marginal propensity to save, and
$\alpha_{0an}, \alpha_{0mn}$ = constants.

Intermediate demands for farm and nonfarm nontradables are assumed to be proportionate to sectoral gross output. Therefore,

$$P_{an} = a_{an.at}T_{at} + a_{an.mt}T_{mt} + a_{an.an}A + a_{an.mn}M, \tag{11}$$

$$P_{mn} = a_{mn.at}T_{at} + a_{mn.mt}T_{mt} + a_{mn.an}A + a_{mn.mn}M, \tag{12}$$

where

P_{an} = intermediate demand for farm nontradables,
P_{mn} = intermediate demand for nonfarm nontradables,
$a_{i.j}$ = intermediate deliveries from sector i to sector j (per unit of currency), where I = (*an, mn*) and j = (*at, mt, an, mn*),
T_{at} = gross output of farm tradables,
T_{mt} = gross output of nonfarm tradables,
A = gross output of farm nontradables, and
M = gross output of nonfarm nontradables.

Investment (I) and government (G) demands for nontradables are assumed to be exogenously given as I_{an}, I_{mn}, G_{an}, and G_{mn}. Including household, intermediate, investment, and government demands, total outputs of farm and nonfarm nontradables are then

$$A = H_{an} + P_{an} + I_{an} + G_{an}, \text{ and} \tag{13}$$

$$M = H_{mn} + P_{mn} + I_{mn} + G_{mn}. \tag{14}$$

To complete the model it is necessary to define household income Y. Assuming that value added (v_j) is a constant share of gross output in each sector and that all value added accrues to households, then

$$Y = v_{at}T_{at} + v_{mt}T_{mt} + v_{an}A + v_{mn}M, \tag{15}$$

where

v_j = the proportion of value added to gross output from sector j, where $j = at, an, mt,$ and mn.

With income so defined, and using the rate of savings in equation (10), household demands for farm and nonfarm nontradables, equations (8) and (9), can be rewritten as

$$H_{an} = \alpha_{0an} + \beta_{an}(1 - s)(v_{at}T_{at} + v_{mt}T_{mt} + v_{an}A + v_{mn}M), \text{ and} \tag{16}$$

$$H_{mn} = \alpha_{0mn} + \beta_{mn}(1 - s)(v_{at}T_{at} + v_{mt}T_{mt} + v_{an}A + v_{mn}M). \tag{17}$$

Household and intermediate nontradables demands, equations (16), (17), (11), and (12), can now be substituted into the total output equations or farm and nonfarm nontradables (13) and (14). Considering the equation for farm nontradables, equations (11) and (16) are substituted into (13) to get

$$\begin{aligned} A = {} & \alpha_{0an} + \beta_{an}(1 - s)(v_{at}T_{at} + v_{mt}T_{mt} + v_{an}A + v_{mn}M) \\ & + a_{an.at}T_{at} + a_{an.mt}T_{mt} + a_{an.an}A + a_{an.mn}M + I_{an} + G_{an}. \end{aligned} \tag{18}$$

All terms not involving A or M are gathered into one variable, δ_{an}, creating

$$\delta_{an} = \alpha_{0an} + \beta_{an}(1 - s)(v_{at}T_{at} + v_{mt}T_{mt}) + a_{an.at}T_{at} + a_{an.mt}T_{mt} + I_{an} + G_{an}.$$

The total output of farm nontradables is then

$$A = \delta_{an} + (1 - s)\beta_{an}v_{an}A + (1 - s)\beta_{an}v_{mn}M + a_{an.an}A + a_{an.mn}M. \tag{19}$$

Similarly for nonfarm nontradables, equations (12) and (17) are substituted into (14) to get

$$M = \alpha_{0mn} + \beta_{mn}(1 - s)\,(v_{at}T_{at} + v_{mt}T_{mt} + v_{an}A + v_{mn}M)$$

$$+ a_{mn.at}T_{at} + a_{mn.mt}T_{mt} + a_{mn.an}A + a_{mn.mn}M + I_{mn} + G_{mn}. \qquad (20)$$

All terms not involving A or M are gathered into one variable, σ_{mn}, creating

$$\delta\mu\nu = \alpha_{0mn} + \beta_{mn}(1 - s)\,(v_{at}T_{at} + v_{mt}T_{mt})$$

$$+ a_{mn.at}T_{at} + a_{mn.mt}T_{mt} + I_{mn} + G_{mn}.$$

Total output of nonfarm nontradables is then

$$M = \delta_{mn} + (1 - s)\,\beta_{mn}v_{an}A + (1 - s)\,\beta_{mn}v_{mn}M + a_{mn.an}A + a_{mn.mn}M. \qquad (21)$$

Solving equations (19) and (21) for A and M creates

$$A = (1 / D)\,[1 - a_{mn.mn} - (1 - s)\,\beta_{mn}v_{mn}]\,\delta_{an}$$

$$+ (1 / D)\,[a_{an.mn} + (1 - s)\,\beta_{an}v_{mn}]\,\delta_{mn}, \text{ and} \qquad (22)$$

$$M = (1 / D)\,[a_{mn.an} + (1 - s)\,\beta_{mn}v_{an}]\,\delta_{an}$$

$$+ (1 / D)\,[1 - a_{an.an} - (1 - s)\,\beta_{an}v_{an}]\,\delta_{mn}, \qquad (23)$$

where

$$D = [1 - a_{an.an} - (1 - s)\,\beta_{an}v_{an}][1 - a_{mn.mn} - (1 - s)\,\beta_{mn}v_{mn}]$$

$$- [a_{an.mn} + (1 - s)\,\beta_{an}v_{mn}]\,[a_{mn.an} + (1 - s)\,\beta_{mn}v_{an}].$$

Equations (22) and (23) specify output of farm nontradables in terms of value added, technology, savings, and MBS parameters.

Two value-added multipliers can now be specified, one measuring the change in regional income resulting from additional sales of tradable farm goods and another measuring the change in regional income resulting from additional sales of tradable nonfarm goods. The first step in calculating these multipliers is to take the derivatives of income, equation (15), with respect to the output of farm tradables (T_{at}) and the output of nonfarm tradables (T_{mt}), resulting in

$$\partial Y / \partial T_{at} = v_{at} + v_{an}\partial A / \partial T_{at} + v_{mn}\partial M / \partial T_{at}, \text{ and} \qquad (24)$$

$$\partial Y / \partial T_{mt} = v_{mt} + v_{an}\partial A / \partial T_{mt} + v_{mn}\partial M / \partial T_{mt}. \qquad (25)$$

The standardized multipliers providing the effects of a dollar increase in gross output of tradables on total regional income are obtained by dividing equations (24) and (25) by the ratio of value added to gross output (v_j) by the sector that changed (farm tradables or nonfarm tradables):

$$(1 / v_{at}) (\partial Y / \partial T_{at}) = 1 + (v_{an} / v_{at}) (\partial A / \partial T_{at}) + (v_{mn} / v_{at}) (\partial M / \partial T_{at}), \text{ and} \quad (26)$$

$$(1 / v_{mt}) (\partial Y / \partial T_{mt}) = 1 + (v_{an} / v_{mt}) (\partial A / \partial T_{mt}) + (v_{mn} / v_{mt}) (\partial M / \partial T_{mt}). \quad (27)$$

These multipliers, equations (26) and (27), have a base value of one dollar, which represents the direct effect of the additional dollar of farm or nonfarm tradables that starts the multiplier process. Two further indirect components appear as well. Equation (26) includes the indirect effects of increased output of farm tradables on regional income through farm nontradables (v_{an} / v_{at}) ($\partial A / \partial T_{at}$) and nonfarm nontradables (v_{mn} / v_{at}) ($\partial M / \partial T_{at}$). Equation (27) includes the indirect effects of increased nonfarm tradables output on regional income through farm nontradables (v_{an} / v_{mt}) ($\partial A / \partial T_{mt}$) and nonfarm nontradables (v_{mn} / v_{mt})($\partial M / \partial T_{mt}$).

The dollar value solutions to equations (26) and (27) include eight values, v_{an}, v_{at}, v_{mn}, v_{mt}, ($\partial A / \partial T_{at}$), ($\partial M / \partial T_{at}$), ($\partial A / \partial T_{mt}$), and ($\partial M / \partial T_{mt}$). The first four are the ratios of value added to gross output for each of the four types of goods. The second four elements are the indirect effects on total income of additional sales of tradables through their effects on nontradables. These indirect effects occur when changing sales of tradables cause demand for nontradable intermediate inputs to change, and when households employed in producing tradables change their purchases of nontradables because of variation in their incomes. They are found by returning to equations (22) and (23) and taking the derivatives with respect to changes in output of farm and nonfarm tradables.

Beginning with changes in farm tradables and noting that tradables enter only the σs,

$$\partial A / \partial T_{at} = (1 / D) [1 - a_{mn.mn} - (1 - s) \beta_{mn} v_{mn}] \partial \delta_{an} / \partial T_{at}$$

$$+ (1 / D) [a_{an.mn} + (1 - s) \beta_{an} v_{mn}] \partial \delta_{mn} / \partial T_{at}, \text{ and} \quad (28)$$

$$\partial M / \partial T_{at} = (1 / D) [a_{mn.an} + (1 - s) \beta_{mn} v_{an}] \partial \delta_{an} / \partial T_{at}$$

$$+ (1 / D) [1 - a_{an.an} - (1 - s) \beta_{an} v_{an}] \partial \delta_{mn} / \partial T_{at}, \quad (29)$$

where

$$\partial \delta_{an} / \partial T_{at} = (1 - s) \beta_{an} v_{at} + a_{an.at}, \text{ and} \quad (30)$$

$$\partial \delta_{mn} / \partial T_{at} = (1 - s) \beta_{mn} v_{at} + a_{mn.at}. \quad (31)$$

Substituting equations (30) and (31) into (28), and equations (30) and (31) into (29) results in

$$\partial A / \partial T_{at} = (1 / D)\,[1 - a_{mn.mn} - (1 - s)\,\beta_{mn} v_{mn}]\,[(1 - s)\,\beta_{an} v_{at} + a_{an.at}]$$

$$+ (1 / D)\,[a_{an.mn} + (1 - s)\,\beta_{an} v_{mn}]\,[(1 - s)\,\beta_{mn} v_{at} + a_{mn.at}], \text{ and} \qquad (32)$$

$$\partial M / \partial T_{at} = (1 / D)\,[a_{mn.an} + (1 - s)\,\beta_{mn} v_{an}]\,[(1 - s)\,\beta_{an} v_{at} + a_{an.at}]$$

$$+ (1 / D)[1 - a_{an.an} - (1 - s)\,\beta_{an} v_{an}]\,[(1 - s)\,\beta_{mn} v_{at} + a_{mn.at}]. \qquad (33)$$

Similarly, the derivatives of output of farm and nonfarm nontradables with respect to changes in the nonfarm sector are

$$\partial A / \partial T_{mt} = (1 / D)[1 - a_{mn.mn} - (1 - s)\,\beta_{mn} v_{mn}]\,\partial \delta_{an} / \partial T_{mt}$$

$$+ (1 / D)[a_{an.mn} + (1 - s)\,\beta_{an} v_{mn}]\,\partial \delta_{mn} / \partial T_{mt}, \text{ and} \qquad (34)$$

$$\partial M / \partial T_{mt} = (1 / D)\,[a_{mn.an} + (1 - s)\,\beta_{mn} v_{an}]\,\partial \delta_{an} / \partial T_{mt}$$

$$+ (1 / D)\,[1 - a_{an.an} - (1 - s)\,\beta_{an} v_{an}]\,\partial \delta_{mn} / \partial T_{mt}, \qquad (35)$$

where

$$\partial \delta_{an} / \partial T m_{mt} = (1 - s)\,\beta_{an} v_{mt} + a_{an.mt}, \text{ and} \qquad (36)$$

$$\partial \delta_{mn} / \partial T_{mt} = (1 - s)\,\beta_{mn} v_{mt} + a_{mn.mt}. \qquad (37)$$

Substituting equations (36) and (37) into (34), and (36) and (37) into (35) results in

$$\partial A / \partial T_{mt} = (1 / D)\,[1 - a_{mn.mn} - (1 - s)\,\beta_{mn} v_{mn}]\,[(1 - s)\,\beta_{an} v_{mt} + a_{an.mt}]$$

$$+ (1 / D)\,[a_{an.mn} + (1 - s)\,\beta_{an} v_{mn}]\,[(1 - s)\,\beta_{mn} v_{mt} + a_{mn.mt}], \text{ and} \qquad (38)$$

$$\partial M / \partial T_{mt} = (1 / D)\,[a_{mn.an} + (1 - s)\,\beta_{mn} v_{an}]\,[\,(1 - s)\,\beta_{an} v_{mt} + a_{an.mt}]$$

$$+ (1 / D)\,[1 - a_{an.an} - (1 - s)\,\beta_{an} v_{an}]\,[(1 - s)\,\beta_{mn} v_{mt} + a_{mn.mt}]. \qquad (39)$$

Finally, to obtain expressions for the multiplier for changes in the farm tradables sector in terms of the model parameters, equations (32) and (33) are substituted into (26), producing

$$
\begin{aligned}
(1 / v_{at})\,(\partial Y / \partial T_{at}) \;&= 1 + (v_{an} / v_{at}) \\
&\times \{\, (1 / D)\,[1 - a_{mn.mn} - (1 - s)\beta_{mn} v_{mn}]\,[(1 - s)\beta_{an} v_{at} + a_{an.at}] \\
&+ (1 / D)\,[a_{an.mn} + (1 - s)\beta_{an} v_{mn}]\,[(1 - s)\beta_{mn} v_{at} + a_{mn.at}]\,\} \\
&+ (v_{mn} / v_{at}) \times \{\, (1 / D)\,[a_{mn.an} + (1 - s)\beta_{mn} v_{an}]\,[(1 - s)\beta_{an} v_{at} + a_{an.at}] \\
&+ (1 / D)\,[1 - a_{an.an} - (1 - s)\beta_{an} v_{an}]\,[(1 - s)\beta_{mn} v_{at} + a_{mn.at}]\,\}. \qquad (40)
\end{aligned}
$$

To obtain an expression for the multiplier for changes in the nonfarm tradables sector in terms of the model parameters, equations (38) and (39) are substituted into (27), producing

$$
\begin{aligned}
(1 / v_{mt})\,(\partial Y / \partial T_{mt}) \;&= 1 + (v_{an} / v_{mt}) \\
&\times \{\, (1 / D)\,[1 - a_{mn.mn} - (1 - s)\,\beta_{mn} v_{mn}]\,[(1 - s)\,\beta_{an} v_{mt} + a_{an.mt}] \\
&+ (1 / D)\,[a_{an.mn} + (1 - s)\,\beta_{an} v_{mn}]\,[(1 - s)\,\beta_{mn} v_{mt} + a_{mn.mt}] \\
&+ (v_{mn} / v_{mt})\ \mathrm{x}\ \{\, (1 / D)\,[a_{mn.an} + (1 - s)\,\beta_{mn} v_{an}]\,[(1 - s)\,\beta_{an} v_{mt} + a_{an.mt}] \\
&+ (1 / D)\,[1 - a_{an.an} - (1 - s)\,\beta_{an} v_{an}]\,[(1 - s)\,\beta_{mn} v_{mt} + a_{mn.mt}]\,\}. \qquad (41)
\end{aligned}
$$

The multipliers provided by equations (40) and (41) include 17 unknowns: the marginal propensity to save (the *s*), four MBSs (the βs), four ratios of value added to gross output (the *v*'s), and eight values of intermediate deliveries between sectors (the *a*s). *The sources of these parameters are discussed in the country chapters.*

In summary, the steps required to arrive at the multipliers detailed here are, first, to classify goods by tradability category and by sector (farm or nonfarm); second, to retrieve the marginal propensity to save, sectoral value-added, and intermediate demand parameters from budget data; third, to estimate MBSs for specific commodities that can be aggregated into composite groups of goods defined by sector and catchment size; fourth, to calculate the growth multipliers; and fifth, to recall that numerical estimates may be too high (30 percent, following the discussion in Chapter 2) because of the assumptions about a perfectly elastic supply of nontradables.

CHAPTER 4

North to South in Burkina Faso

The Burkina Faso case study makes use of an extraordinarily rich household-level data set from three agroecological zones in the central interior of West Africa. It gives a detailed view of the impacts of growth on the tradable farm and nonfarm sectors and on the overall household incomes of the rich and the poor. Because the household samples are drawn from several locations, the effects on cash cropping areas, with their higher agricultural potential, can be compared with those in the more arid livestock and cereal producing regions. Detailed information is also given on farm and nonfarm production and consumption activities and sources of income.

The data come from a collaborative survey conducted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and IFPRI. The main baseline survey on the production and income side, conducted by ICRISAT, covered four years, 1981–85, a period that included both good and bad harvests. The expenditure and income surveys and aggregation and cleaning processes yielding the data used in the present analysis were conducted on the same sample for 1984–85, with the main input coming from IFPRI (Reardon, Delgado, and Matlon 1992).

The original surveys were conducted in three zones of Burkina Faso: the Sahelian, the Sudanian, and the Guinean regions. The true Sahelian zone in the northwest is agroclimatically a poor area with low rainfall, poor soils, and extremely variable cropping outcomes. The Sudanian zone in the Mossi Plateau is an agroclimatically poor-to-intermediate area with low-to-medium rainfall, poor soils, and moderately variable cropping outcomes. The Guinean zone in the southwest is a moderately favored zone with medium-to-high rainfall, good soils, and relatively stable cropping outcomes (Matlon 1988).

These data have been analyzed for several purposes, particularly to examine household coping behavior in the face of income shocks (Reardon, Matlon, and Delgado 1988), to determine household income diversification behavior, and to explore the dependency of nonagricultural production on agricultural income (Reardon, Delgado, and Matlon 1992; Reardon et al. 1994). However, the present study is the first time the data have been used to estimate growth multipliers in order to explore how the consumption patterns of rural people can potentially stimulate further net rural eco-

nomic growth. The study also demonstrates the relative importance of consumption growth linkages relative to production linkages.

Characteristics of the Burkina Faso Sample

Characteristics of the three sample zones and the subsamples within each zone are summarized in Table 5. Average long-term rainfall doubles going from north to south, while the variability of rainfall lessens. The density of farm workers per hectare is highest in the north (the Sahelian zone), about one-third less in the south (the Guinean zone), and even less in the middle (the Sudanian zone), where low yields under subsistence cultivation support a smaller labor input per unit of land.

The income data in Table 5 have been extensively analyzed in Reardon, Delgado, and Matlon (1992) and Reardon et al. (1994). The table shows five results that are significant for the purposes of this report. First, there are significant income disparities within rural areas. Second, in the more humid Guinean zone where cotton is grown, the poor are not much poorer than the poor elsewhere in Burkina Faso, but the "rich" in Burkinabe terms are 50 percent better off. Third, in all three zones, contrary to experiences in South Asia, the poor receive a higher share of their income from their own farms than do the rich. This relationship is evident in both the north, where nonfarm income is from outside sources and crop potential is slight, and the south, where nonfarm income tends to be locally generated.

In the middle, where agricultural potential remains low but farmers have historically been less dependent on outside income than in the north, the farm income dispar-

Table 5 Characteristics of the ICRISAT/IFPRI sample households, by agroecological zone, Burkina Faso, 1981 85

Sample characteristic	Sahelian	Sudanian	Guinean
Number of households	45	44	47
Long-term average rainfall (millimeters)	480	724	952
Coefficient of variance for long-term rainfall	0.34	0.25	0.21
Land per adult equivalent (hectares)	0.92	0.58	0.65
Annual income per adult equivalent (US$)[a]	145	140	191
Poorest one-third of households	86	100	99
Richest one-third of households	260	238	368
Percent of income from own farm	63	66	57
Poorest one-third or households	81	86	71
Richest one-third of households	53	74	49
Percent of income from local services	32	16	31
Poorest one-third of households	11	10	15
Richest one-third of households	44	12	39
Percent of income from local manufactures	1	0	3
Poorest one-third of households	1	1	5
Richest one-third of households	0	0	0

Source: Compiled from Table 4 in Reardon, Delgado and Matlon 1992 and Table 3 in Reardon et al. 1994.
Note: Income terciles are based on annual household total expenditures per adult equivalent, including income in kind valued at market prices.
[a]Estimated at 290 CFA francs per US$1.00 in 1981–85 dollars.

ity between the rich and the poor is less severe than in the other zones. Fourth, as a counterpart, the rich are far more involved in supplying local services than are the poor in all three zones, though where this relationship is less pronounced in the middle. Fifth, local crafts and manufactures do not account for much income of the rich in any zone and only a very small share of income of the poor in all zones. The best showing for the poor is in the cotton-growing south, where respending of cotton income allows the poor to get 5 percent of their income from local crafts.

Thus, unlike the usual Asian assumptions of a rich landowning class that obtains its income from the land and a poor class of landless laborers that has to rely on services, in Burkina Faso the relatively wealthy profit from the nonfarm economy more than the poor, primarily through the provision of services. Nonfarm goods tend not to be of local origin, and thus they account for little local income. Finally, the best market for local crafts and services is in the most monetized area, the cash-cropping south.

Growth Linkages and Tradability

The tradability assumptions used in the present study are based on long-term familiarity with rural consumption and trade patterns in Burkina Faso, including the sample zones. For convenience, the definitions of tradability and the assumptions made for specific groups of goods are summarized in Table 6. At the local level, most goods are tradable (goods typical of the group are frequently exported to or imported from places outside a 100-kilometer radius of the study zone). Local nontradables are services, prepared foods that are not packaged for transit (such as sorghum, beer, and millet cakes), and fresh meat and dairy products.

At the national level used for analysis, more items are classified as nontradable in the sense that they are not typically exported from or imported into Burkina Faso, nor are their prices closely correlated with similar goods that are traded.[5] The most significant change is that millet and sorghum, the basic food sources in the study zones, are considered nontradables. Previous linkages work tended to assume that all foodgrains are tradables and thus solely supply-constrained. While this may be true of maize in some years, at prevailing prices millet and sorghum are rarely brought in commercially from neighboring countries or exported to them, except under extreme and rarely observed circumstances. They are therefore demand-constrained. Production of these goods rarely uses inputs other than land, family labor, hand tools, and seed saved from the previous harvest. If land and labor are going unused during the cropping season, there is scope for supply increase, although such a response will involve some juggling of labor during the bottleneck periods of mid-July and early November (Delgado and Ranade 1987).

Finally, at the regional level of tradability, the only products consumed in the study area that remain tradables are rice, groundnuts, and nonlocal, nonfood com-

[5] This is not to say that they are never traded but that such trade within the study zone is rare at prevailing prices and costs. They are nontradable rather than just nontraded if their prices are determined primarily by local factors.

Table 6 Assumptions about tradability by reference market, Burkina Faso

Sector	Reference market (catchment area)		
	Local	National	Regional
Coarse grains			
Millet and sorghum	T	NT	NT
Maize	T	T	NT
Convenience starch			
Wheat products, tubers, and condiments[a]	T	T	NT
Rice	T	T	T
Other food staples			
Groundnuts	T	T	T
Other pulses and legumes[b]	T	NT	NT
Meat, milk, eggs, and fish			
Chicken and guinea fowl	T	T	NT
Other[c]	NT	NT	NT
Prepared foods, beverages, and cola			
Bottled drinks and cola nut[d]	T	NT[e]	NT
Other (such as *dolo*)[f]	NT	NT	NT
Nonfood commodities			
Local rural manufactures and crafts[g]	T	NT	NT
Outside[h]	T	T	T
Services[i]	NT	NT	NT

Notes: T is tradable and NT is nontradable. Tradability at the local level means that the good is sometimes exported or imported within the local area (100-kilometer radius around the market). Tradability at the national level implies that the good is frequently imported to or exported from Burkina Faso or to or from its neighbors. Tradability at the regional level means that the good consumed in Burkina Faso is often exported to the world market or imported from the world market.

[a]Wheat, macaroni, bread, prepared rice meal, pepper, onion, tomato, lettuce, okra, sorrel, sauce leaves, eggplant, unspecified leaves, sugar, salt, cauliflower, garlic, unspecified fruit, Maggi bouillion cubes, cotton seed, sesame, honey, *soumbala* (a pungent condiment made of fermented locust beans and spices), oils/butter, cooking oil, Irish potatoes, cassava, yam, sweet potato.

[b]Earthpeas, cowpeas.

[c]Cattle, donkey, horse, goat, sheep, pig, fish, milk, egg, other meat, dairy butter.

[e]Cola nuts, beer, soft drinks, wine.

[e]Cola is tradable at the national level but is not important enough to warrant a separate category.

[f]Unspecified meal, couscous of *fonio*, couscous of pearl millet, gruel, fried millet cakes, biscuit, cookies and cakes, groundnut butter, miscellaneous snacks, fried groundnut butter, cooked skewered meat, sorghum beer, coffee, leven, tobacco and cigarettes.

[g]Water, wood, furniture, unspecified farm inputs, livestock feed, hunting materials, bedding.

[h]Kerosene, gasoline, motor oil, matches, soap, batteries, medicine, vehicles, electronic and photo equipment, cooking utensils, clothing, toilet articles, rope, lamps, mosquito coils.

[i]Cereal milling, ceremonial expenses, school fees, taxes or other fees, transportation fare, vehicle repair, housing repair, labor payments, herding, bride price payment, gifts, communication expenses.

modities such as matches, batteries, bicycles, and radios. Even maize consumed in the study area (with the exception of food aid in major drought situations) is West African in origin, and distinct from world market maize.

Parameter Requirements and Estimation

Estimation of Marginal Budget Shares

As outlined in Chapter 3, the modified Working-Leser model of Hazell and Röell (1983) is used to obtain estimates of MBS (see equation [4]). Household characteristics included are the number of livestock per adult equivalent and dummy variables for household ethnicity (Bwaba, Fulbe, or Fulani), for access to a road, and for market group (coincident with agroecological zone).

The equations are estimated separately for each of the 12 groups of goods laid out in Table 6 using the overall sample. MBSs are then obtained for subsamples, such as income terciles or geographic zones, by using mean subsample values for the data in the estimating algorithm for the MBS (equation [5] in Chapter 3). These 12 MBSs are aggregated into farm tradables, farm nontradables, nonfarm tradables, and nonfarm nontradables. MBSs for the four sectors are calculated for the overall sample, the three income groups, and the three agroecological zones. Separate results are presented for different aggregations stemming from different definitions of catchment area, but the preferred interpretation is at the national level.

Value Added, Technology, and Savings

By assumption, technology parameters (the *a*s and *v*s) do not differ over agroecological zones or over income terciles. Consistent with the model, fixed-coefficients (Leontief) technology is maintained. The value of the savings ratio out of household income is also assumed constant.

Technological parameters are derived from three sources. Values for intermediate deliveries of farm nontradables to farm tradables and nontradables ($a_{an.at}$, $a_{an.an}$) and value added from farm tradables and nontradables (v_{at}, v_{an}) are obtained from average farm budgets calculated from the larger data set. Values for intermediate deliveries for farm nontradables to nonfarm tradables and nontradables ($a_{an.mt}$, $a_{an.mn}$), intermediate deliveries for nonfarm nontradables to farm tradables and nontradables ($a_{mn.at}$, $a_{mn.an}$), and value added from nonfarm tradables and nontradables (v_{mt}, v_{mn}) are obtained from calculations using data from a social accounting matrix (SAM) for Niger (Dorosh and Nssah 1991). Values for intermediate deliveries for nonfarm nontradables to nonfarm tradables and nontradables ($a_{mn.mt}$, $a_{mn.mn}$) are guesses based on values taken from SAMs for Niger and Cameroon.[6] The savings rate is the overall sample average of the ratio of savings to total

[6] Niger estimates are from the SAM in Dorosh and Nssah (1991), and Cameroon estimates are from the SAM in Ganthier and Kyle (1991).

Table 7 Parameter assumptions for model estimation, Burkina Faso

Sector	Value-added shares	Intermediate deliveries from nontradables sector (technical coefficients)		Savings ratio
		Farm	Nonfarm	
Farm tradables (AT)	0.85	0.055	0.06	0.06
Farm nontradables (AN)	0.93	0.036	0.03	0.06
Nonfarm tradables (MT)	0.49	0.010	0.10	0.06
Nonfarm nontradables (MN)	0.69	0.030	0.20	0.06

Sources: Values for intermediate deliveries, value-added shares for farm items, and savings ratios are calculated from the ICRISAT/IFPRI survey data for Burkina Faso, 1981–85. Values for nonfarm items are specified using data from a social accounting matrix for Niger (Dorosh and Nssah 1991).

income for each household in the 1984 harvest year. The parameter values summarized in Table 7 are close in orders of magnitude to estimates of similar parameters for Sierra Leone in Haggblade, Hammer, and Hazell 1991 and Haggblade and Hazell 1989. The sensitivity of results to the Burkina Faso assumptions is reported further on.

Average and Incremental Household Consumption Patterns

Average and Marginal Budget Shares by Category of Goods

The household ABSs for the entire sample for 12 groups of goods are computed directly from the data and presented in Table 8. The corresponding MBSs estimated econometrically by the procedure described in Chapter 3 are also given. The ratio of the MBS to the ABS (not shown) is the expenditure elasticity computed at sample means; an MBS smaller than an ABS implies that the relative importance of a goods group is falling as incomes rise (income-inelastic demand). This is the case for millet and sorghum and for pulses and legumes. The reverse is elastic demand, which is the case for meat and dairy products, bottled drinks, nonfood commodities, and services. Convenience starches such as wheat products, rice, and tubers maintain their relative shares as income increases.[7]

Marginal Budget Shares by Sector

The additive properties of MBSs and ABSs allow the discrete components to be reaggregated into different composite groups of goods. Thus the goods and services are sorted by tradability characteristics at the local, national, and regional levels and di-

[7] Table 8 suggests surprisingly income elastic demand for maize. This is probably an anomaly of the sample period, when massive imports of newly harvested Ghanaian maize flowed into the markets of Burkina Faso beginning in May 1985 at the height of the great drought. At the same time, households were scrambling to feed themselves, with the wealthier households increasing their purchases of maize faster than the poor.

Table 8 Household consumption patterns, rural Burkina Faso, 1984/85

Sector	Average budget shares	Marginal budget shares
	(percent)	
Coarse grains		
Millet and sorghum	48.4	42.1
Maize	10.3	10.4
Convenience starch[a]		
Wheat, tubers, condiments	4.9	3.6
Rice	1.9	0.9
Other food staples		
Groundnuts	6.6	4.4
Other pulses and legumes	2.5	0.7
Meat, milk, eggs, and fish	2.9	2.5
Prepared foods, beverages, and cola		
Bottled drinks, cola nut	3.7	7.5
Other (such as *dolo*)	3.7	2.6
Nonfood commodities		
Local nontradables	0.4	0.6
Nonlocal	8.2	13.4
Services	6.5	11.3

Source: See text for estimation procedure, using expenditure data from IFPRI/ICRISAT household surveys of 122 households in three agroecological zones in 1984/85.

Note: *Dolo* is indigenous sorghum beer made by local artisans.

[a]This category includes high-priced staples that are convenient to prepare, such as bread, macaroni, rice, potatoes, and so forth.

vided into farm and nonfarm tradables and nontradables. Farm goods include crops and livestock, while nonfarm products include prepared foods and services in addition to the usual nonfarm goods.

The first column of Table 9 shows that for the overall sample, using the local definition of tradability, an additional $1.00 of income is spent as follows: $0.62 on farm tradables, $0.03 on farm nontradables, $0.22 on nonfarm tradables, and the remaining $0.14 on nonfarm nontradables. However, switching to the national definition of tradability, only $0.19 of each extra dollar is spent on farm tradables, while the share of farm nontradables rises to $0.45. This switch is largely due to reclassifying millet and sorghum as nontradables. Adopting the national definition of tradability reclassifies large shares of household spending from incremental income on items that are demand-constrained from the perspective of the country as a whole.

Sectoral MBSs were calculated for subsamples using overall sample expenditure elasticities and subsample ABSs for the groups concerned, using the Working-Leser procedure in Chapter 3. For all three definitions of tradability, the MBS of farm items declines and that of nonfarm items increases as income increases, consistent with the results in Table 8. For example, using national tradability, as was typically done in earlier linkages studies, the MBS allocated by the highest income tercile to farm tradables in Table 9 is 2.1 percentage points lower than the poorest one-third of households, while the share going to nonfarm nontradables is more than 12 percentage points

Table 9 Marginal budget shares by sector, income, and ecological zone, Burkina Faso, 1984/85

Sector/Catchment	Overall	Income tercile			Ecological zone		
		Poor	Middle	Wealthy	Sahelian	Sudanian	Guinean
	(percent)						
Farm tradables (AT)							
Local	62.2	73.3	63.3	47.5	87.5	63.6	44.5
National	19.3	21.1	17.2	19.0	24.3	21.7	13.9
Regional	5.3	7.8	4.1	4.2	1.1	9.3	4.9
Farm nontradables (AN)							
Local	2.5	2.1	2.3	3.4	0.1	1.8	4.6
National	45.3	54.3	48.4	31.9	63.2	43.7	35.3
Regional	59.4	67.6	61.5	46.6	86.4	56.1	44.2
Nonfarm tradables (MT)							
Local	21.5	15.1	21.6	28.9	9.7	20.7	30.0
National	13.4	8.2	13.4	20.5	4.3	8.8	23.2
Regional	13.4	8.2	13.4	20.5	4.3	8.8	23.2
Nonfarm nontradables (MN)							
Local	13.8	9.5	12.8	20.2	2.8	14.0	20.9
National	21.9	16.4	21.0	28.7	8.2	25.8	27.6
Regional	21.9	16.4	21.0	28.7	8.2	25.8	27.6

Source: See text for estimation procedure, using data from IFPRI/ICRISAT household surveys of 122 households in three agroecological zones in 1984/85.

Notes: Subsample MBSs were estimated at subsample means. See footnote 4. Income terciles are determined by ranking the samples in ascending order based on the total annual household expenditure per adult equivalent, including income in kind valued at market prices.

greater. The direction of change with increasing income is similar using the regional definition of tradability, except that the decline in share of farm nontradables is much more pronounced given that the main foodgrains are nontradables under this catchment area. Using the national definition of tradability, moving from the Sahelian north to the Guinean south shows a more than 10 percentage point decline in the absolute marginal share of farm tradables, a nearly 28 percentage point decrease for farm nontradables, and a 19 percentage point increase for nonfarm nontradables.

Growth Multipliers

Farm Growth Multipliers for the Overall Sample

The parameters shown in Tables 7 and 9 were used in the model to yield the growth multipliers reported in Table 10. As an example, using the national definition of tradability, the overall growth multiplier for $1.00 spent on farm goods is $2.88. Thus, the initial $1.00 induces a net additional increase of $1.88 of income, through net increases in intermediate demands and new consumption of nontradables. In Table 10, the local definition of tradability yields a farm growth multiplier of 1.31, implying that the initial tradable income shock leads only to an extra $0.31 in net new income through respending on nontradable consumer items and intermediate inputs. This

Table 10 Farm and nonfarm growth multipliers for rural Burkina Faso, 1984/85

	Local		National		Regional	
Tradability sector	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**
			(US$)			
Overall	1.31	1.40	2.88	3.07	4.33	4.62
Zone						
Sahel	1.16	1.23	3.31	3.53	9.07	9.68
Sudano	1.30	1.39	3.01	3.22	4.37	4.67
Guinean	1.45	1.54	2.58	2.76	3.19	3.40
Income						
Poorest third	1.25	1.34	3.18	3.39	4.89	5.22
Middle third	1.30	1.38	3.04	3.25	4.54	4.84
Richest third	1.41	1.51	2.45	2.62	3.50	3.74

Source: Results of the model.
Note: Income terciles are based on annual household total expenditures per adult equivalent.

amount is notably similar to estimates for West African multipliers offered in Haggblade, Hammer, and Hazell (1991). The much larger multipliers shown using the regional assumption stem solely from the fact that at the regional level of tradability, most of what people spend incremental income on is nontradable, and leakages to tradables and savings are low. Thus, increments to income cycle in the economy, being re-spent over and over again, stimulating demand-constrained activities.

This illustrates the crucial role of the assumptions concerning the size of the catchment area and nontradability, with embedded assumptions about the elasticity of supply response. Such major assumptions are not unique to growth multiplier analysis. The usual practice of using border prices f.o.b. West African ports as reference prices for Sahelian destinations in project evaluation and trade analysis is another example of an embedded assumption. If the regional definition of tradability adopted here somewhat overstates the lack of tradability of major items such as coarse grains, the more usual local definition clearly understates it. The national definition seems a reasonable compromise.

The 2.88 multiplier at the national level is much higher than the conventional view of low growth linkages in Africa, even allowing for a 30 percent overestimation of the multiplier, which is presumably the result of an overly optimistic view of the elasticity of supply of nontradables. While a multiplier of 1.90 is less than one of 2.88, it is still remarkably close to the Asian multiplier of 1.80 cited in Chapter 2.

Nonfarm Growth Multipliers

One of the novelties of the model used here is that the impact of shocks on the rural nonfarm tradables sector can be estimated separately from agricultural growth linkages. Some examples of such shocks would be discovery of mineral wealth or the opening up of new export markets for handicrafts. Nonfarm growth multipliers are also displayed in Table 10. The directions of change for both the overall sample and

the subsamples closely parallel the results for agriculture, except that nonfarm multipliers are consistently about 7 percent greater than corresponding farm growth multipliers. The difference is primarily the result of different intermediate demands and the valued-added structure of nonfarm tradables relative to other sectors.

The conclusion is that the stimulus to rural nonfarm tradables is at least as efficient at stimulating rural growth as the stimulus to farm tradables, provided it is possible to stimulate growth initially. Which one to emphasize, however, depends on the comparative advantage of farm tradables versus nonfarm tradables in Burkina Faso. At the present time, farm tradables are thought to be more likely to exhibit comparative advantage in trade with neighboring countries and with the rest of the world than nonfarm tradables.

Differences in Multipliers by Agroecological Zone

Going from the Sahelian north to the Guinean south in Table 10, farm growth multipliers increase somewhat, using the local definition of tradability, but they decrease sharply using the regional definition. The national definition yields a 22 percent decline going from north to south. This difference stems from consumption patterns in the north that are more oriented to nontradables and production patterns that make relatively little use of intermediate inputs. Stimulating demand in the north (through increased livestock exports, say) would stimulate little overall demand in the economy if the resulting increased grain consumption in the north just encourages more grain imports into West Africa. However, if increased demand stimulates demand-constrained West African production, then the growth linkages could be large (with an estimated upper limit of an additional $2.30 for each initial $1.00). The choice between the two alternatives depends on one's view of where extra grain consumption in the north is likely to come from and what substitution effects it is likely to produce regionally.

Differences in Multipliers by Income Group

Going from the poorest to the richest one-third of sample households in Table 10, farm growth multipliers estimated under the national definition of tradability are highest for the low-income group, with the lowest multipliers being calculated for the richest one-third of households. This is because the consumption pattern of the poor is largely made up of basic foods that are nontradable with respect to the world market. This confirms Harriss's (1987) intuition that broadening the catchment area beyond the local level will have the effect of improving the income multiplier for income shocks targeted to the poor. Positive income shocks to the agriculture of the poor still produce $0.73 more net income than similar shocks to the rich. Conversely, negative income shocks to the poor are even more damaging to overall rural income than negative income shocks to the rich, because income shocks affect the consumption spending of the poor more severely than they do the consumption spending of the rich.

The Share of Growth Multipliers Attributable to Consumption and Sensitivity Analysis

The model assumes constant technology and commodity composition by sector, across agroecological zones and income groups, while allowing for actual changes in the commodity composition of consumption.[8] These changes are manifested as different MBSs depending upon the degree of tradability, agroecological zone, and income group. Thus differences between groups in the present analysis are driven entirely by differences in consumption patterns.

Following Haggblade, Hammer, and Hazell (1991), an estimate of the pure production multiplier is obtained by setting all the MBSs to zero in equations (40) and (41) in Chapter 3. This yields a farm growth multiplier of 1.13 and nonfarm multiplier of 1.20. In other words, for the overall sample at the national level of tradability, an income stimulus of $1.00 to the farm tradables sector produces an extra $0.13 of income from new intermediate demand for nontradable inputs.

These pure production multipliers make up only a small part of the overall growth multipliers listed in Table 10. With the national definition of tradability, the consumption effects that remain after removal of the pure production effects account for 93 percent of the farm growth multiplier and 90 percent of the nonfarm growth multiplier (using the overall sample). Ignoring these effects, as is the case when only backward and forward production linkages are considered, would lead to a severe underestimate of growth multipliers. It also suggests that correct estimates of the consumption parameters are far more important to results than the value-added shares and technology coefficients, at least in an economy such as that of Burkina Faso.

This proposition was tested more directly through sensitivity analysis on the parameters (Table 11). The sensitivity analysis was necessarily selective and focused primarily on individually testing the effects of 10 percent changes in the entire set of relevant as, vs, and βs for both farm and nonfarm growth multipliers. The effect of the changes on the farm component per se of farm growth multipliers is also shown.

The elasticity of change in the farm multiplier with respect to a change in all the technology coefficients (as) is on the order of 0.1 (or 1.04 / 10). The farm component of the overall farm growth multiplier is the component of the total multiplier that is due to increased demand for farm nontradables. This has an elasticity of 0.16 with respect to a change in all the as. There is considerable curvature in the nonfarm multiplier for the as. Thus a 10 percent increase across-the-board in the as is associated with a 2.0 percent increase in the nonfarm multiplier, while a 10 percent decrease in the as

[8] The assumption of constant technology (common a's and v's) across income groups is straightforward. The assumption of a common commodity composition of sectors across agroecological zones, and thus of common technology across zones, is also reasonable, even if in the north production of farm tradables is likely to involve more groundnuts and less cotton than in the south, and the two in fact have a different set of intermediate demands. At all levels of tradability in the sensitivity analysis, the composite set of a's and v's used reflected the commodity composition at the national level of tradability for lack of a better alternative, even though changing tradability means changing the commodity composition of sectors.

Table 11 Sensitivity analysis for parameters (percentage change in multiplier from a 10 percent change in parameter)

Parameter	Farm multiplier		Nonfarm multiplier
	Total	Farm nontradable	
		(percent)	
Eight intermediate demand coefficients			
Increase of 10 percent in all $a_{an.j}$ and $a_{mn.j}$	1.0	1.6	2.0
Decrease of 10 percent in all $a_{an.j}$ and $a_{mn.j}$	–1.0	–1.6	–1.6
Four value-added shares			
Increase of 10 percent in v_j	–8.3	–7.9	–7.8
Decrease of 10 percent in v_j	9.0	9.4	8.5
Two nontradable marginal budget shares			
Increase of 10 percent in β_{an} and β_{mn}	18.4	29.1	18.6
Decrease of 10 percent in β_{an} and β_{mn}	–13.5	–21.3	–13.4

Source: Calculated from model results, with incorporation of changes indicated relative to the baseline. Each change is in isolation.

Notes: In the notation, the sectors $j = at, mt, an, mn$. The changes in the multipliers are for simultaneous changes in, respectively, the eight a_{ij}, then the four v_j and finally the two βs with *a*s and *v*s at original values, that enter each multiplier. Since $a_{at.j} + a_{mt.j} + a_{an.j} + a_{mn.j} + v_j \leq 1$, a uniform fixed percentage increase in intermediate demand coefficients is compensated in the calculations by a decrease in value-added shares, so that the above relation continues to hold, and similarly, a uniform fixed percentage increase in value-added shares is compensated by a decrease in intermediate demand coefficients. The relationship between multipliers and parameters is nonlinear, such that increases and decreases of parameters do not necessarily produce symmetric effects.

is associated with a 1.6 percent decrease in the nonfarm multiplier. The effect of an across-the-board increase of 10 percent in all the value-added shares (*v*s) without changing anything else is to lower multipliers by about 8 percent (for an increase in *v*s) or to raise them by about 9 percent (for a decrease in *v*s). Changing the MBSs (the βs) for nontradable goods provokes an elastic response in the multiplier estimates, ranging from an 18 to 29 percent increase in multipliers for a 10 percent increase in the βs to a 13 to 21 percent decrease in multipliers for a 10 percent decrease in βs.

In sum, the choice of *a*s is of relatively minor significance for the final elasticity estimates. The *v*s matter much more, but still only half as much as the MBSs for nontradables, which truly drive the results. This confirms the importance of getting tradability assumptions right, because erroneously classifying an important set of goods as supply-constrained tradables rather than demand-constrained nontradables severely reduces multiplier estimates. The reverse also holds: erroneously assuming a good to be a nontradable greatly inflates multiplier estimates.

Decomposition of Growth Multipliers by Source

The multipliers reported in Table 10 measure the net total effect of exogenous increases in income from the tradables sector and are set out as equations (26) (the farm growth multiplier) and (27) (the nonfarm growth multiplier) in Chapter 3. Both of these equations can be decomposed into three parts: (1) the initial tradable income stimulus, equal

to unity by definition, (2) the net additional income from intermediate demands and consumer respending in the farm nontradables sector stemming from the initial stimulus, and (3) the net additional income from intermediate demands and consumer respending in the nonfarm nontradables sector stemming from the initial stimulus. These three components have been calculated separately and set out in Table 12 as *T*, *A*, and *M*, respectively. The sum of the three components is the total multiplier, also reported in Table 10.

Thus under the national definition of tradability, the total farm growth multiplier for the poorest one-third of households is 3.18, of which $1.00 is the initial exogenous

Table 12 Sources of income growth from linkages by catchment area, income group, and ecological zone, Burkina Faso, 1984/85

	Income group		Ecological zone	
Catchment area	**Poorest third**	**Richest third**	**Sahel**	**Guinean**
Farm				
Local				
T_{at}	1.00	1.00	1.00	1.00
A	0.09	0.12	0.07	0.14
M	0.16	0.29	0.09	0.31
Total	1.25	1.41	1.16	1.45
National				
T_{at}	1.00	1.00	1.00	1.00
A	1.65	0.80	1.97	0.92
M	0.53	0.65	0.34	0.66
Total	3.18	2.45	3.31	2.58
Regional				
T_{at}	1.00	1.00	1.00	1.00
A	3.09	1.58	7.20	1.38
M	0.80	0.92	0.87	0.81
Total	4.89	3.50	9.07	3.19
Nonfarm				
Local				
T_{mt}	1.00	1.00	1.00	1.00
A	0.06	0.08	0.03	0.10
M	0.28	0.43	0.20	0.44
Total	1.34	1.51	1.23	1.54
National				
T_{mt}	1.00	1.00	1.00	1.00
A	1.72	0.81	2.06	0.94
M	0.67	0.81	0.47	0.82
Total	3.39	2.62	3.53	2.76
Regional				
T_{mt}	1.00	1.00	1.00	1.00
A	3.26	1.64	7.65	1.42
M	0.96	1.09	1.03	0.98
Total	5.22	3.74	9.68	3.40

Source: Results of the model components.

Notes: T_{at} is the initial income growth for farm tradables.
T_{mt} is the initial income growth for nonfarm tradables.
A is the farm component of the overall growth multipliers.
M is the nonfarm component of the overall growth multipliers.
Income terciles are based on annual household total expenditures per adult equivalent.

shock, $1.65 stems from net new spending on farm nontradables, and $0.53 comes from net new spending on nonfarm nontradables. In relative terms, 31 percent of the total increment to income stems from the initial stimulus, 52 percent from net new respending on farm nontradables, and 17 percent on nonfarm nontradables.

Four trends are apparent from the decomposition of farm growth multipliers in the top part of Table 12. First, under assumptions of local tradability, the contribution of nonfarm items (*M*) to the total multiplier tends to be higher than the farm component (*A*), especially for the richer households and especially in the southern Guinean zone, which has higher agricultural potential. These results are consistent with earlier linkages work, which tended to see linkages primarily as the way in which agricultural growth stimulates nonagricultural growth.

Second, once the assumptions consistent with a bigger catchment area are substituted, the absolute and relative contributions of farm items themselves to overall farm growth multipliers increases sharply, because so many farm items become nontradable. The two remaining trends are largely related to this finding. Third, the absolute and relative contributions of farm items to farm growth multipliers tend to be higher for the poor than the rich, and this relationship escalates sharply as the catchment area expands. Fourth, the relative and absolute roles of farm items in farm growth multipliers tend to be more important in the north and the south, when the national and regional definitions of tradability are adopted.

In sum, when the local definition of tradability is used, similar to that in previous household linkages work, income shocks to the poor or to the north as a region—or both—stimulate little extra income growth through linkages. Shocks to the south and to the relatively rich do better, but they primarily stimulate the nonfarm sector. When a more satisfactory set of assumptions inherent in a broader national definition of tradability is used, basic foods begin to become nontradables. And decomposition of the estimated growth multipliers shows that the farm nontradables sector accounts for the majority of net additional income growth from exogenous increases in incomes in the tradables sector, whether or not the initial income stimulus was inside or outside of the farm sector. Income shocks directed to the poor and the north stimulate the farm sector in particular once basic foods are designated nontradables.

Conclusions

Demand is income-elastic, in increasing order of magnitude, for prepared foods and beverages, for local nontradable nonfarm items, and for nonlocal nonfoods. Nonfarm items as a whole, including prepared and manufactured foods, accounted for 23 percent of average whole-sample expenditures and 35 percent of increments to expenditures. These items are important for the future but are numerically of much smaller importance than basic staples. Basic food staples account for the majority of both average and incremental expenditures in the study zones. For the sample as a whole, coarse grains alone accounted for 59 percent of average expenditures and 53 percent of incremental expenditures. The comparable figures for the poor and the Sahelian north are even stronger. These findings are not atypical of the Sahel and suggest that

the tradability assumptions made about coarse grains are central to one's view of the potential for productive demand-side stimulus to rural development in these areas.

The tendency in earlier literature to assume that these coarse grains were freely traded resulted in the implicit assumption that respending of rural incomes on these items was a "leakage," in the sense that it simply displaced exports of grain from rural areas or encouraged further imports of grain to the study zone. This assumption erroneously leads to the conclusion that the scope for additional demand-led growth from an initial supply-side shock, as in growth linkages theory, is low.

The concept of a catchment area implicit in any regional model is central to estimates of the level of growth multipliers. It is not an arbitrary choice, since only one set of assumptions is likely to be consistent with the world as it really is. If local income growth in northern Burkina Faso does truly elicit additional sorghum shipments north from southern Burkina Faso without major price increases, as implicitly hypothesized in the assumptions underlying the national level of tradability, then this should be the set of assumptions chosen. Failure to make appropriate assumptions leads to strategies that underemphasize the employment-creating potential of income growth in the rural tradables sector through growth linkages.

Defining tradability at the national rather than the local level is a reasonable compromise. While household-level data of the sort used do not capture all the linkages implicit in adopting a national catchment area, they do vastly improve estimation of how initial supply-side shocks to the tradables sector can further stimulate economies that are still semi-open, because of remoteness and poor infrastructure. The estimates of linkages for the national level of tradability in the present study are presumably too low, since some of the truly national linkages are not captured in the household data available. This only strengthens conclusions that show high multipliers.

Ignoring the central fact of the nontradability of much of agriculture under a larger catchment area can lead to growth strategies that are inefficient. Estimation of farm growth multipliers under the national definition of tradability leads to an overall estimate of $1.88 in net new income from intermediate demands and consumer respending of an initial $1.00 in additional income from the farm tradables sector. The net new income from targeting income shocks to specific subgroups ranges from $1.45 to $2.31.

This points to a central difference between Burkina Faso and areas where foodgrains are freely tradable because of low relative transfer costs to and from the outside world. Demand stimulus in rural Burkina Faso is capable of inducing considerable employment within the farm sector itself. Provided that a sustainable way is found to achieve the initial boost in incomes in the rural tradables sector, and provided that the supply of farm nontradables, such as grain, is somewhat price-elastic, foodgrain production itself will provide substantial new employment. This could be the case if cash crop development were to both stimulate demand and, through better infrastructure and input distribution, increase the elasticity of supply of foodstuffs.

Shocks to rural tradable nonfarm incomes are slightly more efficient at boosting overall value added than income shocks to farm tradables. The estimated multipliers were robustly greater (about 7 percent) than those for shocks to farm tradables. The choice of which rural tradables sector to stimulate depends on comparative advantage

and not growth multipliers. Both farm and nonfarm tradable income shocks increase net additional employment outside the stimulated sector principally through consumption linkages to the farm nontradables sector.

The tradability issue not only affects one's view of the scope for agricultural growth linkages to complement growth strategy, but also one's view of the consistency between growth and equity policies. In the model, the relative importance of the farm nontradables sector in providing additional value added from growth linkages increases greatly with the size of the catchment area considered. When only local linkages are considered, which is a mistake, income shocks to the rich create more overall income growth than shocks to the income of the poor, confirming the conventional wisdom from Asian linkage studies that there is a trade-off between growth and equity arising even from differential consumption patterns of the poor and rich.

This relationship is reversed when the more appropriate, national catchments are assumed, because the poor consume a relatively higher proportion of items that are tradable locally but not over national borders. At the local definition of tradability, the initial $1.00 stimulus to the farm incomes of the poorest one-third of households produced an additional net income of $0.25 beyond the initial shock, while the same figure for the richest one-third was $0.41. With the alternative national definition and assumptions, the net additional increment was $2.18 for the poor and $1.45 for the rich.

To summarize, neglect of the fact that so many rural people in countries such as Burkina Faso consume items that are nontradable because of high transport costs may have led, logically, to growth strategies that tend to ignore the potential to achieve multiplied growth through alleviation of demand constraints for farm items. The initial engine of this growth still needs to come from the rural tradables sector. For a given initial income influx, growth linkages in the farm sector are nearly as efficient as in the nonfarm sector. Supply-side policies should continue to focus on farm products that are likely to be competitive on expanded regional and world markets, with the knowledge that the true returns in terms of net value added to the economy are potentially much higher than the income shocks themselves. Realizing the growth potential offered by strong demand linkages to the farm sector, from both farm items themselves and nonfarm items, will require a price-elastic supply of those things that rural people wish to consume more of as their incomes go up. Reaping the fruits of export-led growth will also require policy attention to increasing the supply of nontradable wage goods such as coarse grains.

Ultimately the dynamic rural consumer items will be those whose demand is currently income-elastic, such as services, radios, batteries, beverages, fruits, vegetables, meat, and dairy products. However, the high average expenditure share for starchy staples suggests that—despite having slightly income inelastic demand—they can form either a prime source of growth, or a major bottleneck to it. The elasticity of the supply of staples with respect to price will determine whether demand stimulus will lead to real income growth or to the choking off of growth through rising relative prices of nontradables. In the Burkina Faso case, where nontradables are probably major wage goods such as food, this could mean that the cost of labor and therefore the basic cost of production of farm tradables would also rise.

CHAPTER 5

Southwestern Niger

This chapter explores growth linkages between the farm and nonfarm sectors in Niger's rural economy, an economy characterized by households that conduct a number of highly diversified nonfarm activities. As in many other parts of the semiarid tropics, the natural resource base in Niger is extremely fragile and rainfall is highly variable across and within years. Yet population densities on arable land are rising. Niger is also subject to a strong commercializing influence from extensive cross-border trade with Nigeria directly and through Benin (Hopkins and Reardon 1993). The combined impact of these forces creates pressure on a variable, at-risk agricultural resource base.

Given these circumstances, nonfarm income plays an important role in Niger in sustaining the livelihoods of rural farmers, assuring household food security, and providing liquidity for productive investments. Nonfarm activity not only provides income alternatives to households that are currently farming, it may alleviate pressure on an already fragile and deteriorating resource base. Therefore, understanding the nature of the nonfarm economy, its role within the rural economy, and the conditions necessary to stimulate its growth is of strategic importance. In particular, given the prevalence of cross-border trade, development policy cannot ignore the impact of major changes in export and import incentives on the rural nonfarm economy.

This chapter addresses these issues by examining the implications of current consumption patterns for growth, using ABSs and MBSs estimated from comprehensive household survey data. After classifying goods and services by sector (farm or nonfarm) and degree of tradability, growth multipliers are estimated to explore the impact of an increase in tradables sector income on the demand for nontradables. Results provide evidence of large multipliers and strong nonfarm linkages.

An example of the importance of classifying goods by farm or nonfarm sector, rather than as agricultural or nonagricultural or rural or urban, is provided by comparing the conclusions of the present study with those of a 1989 study by Doan and Lewis. The Doan and Lewis study focused on rural market towns in western Niger to assess the extent to which they could serve as growth poles. Doan and Lewis concluded that the potential for income multipliers in market towns and, by extension, in rural areas of the zone is low, based entirely on demand considerations (they did not address or as-

sume supply conditions). More specifically, they concluded that increases in agricultural incomes are not likely to lead to more diversified economic activities in rural areas, because of the low income base and low effective demand for "nonfarm" (that is, urban) goods among the rural population. Contrary to Doan and Lewis, the present study finds high value-added multipliers with great potential for stimulating more diversified income sources, provided the right kind of initial income stimulus can be achieved. Development strategies need to focus both on creating the initial catalyst for agricultural exports to coastal countries and on increasing the stimulative impact of the income generated from these exports.

Background and Policy Context

Niger is a vast landlocked country with a 1990 population of 7.7 million and per capita GNP of US$320 a year (World Bank 1996). It is one of the poorest countries in the world. Only 12 percent of the country is arable, and nearly 70 percent of the arable land receives no more than 300 to 400 millimeters of rain, the minimum for rainfed cultivation (irrigated land accounts for less than 1 percent of arable land). More than 90 percent of the population of Niger lives either along the Niger river or along the border with Nigeria. Despite its poor resource base, Niger has been largely self-sufficient in cereal production except during drought years.

The economy is dominated by the rural smallholder sector and uranium mining. Agriculture (including livestock) is the largest sector of Niger's economy. In 1990 it employed 90 percent of the country's labor force and accounted for 36 percent of GDP (World Bank 1996). In terms of both production and domestic consumption, millet and sorghum are the principal crops. They account for about 85 percent of total production during the main agricultural season and about 80 percent of national caloric intake. The dominant cropping system involves the intercropping of millet, sorghum, and cowpeas. Livestock (which are now owned primarily by sedentary farmers, rather than pastoralists) are an important component of the overall farming system.

Until the early 1970s, livestock and groundnuts were the main agricultural export products. Groundnuts have since declined in importance, and cowpeas are now Niger's leading cash crop with Nigeria being the major market outlet. Niger's agriculture has stagnated over the last few decades, owing largely to a combination of climatic, economic, and policy factors: recurring droughts, the impact of major policy changes in neighboring Nigeria, the commodity boom effects of the exploitation of uranium deposits in the 1970s and the decline in uranium prices after 1983, and the general impact of an overvalued CFA franc vis-à-vis a devalued Nigerian naira after 1986.

Uranium has been the principal foreign exchange earner since the mid-1970s. Since the collapse of the uranium market in the early 1980s, the government of Niger's stated policy has been to replace lost uranium revenue with an increase in agricultural productivity and exports (1983–87 five-year plan). To move the economy in this direction, the government and its donors embarked on a program of structural adjustment and agricultural price policy reform in 1983. The main goal of this effort, which has met with only partial success, was to reestablish the competitiveness of agricul-

tural tradables in export markets. These principally include livestock and cowpea exports to Nigeria.[9] The nominal devaluation of the CFA franc (FCFA) that occurred in January 1994 had a major stimulative impact on the domestic prices of exports in Niger, particularly livestock (Institut du Sahel 1997).

Study Regions and Sample Characteristics

This study uses detailed household expenditure and income data from a survey conducted in Niger between September 1989 and December 1990. The data were collected for a USAID/Niger-funded project called "Household-Income Generating Strategies and Agricultural Price Policy Impacts in Niger," which was carried out in collaboration with the Institut National de Recherche Agricole du Niger (INRAN) and the ICRISAT Sahelian Center. The objective of the study was to examine the nature and determinants of household income-generating strategies and how they condition the effects of policy changes on production, consumption, and marketing of farm products, as well as investment in farm and nonfarm enterprises.

Fortnightly and monthly interviews enumerated crop and livestock transactions (purchases, sales, gifts), food and nonfood consumption, crop production, and nonfarm income. The sample consisted of 135 randomly chosen households from five regions in the Sudano-Sahelian and Sudano-Guinean zones of western Niger. Fifteen villages were chosen to reflect the diversity of the regions in access to markets, infrastructure, size, and so forth. The survey methodology is described in more detail in Hopkins and Reardon 1989.

The regions included in this analysis fall administratively within the Dosso *département* (state) of western Niger and span two agroecological zones—the Sudano-Sahelian zone and the Sudano-Guinean zone. The Sudano-Sahelian zone (the northern and southern Boboye survey regions) has an average annual rainfall of 400–600 millimeters. This zone is moderately poor agroclimatically, with highly variable rainfall both within and between years. Millet, cowpeas, and some groundnuts are produced, with low yields per hectare. Livestock husbandry is widely practiced, but degradation has led to rapid reduction in grazing areas.

The Sudano-Guinean zone has an average annual rainfall of 600–850 millimeters. It is bordered to the south and east by Nigeria and to the west by Benin. This zone is moderately good agroclimatically and considered "high potential," although current performance is modest. The variation in its rainfall from year to year is lower than that of the Sudano-Sahelian zone. Millet, sorghum, some maize, cowpeas, bambara nuts, and groundnuts are produced. Yields are higher and animal traction is used to a greater extent than in the Sudano-Sahelian zone. Land constraints are less severe than in the northern zone. Livestock husbandry is an important part of the income-generating strategies of households.

[9] It is worth noting in this context that Nigeria's recorded imports of livestock products in 1985, mostly from Europe, exceeded estimates of Niger's total farm sector GDP in the same year (see Delgado 1991).

Average household size, income levels, and asset holdings are fairly similar across agroclimatic zones, although there is variation among individual regions (Table 13). The northernmost region (northern Boboye) has the most degraded resource base and the lowest annual income level (US$103 per adult equivalent), while the southernmost region (Gaya River) has the highest income level (US$153 per adult equivalent).

Rural households in western Niger have incomes that are well diversified into nonfarm sources, even by Sahelian standards (Hopkins and Reardon 1993). Income from activities other than crop and livestock production makes up 52 percent of the average Sudano-Sahelian household's income and 43 percent of the average Sudano-Guinean household's income.

Household income diversification varies in nature by agroecological zone. In the lower-potential Sudano-Sahelian zone of Niger, diversification strategies are outward oriented, with migration playing a large role in household income-generating strategies. Nonfarm activities tend to be better linked to the economies of local towns and to migration than to the local crop and livestock economy. Diversification in this zone helps offset local crop risks and compensates for harvest shortfalls. In the higher-potential Sudano-Guinean zone, which receives higher and more stable rainfall, diversification is inward-oriented. Nonfarm activities tend to be linked to local crop and livestock activities and to proliferate where infrastructure is adequate.

Historically, trade has flourished between the coastal and Sahelian economies. Across Niger's border to the south is an economy with 4 times the number of consumers in all of the Sahel and 15 times the number in Niger. The importance of this cross-border trade, especially in the southern zone, is evident from the substantial share of household sales and purchases that occurred directly across the border during the 1989–90 survey period (Table 13). In the Sudano-Guinean zone, 20 to 40 percent of pulse sales and 30 to 40 percent of livestock sales by households took place directly in Nigerian and Benin markets. In addition, 15 to 30 percent of the zone's cereal is sold directly in cross-border markets. These magnitudes, although not inclusive of all cross-border trade, give an indication of the minimum amount of cross-border trade in the sample zones and in Niger's rural economy more broadly (Hopkins and Reardon 1992).

Classification of Household Expenditures

The detailed nature of the Niger data and the authors' knowledge of the commodities, households, and regions where the data were collected permit a rigorous and accurate categorization of individual goods. For example, millet flour (a nonfarm nontradable) is distinguished from unthreshed (with bran) millet (a farm tradable) and from millet cakes (a nonfarm nontradable). Likewise, traditionally processed peanut oil (a nonfarm nontradable) is distinguished from imported palm oil (a nonfarm tradable). Similarly, locally crafted nonfarm tradables, such as palm-frond woven mats, are distinguished from locally crafted nonfarm nontradables, such as calebasses (gourds used for utensils). Expenditures on 200 individual food items and 750 nonfood goods and services are classified: (1) by functional (commodity) category, (2) by sector (farm or nonfarm), and (3) by tradability.

Table 13 Selected zone, sample, and household characteristics, Dosso, Niger, 1989/90

Characteristics	Sudano-Sahelian zone		Sudano-Guinean zone		
	Northern Boboye	Southern Boboye	Dallol Maouri	Gaya Plateau	Gaya River
Long-term annual rainfall (millimeters)	450–500	500–550	600–700	700–750	750–800
Sample size (number of households)	23	23	23	20	24
Household size					
Average number of persons	7.2	9.0	8.7	7.6	8.7
Average number of adult equivalents	5.4	6.7	6.7	6.0	6.5
Household income					
Average income level (US$ per adult equivalent)	103	150	110	123	157
Nonfarm income (percent)	36	70	57	34	43
Household assets					
Land (hectares)	5.7	6.3	6.4	5.6	5.0
Land cultivated per adult equivalent (hectares)	1.1	0.9	1.0	0.9	0.8
Household cross-border purchases as share of total purchases (percent)					
Cereals	2	1	31	1	15
Pulses	0	0	3	0	0
Livestock	0	0	26	0	53
Household cross-border sales as share of total sales (percent)					
Cereals	0	0	3	0	18
Pulses	0	0	19	3	42
Livestock	0	0	40	0	31

Source: Hopkins and Reardon 1993.

Functional Classification

Food and nonfood goods were then classified into 6 broad functional categories: crops and crop products, livestock and livestock products, stimulants and beverages, consumption nondurables, consumption durables, and services. These groups are further subdivided into 20 disaggregated categories:

1. Crop and crop products are divided into 8 subcategories: millet, sorghum, and *fonio* (a local grain); maize; rice; pulses; processed staples; by-products; vegetables; and other foods.
2. Livestock and livestock products are divided into 2 subcategories: meat, fish, poultry, and eggs, and fresh milk and butter. Meat includes both live animals (small ruminants and fowl) purchased to slaughter for immediate consumption, as well as cooked and uncooked meat from a local butcher.
3. Stimulants and beverages are not subdivided further. This category includes cola nuts, cigarettes, tobacco, coffee, tea, and soft drinks.

4. Consumption nondurables (frequent purchases) are divided into 3 subcategories: fuelwood and kerosene, toiletries and soap, and miscellaneous (matches, batteries, and medicine such as aspirin or Nivaquine).
5. Consumption durables (infrequent purchases) are divided into 3 subcategories: clothing, furniture and kitchen utensils, and miscellaneous (for example, jewelry, flashlights, kerosene lamps, bedding material, and local construction materials).
6. Services are divided into 3 subcategories: social obligations, transportation (for example, cart or taxi fares), and miscellaneous (for example, repair services, utility [water and wood carrying] services, healer or mystic services, and cereal milling services).

Farm-Nonfarm Classification

Earlier growth linkages work in Africa tended to equate locally produced food with the farm sector, following Asian precedents and the tendency to distinguish sectors by location, that is, urban versus rural (King and Byerlee 1977; Haggblade and Hazell 1989; Doan and Lewis 1989). The farm or nonfarm distinction is perhaps more relevant for rural African economies since it allows processed food items (for example, processed cereals such as flour, breads, and cakes, processed vegetables, and processed meat such as butchered, dried, smoked, and grilled meat) to be appropriately placed in the nonfarm sector. Given that food processing is one nonfarm activity that is expected to grow most rapidly during a structural transformation (Haggblade, Hazell, and Brown 1987; Hazell and Haggblade 1989), it is particularly important to make this distinction.

Consumption durables (kitchen utensils, furniture, and clothing), nondurables (fuelwood, kerosene, and soap), and services are classified as nonfarm goods and services. In addition, food items that originate off-farm (while using farm sector inputs) are also classified as being in the nonfarm sector (flour, cakes, breads, tomato paste, canned milk, cooked tubers, spices, grilled meat, and smoked fish). This is true regardless of whether they are imported or of local origin. Goods that originate on the farm (unprocessed cereals and pulses, fresh vegetables and fruits, by-products, and live animals) are classified as farm sector goods.

Tradability Assumptions

For western Niger, the external reference market at the national level of tradability (the national catchment) is the West African regional market, particularly Nigeria. As in other chapters, the local catchment area refers to tradability within the immediate geographic region (roughly a 100 kilometer radius from the study villages). Nontradables at the local level are hypothesized to be traded freely within this catchment, but are not traded outside it. Similarly, nontradables with respect to world markets are assumed to circulate freely within the West African regional catchment.

The detailed nature of the Niger data base and the authors' knowledge of the country allow a different technique to be used in this chapter to get around the problem of aggregating tradables and nontradables. Each of the 950 individual consumption

items in the survey, as opposed to categories of goods and services, are classified as tradable or nontradable. Thus, a given category of goods (for example, millet, sorghum, and *fonio*) can be comprised of both tradable and nontradable items, with shares attributed to each. Table 14 presents the share of nontradable expenditures in each category of goods.

For example, at the national market level, only 5 percent of expenditures in the millet, sorghum, and *fonio* category were on nontradable items (*fonio*), while 95 percent were on tradable items. Millet and sorghum, although clearly nontradables on the world market, were considered tradable at the national level of tradability because of

Table 14 Share of nontradables in consumption expenditures by commodity group for alternative tradability assumptions, Dosso, Niger, 1989/90

Commodity group	Catchment area		
	Local	National	Regional
		(percent)	
Crop and crop products	11	19	84
Millet, sorghum, and *fonio*	5	5	100
Maize	0	0	0
Rice	0	0	0
Pulses	0	21	58
Processed staples	53	70	100
By-products	45	99	99
Vegetables and spices	26	63	74
Other	12	34	65
Stimulants and beverages	1	1	70
Livestock and livestock products	88	90	100
Meat, fish, poultry, and eggs	86	88	100
Fresh milk and butter	100	100	100
Consumption nondurables	0	5	45
Fuelwood and kerosene	0	14	14
Toiletries and soap	0	0	100
Other nondurables	0	0	12
Consumption durables	12	18	66
Clothing	0	0	66
Furniture and kitchen utensils	27	29	73
Other durables	24	47	47
Services	100	100	100
Social obligations	100	100	100
Transport	100	100	100
Other	100	100	100

Source: IFPRI/INRAN survey data, 1989/90.

Notes: Since each category of goods is the aggregate of a large number of individual items, the numbers in this table represent the percent of each category that is classified as nontradable. For example, the processed staple category includes processed coarse grains (millet flour and millet cakes), processed pulses (cowpea cakes), processed tubers (manioc flour and boiled yams), and bread. Although these items are in the same commodity grouping, some of the items are tradable (bread and manioc flour) while others are nontradable (millet cakes and boiled tubers). As another example, the pulses category includes cowpeas, groundnuts, and bambara nuts. All are tradable at the local level; only groundnuts and cowpeas are tradable at the national level, and only groundnuts are tradable at the regional (world market) level. For an explanation of the individual items included in each category of goods, see the discussion in the text.

frequent commerce with Nigeria, which served as a much larger reference market. Pulses such as cowpeas, groundnuts, and bambara nuts are tradable within the local catchment area, but only groundnuts and cowpeas are tradable at the national level, and only groundnuts at the regional level. Hence the share of nontradable pulse expenditures increases from 0 to 58 percent as the market reference area increases.

Estimation of Multiplier Model Parameters

Following the methodology described in Chapter 3, the fixed-price value-added multiplier model requires estimation of the following parameters: MBS, value-added to gross output ratios, intermediate delivery coefficients, and the marginal savings ratio. However, the sensitivity analysis conducted in Chapter 4 indicates that the multipliers depend overwhelmingly on the tradability assumptions and the MBS. This section discusses how each group of parameters was obtained.

Marginal Budget Shares

MBSs are computed using parameters estimated through the Working-Leser model of consumption described in Chapter 3 (see equation 4). The explanatory variables used in estimation of the Working-Leser equations are presented in Table 15. Household size and composition (age and gender distribution) are key variables influencing household expenditure patterns. An important factor affecting household expenditure patterns is the liquidity of the household. Two measures of liquidity are incorporated into the model. Net total credit as a share of total expenditures reflects the ability of households to obtain credit from moneylenders and shopkeepers.[10] Earned nonfarm income as a share of total income by contrast reflects the ability of households to generate cash income from nonfarm sources.

In rural African households, consumption from own production is a large share of household expenditures. The effect of the household's ability to feed itself for the duration of the year is captured by including the production sufficiency ratio (PSR) as an explanatory variable. The PSR indicates the ability of a household to use the factors of production at its command, such as farm size and land quality, to meet the Food and Agriculture Organization of the United Nations' (FAO's) minimum caloric requirements of 2,280 kilocalories per adult equivalent per day.

The market village dummy variable is included to capture the effect of higher levels of infrastructure (for example, a weekly market) on consumption. Lastly, dummy variables for each region and agroclimatic zone are incorporated to reflect geographic differences, such as overall level of infrastructure and proximity to borders, and agroclimatic differences (in soils and rainfall, for example).

[10] Total credit is the sum of net consumption and net production credit and includes both cash and in-kind credit. Total credit was used because consumption and production credit are highly fungible.

Table 15 Independent variables included in the Engel function regressions, Niger

Description	Name	Unit
Intercept	INTERCEPT	FCFA
Reciprocal of per capita total expenditure	1/TEXPPC	FCFA
Log of per capita total expenditure	TEXPPCLN	
Household size	POP	Persons
Household size / per capita expenditure	POP_XC	
Number of adult females (over 15) as portion of family size	SHAF	Percent
SHAF / per capita expenditure	SAF_XC	
Number of female children (5–14 years) as portion of family size	SHEF	Percent
SHEF / per capita expenditure	SEH_XC	
Number of infants (under 5) as portion of family size	SHI	Percent
SHI / per capita expenditure	SI_XC	
Dummy variable for market village: market village = 1; nonmarket village = 0	MKT2	
Market village / per capita expenditure	MKT2_XC	
Production sufficiency ratio	PSR	Percent
PSR / per capita expenditure	PSC_XC	
Total credit as share of total expenditures	STCX	Percent
STCX / per capita expenditure	STCX_XC	
Nonfarm earned income as a share of total income	SH_NONFE	Percent
SH_NONFE / per capita expenditure	SHFE_XC	
Dummy variable for region two: Region 2 = 1; otherwise = 0	DUMREG2	
DUMREG2 / per capita expenditure	REG2_XC	
Dummy variable for region four: Region 4 = 1; otherwise = 0	DUMREG4	
DUMREG4 / per capita expenditure	REG4_XC	
Dummy variable for region five: Region 5 = 1; otherwise = 0	DUMREG5	
DUMREG5 / per capita expenditure	REG5_XC	
Dummy variable for market group: Sudano-Guinean = 1; Sudano-Sahelian = 0	DUM_MG3	
DUM_MG3 / per capita expenditure	MG3_XC	

Note: Region 2 is Southern Boboye; region 4 is Gaya Platea; region 5 is Gaya River. The region 1 dummy (Northern Boboye) was not significant. Region 3 (Dallol Maouri) is represented by the intercept.

Technical Parameters

Value added and intermediate delivery parameters to the farm sector were calculated using the detailed input/output farm budget data from the IFPRI/INRAN Niger survey. Parameters for the nonfarm sector were based on data from a SAM for Niger (Dorosh and Nssah 1991).[11] The savings ratio is the one derived from the Burkina Faso data and considered a reasonable estimate for the Sahel. The technical parameters used in the model are given in Table 16. The numbers reflect the fact that more hired labor was used in crop production in Niger than in Burkina Faso, for example, as evidenced by the higher coefficients for nonfarm, nontradable intermediate deliveries in Niger.

[11] The sensitivity analysis of the estimated multipliers to parameter assumptions in Chapter 4 found that a 1 percent change in intermediate demand coefficients was only associated with a 0.1 percent change in the multiplier. Given the range within which multipliers are interpreted, it can be assumed that this simplification has little effect on results.

Table 16 Technical parameters used in growth multiplier calculations, Dosso, Niger, 1989/90

	Farm sector		Nonfarm sector	
Coefficients	**Tradable**	**Nontradable**	**Tradable**	**Nontradable**
Intermediate deliveries from nontradable farm sector	0.00	0.12	0.06	0.03
Intermediate deliveries from nontradable nonfarm sector	0.09	0.12	0.10	0.20
Value-added shares	0.51	0.75	0.49	0.69
Savings ratio	0.06	0.06	0.06	0.06

Sources: For the farm sector, intermediate delivery and value-added parameters were derived from IFPRI/INRAN input-output farm budget data, 1989/90. For the nonfarm sector, these parameters were calculated using secondary data from a social accounting matrix for Niger (Dorosh and Nssah 1991). The savings ratio is based on Burkina Faso estimates (see Chapter 4 for details).

Note: Regional definitions of tradability were used to compute the above coefficients.

Household Expenditure Patterns

Growth linkages analysis largely concerns the strategic implications of consumption patterns. Once the tradability of goods and services is established, the estimated MBSs by sector are central to the multipliers obtained. Interpreting results often requires a more disaggregated view of consumption response to income changes than categories such as "farm nontradables," for example, allow. Therefore the present section will discuss expenditure patterns in considerable detail, disaggregated by the goods and services group, agroecological zone, and income group.

Table 17 summarizes the expenditure behavior of rural Niger's households for the overall sample average and by agroecological zone. ABSs provide a view of the relative magnitude of different products in the household's current budget. Marginal expenditure shares, on the other hand, provide a view of how households will allocate increments to income. In both cases, they are expressed in percentages and sum to 100 across goods and services groups.

Overall Expenditure Patterns

Food [12] accounts for nearly three-quarters of the average expenditure of sample households. Although, as Engel's Law predicts, the budget share of food decreases as incomes increase, nearly 60 percent of any additional expenditure will still be spent on food, while 40 percent will be allocated to nonfood goods and services. The importance of food in both average and incremental expenditures indicates that the capacity of the farm sector to respond to increased demand as incomes rise will be a key factor in the success of rural growth strategies.

[12] Food includes crop and livestock products in both processed and unprocessed form.

Table 17—Expenditure patterns for Sudano-Sahelian and Sudano-Guinean zones, Dosso, Niger, 1989/90

Commodity group	Sudano-Sahelian zone			Sudano-Guinean zone			Overall sample		
	ABS	MBS	Expenditure elasticity	ABS	MBS	Expenditure elasticity	ABS	MBS	Expenditure elasticity
					(percent)				
Crop and crop products	64.45	40.81	0.63	60.80	48.42	0.80	62.29	46.27	0.74
Millet, sorghum, and *fonio*	39.79	14.16	0.36	38.61	24.45	0.63	39.09	17.69	0.45
Maize	5.03	9.05	1.80	3.05	1.40	0.46	3.86	4.71	1.22
Rice and wheat	1.34	2.87	2.14	0.88	0.37	0.42	1.07	1.04	0.98
Pulses	2.76	–1.50	–0.54	6.07	9.10	1.50	4.72	8.15	1.73
Processed staples	4.61	3.56	0.77	4.05	2.47	0.61	4.28	3.50	0.82
By-products	0.89	1.10	1.23	0.66	0.98	1.49	0.75	1.04	1.38
Vegetables	7.68	8.12	1.06	6.12	7.07	1.16	6.75	7.69	1.14
Other	2.35	3.44	1.46	1.37	2.58	1.89	1.77	2.45	1.39
Stimulants and beverages	2.62	4.12	1.58	5.65	5.02	0.89	4.42	3.70	0.84
Livestock and livestock products	9.47	15.19	1.60	8.50	15.53	1.83	8.90	13.20	1.48
Meat, fish, poultry, and eggs	7.26	10.84	1.49	7.33	13.41	1.83	7.30	10.13	1.39
Fresh milk and butter	2.21	4.36	1.98	1.18	2.12	1.81	1.60	3.07	1.92
Consumption nondurables	6.54	7.53	1.15	5.50	4.67	0.85	5.92	6.59	1.11
Fuelwood and kerosene	2.14	2.60	1.21	1.25	1.82	1.46	1.61	2.08	1.29
Toiletries and soap	2.26	1.98	0.88	1.83	1.44	0.79	2.00	2.08	1.04
Other nondurables	2.14	2.95	1.38	2.43	1.37	0.57	2.31	2.43	1.05
Consumption durables	6.35	16.19	2.55	9.24	15.77	1.71	8.06	13.95	1.73
Clothing	3.28	8.15	2.48	6.04	10.28	1.70	4.92	8.02	1.63
Furniture and kitchen utensils	1.15	1.30	1.12	1.70	2.22	1.31	1.48	2.63	1.78
Other durables	1.92	6.75	3.52	1.50	3.27	2.18	1.67	3.30	1.98
Services	10.58	16.15	1.53	10.31	10.59	1.03	10.42	16.28	1.56
Social obligations	3.88	8.09	2.08	4.81	7.29	1.52	4.43	10.16	2.29
Transport	2.68	3.86	1.44	2.12	2.11	0.99	2.35	2.85	1.22
Other	4.02	4.21	1.05	3.38	1.20	0.35	3.64	3.27	0.90

Source: IFPRI/INRAN survey data, 1989/90.

Notes: ABS is average budget share; MBS is marginal budget share.

Locally produced coarse grains (millet, sorghum, and *fonio*) account for the largest single share of both average expenditures (39 percent) and incremental expenditures (18 percent). This suggests a strong rural demand for locally produced coarse grains as incomes rise. Livestock and livestock products account for 9 percent of total household expenditures, with 13 percent of any increase in income spent on these products. Of this 13 percent, 10 percent of incremental income will be spent on meat and 3 percent on milk.

There are a number of specific food items whose budget shares will rise with increases in income. They include in ascending order of their MBSs: meat, pulses, vegetables (including onions, fresh and dried gumbo, fresh tomatoes, tomato concentrate, cooked leaves, and some spices), maize, milk, other foods (for example, fruits, tubers, oils, canned and powdered milk, and sugar), and by-products (for example, cowpea fodder and millet stalks). To the extent that these food items are nontradable, rural growth can be further stimulated through an income increase in the farm tradables sector that is spent on them. In value terms, 85 percent of total expenditures on meat are on nontradables at the local level (that is, they represent expenditures on raw and cooked meat rather than live animals for slaughter), 100 percent of total expenditures on milk are on nontradables, 45 percent of espenditures on by-products, and 26 percent of vegetables and spices.

Nonfood goods account for 14 percent of total expenditures and services account for 10 percent. Spending on these broad categories will increase as incomes increase—25 percent of additional income will be spent on nonfood goods, while 16 percent of any increase in income will be spent on services. Thus, farm sector growth has the potential to increase the demand for nonfood goods and services. Again, whether this translates to a stimulus for growth in the local economy depends on the tradability of the nonfood items demanded. To the extent that the increase in income is spent on local nontradables (for example, locally made furniture and kitchen utensils, baskets, and all services), the local nonfarm economy will get a boost from an increase in farm income. About 25 percent of furniture and kitchen utensils and miscellaneous durables are categorized as nontradables at the local level.

A larger share of nonfarm goods are classified as nontradables with respect to world markets. For example, 100 percent of all toiletries and soap, 66 percent of clothing (regionally fabricated cloth), 73 percent of furniture and kitchen utensils (metal beds, plates, and pots), and 47 percent of other durables (metal trunks and sheets) are all nontradables. Most of these products are locally manufactured in neighboring coastal countries, especially Nigeria. Thus, a boost to the farm tradables sector in Niger, due to devaluation of the FCFA for example, is likely to increase demand for cross-border products manufactured in Nigeria on the income side, although the price effect will be to discourage consumption of imports (Hopkins and Reardon 1992).

Expenditure Patterns by Agroecological Zone

Disaggregation of sample expenditure patterns and multiplier analysis by agroecological zones helps identify differences in the type of multiplier growth that can be

achieved in each of them and those sectors that are most likely to be stimulated by the spending of increased household incomes.

Coarse grains (millet, sorghum, *fonio*, and maize) account for 45 percent of the Sudano-Sahelian household budget and 42 percent of the Sudano-Guinean budget (Table 17). MBSs are also similar across zones—23 versus 25 percent. However, the composition of the incremental coarse grain budget (between the locally produced and the imported coarse grains) differs greatly. The MBS for millet, sorghum, and *fonio* is 70 percent greater in the higher potential Sudano-Guinean zone, compared with the Sudano-Sahelian zone. Nearly a quarter of any increase in income will be spent on millet, sorghum, and *fonio* in the Sudano-Guinean zone—only 1 percent will be spent on maize.

In the Sudano-Sahelian zone, on the other hand, only 14 percent of any increase in income will be spent on locally produced coarse grains; 9 percent will be spent on maize. Virtually no maize is produced in this zone. The demand for maize is filled largely by imports from Benin, Ghana, and Nigeria. Maize produced in the Sudano-Guinean zone (largely in the Fadama areas along the Niger river) is mostly for home consumption; little enters commercial channels.

Sudano-Guinean households have larger coarse grain stocks from own production than do Sudano-Sahelian households.[13] During the hungry season, when local coarse grain stocks are low and relative millet prices are at their highest levels, maize accounts for nearly a quarter of total cereal calories in the Sudano-Sahelian zone (Hopkins and Reardon 1993). The households in the Sudano-Sahelian zone substitute commercially available imported maize for locally produced coarse grains to fill their cereal needs during the hungry season.

Maize is often substituted for local coarse grains in western Niger if its price is low enough relative to millet and sorghum. This lends support to the classification of millet and sorghum as tradables in western Niger at the local and national levels. Furthermore, if upward pressure is placed on millet and sorghum prices, as a result of increased demand induced by linkages, maize imports from Benin, Ghana, and Nigeria will increase.

Expenditure patterns (average and marginal) for livestock and livestock products are similar across agroecological zones (the ABS is 9 percent and the MBS is 15 percent). In the Sudano-Sahelian zone, livestock and livestock products have the same relative importance as locally produced coarse grains. Income growth will put considerable pressure on local milk and meat supplies.

Expenditure Patterns by Income Tercile

When expenditure patterns are summarized across income terciles (Table 18), food, as expected, represents a smaller share of total expenditures in the top third of sample households than in the bottom third of households (two-thirds versus three-quarters).

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[13] For the 1989 and 1990 harvest years, households in the Sudano-Guinean zone, on average, had a three-months greater supply of grain from own production in stock than did farmers in the Sudano-Sahelian zone..

Table 18—Spending patterns for lower and upper expenditure terciles, Dosso, Niger, 1989/90

Commodity group	Lower expenditure tercile			Upper expenditure tercile			Overall sample		
	ABS	MBS	Expenditure elasticity	ABS	MBS	Expenditure elasticity	ABS	MBS	Expenditure elasticity
					(percent)				
Crop and crop products	66.08	51.31	0.78	58.34	39.56	0.68	62.29	46.27	0.74
Millet, sorghum, and *fonio*	44.13	19.72	0.45	34.36	13.90	0.40	39.09	17.69	0.45
Maize	3.51	5.72	1.63	3.78	3.28	0.87	3.86	4.71	1.22
Rice and wheat	1.02	2.01	1.97	1.25	–0.13	–0.11	1.07	1.04	0.98
Pulses	4.32	10.83	2.51	4.39	5.15	1.17	4.72	8.15	1.73
Processed staples	4.30	2.85	0.66	4.48	4.77	1.06	4.28	3.50	0.82
By-products	0.70	1.28	1.83	0.97	0.78	0.80	0.75	1.04	1.38
Vegetables	6.52	6.57	1.01	7.00	9.17	1.31	6.75	7.69	1.14
Other	1.58	2.32	1.47	2.11	2.64	1.25	1.77	2.45	1.39
Stimulants and beverages	4.18	–1.66	–0.40	4.96	9.02	1.82	4.42	3.70	0.84
Livestock and livestock products	8.51	10.75	1.26	9.56	16.93	1.77	8.90	13.20	1.48
Meat, fish, poultry, and eggs	7.33	7.86	1.07	7.45	13.08	1.75	7.30	10.13	1.39
Fresh milk and butter	1.18	2.87	2.44	2.11	3.85	1.83	1.60	3.07	1.92
Consumption nondurables	5.55	6.56	1.18	6.28	7.08	1.13	5.92	6.59	1.11
Fuelwood and kerosene	1.44	1.75	1.21	1.83	2.36	1.29	1.61	2.08	1.29
Toiletries and soap	2.10	1.74	0.83	1.96	2.71	1.38	2.00	2.08	1.04
Other nondurables	2.00	3.07	1.53	2.50	2.01	0.80	2.31	2.43	1.05
Consumption durables	6.49	12.62	1.94	9.52	15.21	1.60	8.06	13.95	1.73
Clothing	3.95	7.30	1.85	5.65	8.86	1.57	4.92	8.02	1.63
Furniture and kitchen utensils	1.19	2.71	2.28	1.55	2.49	1.60	1.48	2.63	1.78
Other durables	1.35	2.62	1.94	2.32	3.86	1.66	1.67	3.30	1.98
Services	9.20	20.44	2.22	11.33	12.21	1.08	10.42	16.28	1.56
Social obligations	3.91	12.78	3.27	5.10	7.84	1.54	4.43	10.16	2.29
Transport	1.52	4.01	2.64	2.41	1.51	0.63	2.35	2.85	1.22
Other	3.78	3.65	0.97	3.83	2.86	0.75	3.64	3.27	0.90

Source: IFPRI/INRAN survey data, 1989/90.

Note: ABS is average budget shares; MBS is marginal budget shares. Expenditure terciles are used as proxies for the lower, middle, and upper thirds of the income distribution. They are based on total household expenditures per adult equivalent, including income in kind valued at market prices per adult equivalent.

In terms of increments to income, the poor spend 62 percent of additional income on food and the rich, 56 percent. Although these MBSs are quite similar, the composition of the incremental food basket is different. The rich will spend more of any additional income on livestock products (17 versus 11 percent) while the poor will spend more on crop and crop products (51 versus 40 percent).

The poor allocate a larger share of their budget to locally produced coarse grains than the rich do (45 versus 34 percent). And, the poor spend more of any increments to income on local coarse grains than the rich do (20 versus 14 percent). The ABSs for maize, on the other hand, are similar between lower and upper tercile households (4 percent), but the MBSs are two times greater in the lower tercile households (6 versus 3 percent). Thus, millet and sorghum are preferred coarse grains in the diets of rural people in Niger; expenditure elasticities for maize decrease rapidly with increases in income, whereas millet and sorghum expenditure elasticities are constant across income terciles. At 1.6, the expenditure elasticity for maize is highly elastic in lower-tercile households and barely inelastic (0.9) in upper-tercile households, while the expenditure elasticity for millet and sorghum are both near 0.4.[14]

The ABS for livestock and livestock products is similar across terciles (9 percent) but the MBS is 55 percent greater in the upper tercile (17 versus 11 percent). Relatively wealthier households will spend more of any increments to income on livestock products than local coarse grains (17 versus 14 percent), whereas poorer households will spend a higher share on local coarse grains than on livestock products (20 versus 11 percent).

Compared with poorer households, wealthier households have slightly higher ABSs (16 versus 12 percent) and MBSs (22 versus 19 percent) for nonfood goods. The upper income tercile also spends 11 percent of its income on services, while the lower tercile spends 9 percent. Interestingly, and contrary to expectations, the poor will spend a much higher proportion of any increment to income (20 percent) on services than the rich (only 12 percent). To put this in context, the poor will spend the same share of any increment to income on services as on locally produced coarse grains (20 percent).

The largest category of service expenditures are "social obligations." This category includes contributions made to other households for various ceremonies (such as baptisms or marriages) but does not include religious expenditures, which are placed in the "other" category.

One possible explanation for the high share of incremental income that the poor allocate to services, given that expenditures on services are largely items related to the creation or alleviation of social obligations, is the "social security" factor. Poorer households tend to be more dependant on the goodwill of others, and therefore they spend a larger share of increments to income to cement social relations. In the higher-potential Sudano-Guinean zone, the MBS for services is greater for the rich than for the poor (13 versus 5 percent), while in the lower-potential Sudano-Sahelian zone, the MBS for services is greater for the poor (21 versus 13 percent). The finding that

[14] Also Chapter 4 on "Food Consumption" in Hopkins and Reardon 1993 for additional support of this point.

growth multipliers are larger for lower-tercile households is in part driven by the magnitude of the MBS for services in poor households.

Expenditure Patterns by Sector

The tradability assumptions underlying Table 14 can be combined with the expenditure pattern data summarized in Tables 17 and 18 to estimate the shares of total household income and increments to household income that are allocated to each of four sectors: farm tradables, farm nontradables, nonfarm tradables, and nonfarm nontradables. These are basic data for assessing whether household income growth will stimulate production of demand-constrained goods (nontradables), and whether growth will be on the farm or nonfarm side.

As can be seen in Table 19, ABSs and MBSs for nontradables as a group are higher in the Sudano-Sahelian zone, whereas expenditures on tradables are higher in the higher potential Sudano-Guinean zone, with its proximity to the border. Thus, Sudano-Sahelian households consume more locally produced nonfood goods as incomes rise, while households in the Sudano-Guinean zone consume more imported goods. The sample zone with the easiest access to Nigerian markets (the Dallol Maouri Sudano-Guinean study region) has the lowest MBS for nontradables (41 percent at the preferred national definition of tradability), while the Sudano-Sahelian region further from the border has a higher share (45 percent). This illustrates the impact of proximity to the border. The MBS is substantially higher in the Northern Boboye subsample (not shown), the farthest region from the border.

When disaggregated by income terciles, demand for nontradables as a group is income-elastic (MBS > ABS), but significantly more so for the poor than for the rich at the national level of tradability. In Table 18, demand for services by the poor plays a preponderant role in explaining this result. Various farm nontradables such as certain pulses and by-products also have a higher income elasticity of demand. Using the alternative assumptions for a regional level of tradability (with world markets), demand for nontradables is income inelastic for both rich and poor, largely because Niger's millet and sorghum, which account for large expenditure shares, are nontradables with respect to the world market.

Growth Multipliers

In the summary of growth multipliers in Table 20, the numbers represent the total net additions to average household income in dollars that result from an initial income increase of $1.00 in the tradable farm or nonfarm sectors. The values depend on which of the mutually incompatible definitions of tradability is chosen: local, national, or regional. In keeping with the discussion in Chapter 3, the appropriate set of assumptions is embodied in the definition using the national level of tradability. "Local" and "regional" results are offered primarily to show the sensitivity of results to the set of assumptions chosen, particularly elasticity of supply. Sources of economic growth can be decomposed and attributed to new spending on demand-constrained, nontradable

Table 19—Average and marginal budget shares by sector for overall sample and sample subgroups, Dosso, Niger, 1989/90

Catchment area and sector	Overall sample		Sudano-Sahelian zone		Sudano-Guinean zone		Lower expenditure tercile		Upper expenditure tercile	
	ABS	MBS	ABS	MBS	ABS	MBS	ABS	MBS	ABS	MBS
	(percent)									
Local										
Tradables										
Farm	51	32	54	31	49	37	55	37	46	24
Nonfarm	24	29	21	31	26	29	22	20	26	38
Total	75	61	75	62	75	66	77	57	72	62
Nontradables										
Farm	7	13	7	13	8	14	7	11	9	16
Nonfarm	18	26	18	25	18	20	16	32	19	22
Total	25	39	25	38	26	34	23	43	28	38
National										
Tradables										
Farm	48	28	51	29	46	34	53	34	44	20
Nonfarm	20	25	17	26	23	25	19	17	22	33
Total	68	53	68	55	69	59	72	51	66	53
Nontradables										
Farm	10	17	10	15	10	18	9	14	11	20
Nonfarm	21	30	22	30	21	23	19	35	23	26
Total	31	47	32	45	31	41	28	59	34	46
Regional										
Tradables										
Farm	8	13	9	13	8	9	7	16	9	10
Nonfarm	10	12	9	14	10	13	8	7	11	17
Total	18	25	18	27	18	22	15	23	20	27
Nontradables										
Farm	50	32	52	31	48	42	55	32	46	30
Nonfarm	32	43	30	42	34	35	30	45	35	42
Total	82	75	82	73	82	77	85	77	81	72

Source: IFPRI/INRAN survey data, 1989/90.

Note: ABS is average budget share; MBS is marginal budget share. Expenditure terciles are used as proxies for the lower, middle, and upper thirds of the income distribution. They are based on total household expenditures per adult equivalent, including income in kind valued at market prices.

Table 20 Growth multipliers and decomposition of multipliers under alternative tradability assumptions for initial income shocks to tradable farm and nonfarm sectors, Dosso, Niger, 1989/90

	Tradable farm			Tradable nonfarm		
Sample subgroup	**Local**	**National**	**Regional**	**Local**	**National**	**Regional**
Overall sample						
Tradables	1.00	1.00	1.00	1.00	1.00	1.00
Farm nontradables	0.21	0.29	0.90	0.24	0.32	0.95
Nonfarm nontradables	0.56	0.67	1.44	0.60	0.72	1.51
Total multiplier	1.77	1.96	3.34	1.84	2.03	3.47
Sudano-Sahelian zone						
Tradables	1.00	1.00	1.00	1.00	1.00	1.00
Farm nontradables	0.20	0.25	0.83	0.22	0.28	0.88
Nonfarm nontradables	0.54	0.66	1.36	0.58	0.70	1.43
Total multiplier	1.73	1.91	3.18	1.80	1.98	3.31
Sudano-Guinean zone						
Tradables	1.00	1.00	1.00	1.00	1.00	1.00
Farm nontradables	0.21	0.27	1.28	0.23	0.30	1.35
Nonfarm nontradables	0.45	0.53	1.38	0.48	0.57	1.45
Total multiplier	1.65	1.80	3.67	1.72	1.87	3.81
Lower expenditure tercile						
Tradables	1.00	1.00	1.00	1.00	1.00	1.00
Farm nontradables	0.19	0.26	0.98	0.22	0.29	1.04
Nonfarm nontradables	0.65	0.76	1.58	0.70	0.81	1.66
Total multiplier	1.84	2.03	3.57	1.91	2.11	3.70
Upper expenditure tercile						
Tradables	1.00	1.00	1.00	1.00	1.00	1.00
Farm nontradables	0.25	0.34	0.82	0.27	0.37	0.87
Nonfarm nontradables	0.49	0.62	1.35	0.53	0.66	1.43
Total multiplier	1.74	1.96	3.18	1.81	2.02	3.30

Source: IFPRI/INRAN survey data, 1989/90.

In the summary of growth multipliers in Table 20, the numbers represent the total net additions to average household income in dollars that result from an initial income increase of $1.00 in the tradable farm or nonfarm sectors. The values depend on which of the mutually incompatible definitions of tradability is chosen: local, national, or regional. In keeping with the discussion in Chapter 3, the appropriate set of assumptions is embodied in the definition using the national level of tradability. "Local" and "regional" results are offered primarily to show the sensitivity of results to the set of assumptions chosen, particularly elasticity of supply. Sources of economic growth can be decomposed and attributed to new spending on demand-constrained, nontradable goods and services (including new intermediate demands) in either the farm or the nonfarm sector.

For example, the second set of four numbers in the first column in the upper lefthand corner of Table 20 (the Sudano-Sahelian Zone) should be interpreted as follows: assuming local tradability, a $1.00 increase in household incomes from an outside event affecting tradables will lead to $0.20 of additional income from spending on

farm nontradables, and to $0.54 of additional income from spending on nonfarm nontradables. Thus, the total multiplier is 1.73, and the net extra growth from spending on demand-constrained items (that is, from growth linkages) is $0.73.

Elastic supply of the nontradable items demanded is a reasonable assumption for the study zones, although less so in a few specific cases. Milk, for example, might be a case where the relative price would need to increase substantially and to stay high over a considerable period of time in rural Niger before producers would find a way of meeting increased demand through increased production.

Six points emerge from Table 20. First, regardless of the tradability assumption used, multipliers for Niger—as for the other countries—are larger than previous African linkage studies have shown. The national reference market definition yields a multiplier of 1.96.

Second, linkages with the nonfarm economy appear stronger than previous studies suggest, and in fact stronger than other countries in the present study. For western Niger overall, the additional income generated in the nonfarm sector is 2 to 2.5 times that of the farm sector. The additional income accruing to the nonfarm sector from a $1.00 shock to the farm tradables sector is $0.54, while that to the farm nontradables sector is only $0.20. Thus, of the $0.73 of indirect gain, 74 percent is generated in the nonfarm economy. Third, in western Niger, multipliers are larger for the poorest one-third of households than for the richest one-third (5 percent larger using the national definition).

Fourth, farm-nonfarm linkages appear to be stronger for poorer households: income increments to lower-income households stimulate the nonfarm sector more than income shocks to the upper-income households. A $1.00 increase in income from farm tradables for lower income households generates $0.76 of additional income in the nonfarm sector, versus only $0.62 for upper-income households. This result is driven by the fact that the poor spend $0.35 of each additional dollar on nonfarm nontradables, as opposed to $0.26 spent by the rich (Table 19). The richest one-third of households spend $0.33 of each additional $1.00 on nonfarm tradables, while the poor spend only $0.17. The consumption preference of the rich for tradable items represents a leakage from the local rural economy from the standpoint of net income generation.

Fifth, the size of the multiplier is driven largely by the consumption spending patterns of rural households. Consumption linkages account for 79 percent of multipliers in Niger. Sixth, multipliers for increased income in the nonfarm tradables sector, as would be the case if Niger exported rural handicrafts, are of the same order of magnitude as those for increments to income in the farm sector. The multipliers from stimulating farm or nonfarm income are not significantly different. However, the ability to promote sustained growth in the tradables sector, which is essential to jump-starting sustained growth overall, will depend on the comparative advantage of farm tradables versus nonfarm tradables, an issue not investigated in this report.

Conclusions and Policy Implications

Two strategic questions are addressed in this chapter. First, what should the thrust of policy be in order to maximize and sustain economic growth made possible by policy reforms that promote farm tradables in rural areas? Second, what policies can promote the development of nonfarm incomes and employment in western Niger, thereby alleviating some of the pressure on a fragile natural resource base to supply livelihoods from farming? There are five sets of conclusions of direct relevance to these two questions.

First, the consistently high farm multipliers under different assumptions (zone, tradability, and income group) suggest that rural demand-led growth is feasible under the variety of alternative hypotheses about supply and demand constraints embodied in the three alternative sets of assumptions about tradability. A considerable amount of extra growth can be achieved by boosting rural incomes, stimulating demand for nontradable goods, and bringing underemployed resources into production. In most cases the additional growth from linkages to the nontradables sector was at least as large as the initial income stimulus from the tradables sector.

Second, development strategies that boost rural incomes broadly, by putting money in the hands of many rural consumers, will have a large overall impact on growth, especially compared to policies that put money in the hands of a few large producers. The analysis indicates that 79 percent of additional growth from spending new income from tradables on demand-constrained items (that is, growth linkages) is attributable to consumption demand, and only 21 percent to intermediate demands for nontradable inputs used in production. The conclusion is that widespread stimulus to demand-constrained sectors will be primarily from the consumption side.

This insight is further supported by the multiplier analysis by income tercile, which shows that income in the hands of the poorest third of households stimulates more overall growth (has a higher multiplier), and more growth in the nonfarm sector (more of the multiplier comes from the nonfarm sector), than is the case for the richest one-third of households.

Third, the research shows that increases in farm income are an efficient way to stimulate growth in the rural nonfarm sector. Increases in cash crop or livestock incomes, for example, will lead to at least as much growth again in things like transportation services, processed food items, local handicrafts, and local nontradable foods. Two-thirds of the additional growth from an initial income stimulus is in the nonfarm sector.

Alternatives for promoting rural nonfarm employment are unlikely to achieve sustained or widespread success. The nonfarm tradables sector is not negligible, with an ABS of 20 percent and an MBS of 25 percent (assuming national tradability). Yet, few areas in the study zone appear to have a comparative advantage in exporting nonfarm items; a few niche activities such as processed foods, salt extraction, and woven mats cannot provide a widespread boost to income. Most nonfarm tradables consumed in the zone are importables (clothing, kitchen utensils, assorted other consumer du-

rables, fuel, toiletries, and other nondurables). Policies directed specifically toward producing these items locally are likely to fail.

However, nontradable nonfarm items, such as services, some processed foods, and local utensils and furniture, account for 47 percent of incremental household spending. These items cannot be competitively imported to the zone (or exported from it); stimulating widespread local demand for them will lead to widespread local growth in these activities, provided barriers to entry do not prevent local people from expanding production.

The conclusion is fundamental: finding a way to boost rural household incomes broadly and in a sustained fashion (that is, automatically, year after year) is the way to stimulate growth in nonfarm employment. Direct support to nontradable, nonfarm enterprises, in the absence of a sustained market for the product driven by another income source, cannot create growth in this sector. Since most viable nonfarm production activities are nontradables, they should be approached first on the demand side and then on the supply side.

Fourth, nonfarm linkages will amplify rural growth, but only the tradable (supply-constrained) sectors can serve as the stimulus. Which tradable activities to promote on the supply side is primarily a matter of comparative advantage. Although not explored in this study, the need for widespread income growth points to the farm tradables sector. Livestock, hides, onions, and pulses, for example, are the only exports widely produced in the study zones at present. To stimulate growth in the nontradables sector, new income must be continually infused from outside the zone, and attention must be paid to improving the elasticity of supply of the items demanded.

Calculations of returns to promoting the supply side of tradable activities should take into account not only the direct, but also the indirect benefits from linkages-induced growth. As the results indicate, these may be at least as large as the direct benefits themselves. Interventions on the supply side would include agricultural research, extension, and infrastructure.

Fifth, rural growth strategies also require enhancement of the supply-responsiveness of the goods and services demanded as rural incomes rise. Increases in local demand for tradables are (somewhat heroically, in the case of Niger) assumed to be automatically met by increased imports (or reduced exports) of the item in question, at a price determined by markets outside the zone of analysis. Increases in local demand for nontradables, the driving force of linkages, only serve to boost local incomes if they are translated directly into increased local production of the items in question.

Policy plays a big role both in ensuring that newly demanded tradables are in fact freely available in local markets, through lowering costs of distribution, and in directly facilitating the supply-response of local production of nontradables. Commodity groups with high MBSs such as millet and sorghum, milk, and meat, require particular attention. Since 13 percent of incremental income in rural areas is spent on livestock products, increased attention should be focused on the livestock sector to enable it to meet both growing domestic demand as incomes rise and export opportunities, as devaluation of the CFA makes the sector more competitive.

Government should pay particular attention to maize, an importable. Widespread income growth in rural Niger would put considerable pressure on local grain supplies, as shown by the high MBS for coarse grains. In zones such as the Sudano-Sahel, income growth will lead to demand for maize imports, at the same time that Niger's recent devaluation will make maize imports considerably more expensive. The resulting upward pressure on prices will stimulate local coarse grain production further. Unless the local supply of these grains is elastic, their price will rise relative to exportables, cutting into the profitability of the latter.

CHAPTER 6

The Senegalese Groundnut Basin

This chapter examines sources of farm-nonfarm linkages in Senegal's Groundnut Basin, a highly commercialized cash-cropping zone with relatively good transport and commercial infrastructure by West African standards. Since the early 1980s, groundnut production—which represents the bulk of the Senegalese farm tradables sector—has stagnated. Both area planted and aggregate production have declined for a number of reasons. Structural adjustment reduced subsidized input distribution and credit programs, making it difficult for farmers to obtain groundnut seed and fertilizer. The agricultural policy by the government undertaken in the mid-1980s also shifted agricultural investment from the rainfed Groundnut Basin to the newly developed irrigated zones in the Senegal River basin. This reduced both absolute and relative investment in extension and research for rainfed crops, particularly groundnuts (an exportable) and millet (a major food staple). Higher priorities were given to rice (a major importable) and maize. The full implications of these policies for overall growth in the Groundnut Basin cannot be fully understood without examining the production and consumption linkages between the groundnut sector and the rest of the rural economy.

Description of the Study Zones, Data, and Sample

Study Zones

The southeastern and central parts of the Groundnut Basin were selected because they have different agroclimatic and infrastructural endowments. The central part of the Groundnut Basin is characterized by lower and more variable rainfall, a shorter growing season, and sandier, less fertile soils than the southeastern part of the basin. The center is also more densely populated and is served by more developed commercial and transport infrastructure than the southeast (Table 21). Differences in population density and infrastructure are the result of the introduction of groundnut production in the center several decades before it became popular in the southeast. Although, infrastructure is less well developed in the southeast, there is substantial extralegal trade across the nearby Senegambian border.

Table 21 Zone characteristics, southeastern and central Groundnut Basin, Senegal, 1989/90

Characteristic	Southeastern Groundnut Basin	Central Groundnut Basin
Rural population	144,229	958,819
Population density (per square kilometer)		
Rural only	31	52
Rural and urban	32	67
Percent of rural population in market villages	15	17
Long-term range of rainfall (millimeters per year)	700–1,000	500–700
Length of rainy season (months)	6	4–5
Soil quality	Rocky plateau, some clay	Sandy, ferric, and leached
Vegetation	Densely wooded savanna	Sparsely wooded savanna

Source: Kelly et al. 1993, using ISRA/IFPRI survey data, 1989/90.

Principal crops in both zones are millet and groundnuts. In addition, secondary crops requiring a longer rainy season such as maize, sorghum, and cotton are also grown in the southeast. Animal husbandry is important in both zones. In the central basin, household livestock holdings are fewer and are predominantly small ruminants. Cattle ownership is more common in the southeast, where pasture is more abundant (see Tables 22 and 23). The study zone is part of the expansion area of the classic Senegalese Groundnut Basin—the latter dating back to the nineteenth century—where commercialized smallholder groundnut cultivation was introduced before the Second World War, and particular progress was made during the expansion of cash cropping in the 1960s.

Data

Data analyzed for each zone cover one full year.[15] The data are a subset of data collected for the IFPRI/ISRA study, "Consumption and Supply Impacts of Agricultural Price Policies in the Groundnut Basin and Senegal Oriental" (Kelly et al. 1993). The three villages covered in each zone were purposely selected to be representative of the zone and to include one market village.[16] Households were selected randomly from all households in each village. The sample for the present work covered 34 households in the central Groundnut Basin and 35 households in the southeastern Groundnut Basin.

The IFPRI/ISRA data set contains demographic, expenditure, and income data. Fortnightly interviews provided a 24-hour recall on food consumption and expendi-

[15] Because of problems with missing data, the periods covered are not identical for each zone. The southeastern data set covers October 1, 1989 through September 30, 1990, while the data for the center covers April 1989 through March 1990.

[16] Households in market villages were intentionally oversampled to permit better analysis of the impact that infrastructure has on production and consumption behavior. Sample averages are weighted to correct for oversampling, and dummy variables in the regression analyses capture the infrastructure effect.

Table 22 Sample household characteristics, southeastern Groundnut Basin, Senegal, 1989/90

Characteristic	Overall sample	Sample means (n = 35)		
		Poorest third	Richest third	Market village
Persons per household	13.60	18.03	10.95	11.29
	(9.65)	(15.68)	(3.46)	(4.71)
Share of females ≥ 15 years in the household	0.28	0.20	0.31	0.31
	(0.09)	(0.06)	(0.10)	(0.10)
Share of males ≥ 15 years in the household	0.23	0.25	0.24	0.24
	(0.09)	(0.12)	(0.08)	(0.07)
Share of females ≥ 5 and < 15 years in the household	0.14	0.14	0.16	0.13
	(0.09)	(0.10)	(0.09)	(0.11)
Share of males ≥ 5 and < 15 years in the household	0.12	0.18	0.04	0.10
	(0.14)	(0.19	(0.06)	(0.13)
Share of children < 5 years in the household	0.23	0.23	0.25	0.23
	(0.12)	(0.14)	(0.09)	(0.10)
Age of household head	41.66	44.45	41.50	39.92
	(12.51)	(18.00)	(8.42)	(7.23)
Hectares of land cultivated	12.21	13.84	9.73	9.40
	(8.19)	(11.15)	(4.86)	(6.54)
Amount of agricultural production loans and food loans received (FCFA)	11,028	13,267	7,492	6,445
	(13,348)	(16,254)	(12,083)	(9,276)
Noncrop income per capita[a]	1,639	767	2,187	2,347
	(1,369)	(642)	(1,416)	(1,538)
Number of cattle owned	3.26	1.45	5.75	5.50
	(6.46)	(3.70)	(9.36)	(9.58)
Share of Wolof households	0.91	1.00	0.83	1.00
	(0.28)	(0)	(0.39)	(0)
Share of sample households in market villages	0.34	0.09	0.58	1.00
	(0.48)	(0.30)	(0.51)	(0)
Annual household expenditure per capita (FCFA)[b]	41,248	29,670	52,668	45,906
	(11,026)	(6,250)	(5,784)	(7,884)

Source: IFPRI/ISRA survey data, 1989/90.

Notes: Income terciles are based on annual household expenditure per capita. The overall sample average is weighted to adjust for oversampling in market villages. Standard deviations are in parentheses.

[a]Noncrop income was earned during the harvest year October 1, 1988–September 30, 1989.

[b]Data cover harvest year October 1, 1989–September 30, 1990.

ture and a 15-day recall on nonfarm product purchases, crop production activities, and nonfarm income. Monthly interviews provided a full 30- to 31-day recall for less frequent nonfood expenditures, livestock transactions, and most nonfarm income data. Data on frequent, repetitive purchases (cigarettes, cola nuts, and condiments, for example) were collected using a quarterly 15-day recall.[17]

[17] For more details on survey methods see Fall, Kelly, and Reardon 1989.

Table 23 Sample household characteristics, central Groundnut Basin, Senegal, 1989/90

Characteristic	Overall sample	Sample means (n = 34)		
		Poorest third	Richest third	Market village
Persons per household	11.28	10.54	10.27	12.05
	(5.60)	(4.79)	(6.16)	(6.87)
Share of females ≥ 15 years in the household	0.41	0.40	0.46	0.38
	(0.12)	(0.11)	(0.13)	(0.12)
Share of males ≥ 15 years in the household	0.36	0.42	0.43	0.45
	(0.16)	(0.17)	(0.17)	(0.14)
Share of females ≥ 5 and < 15 years in the household	0.12	0.16	0.13	0.10
	(0.12)	(0.11)	(0.11)	(0.09)
Share of males ≥ 5 and < 15 years in the household	0.19	0.17	0.19	0.21
	(0.13)	(0.17)	(0.12)	(0.14)
Share of children < 5 years in the household	0.19	0.19	0.21	0.21
	(0.13)	(0.16)	(0.09)	(0.14)
Age of household head	40.29	50.73	48.18	51.82
	(12.43)	(11.34)	(11.36)	(12.31)
Hectares of land cultivated	9.78	7.39	11.67	8.47
	(8.96)	(2.87)	(13.23)	(8.11)
Amount of agricultural production and food credit received (FCFA)	19,705	19,895	19,855	22,105
	(23,581)	(20,225)	(28,475)	(32,835)
Noncrop income per capita[a]	1,823	607	3,535	3,528
	(3,337)	(389)	(5,579)	(5,443)
Number of cattle owned	1.15	0	0	1.27
	(4.07)	(0)	(0)	(2.83)
Share of Wolof households	0.79	0.64	1	0.91
	(0.41)	(0.50)	(0)	(0.30)
Share of sample households in market villages	0.32	0.09	0.45	1
	(0.47)	(0.30)	(0.52)	(0)
Annual household expenditure per capita (FCFA)[b]	49,044	33,086	70,111	61,025
	(21,648)	(5,179)	(26,366)	(31,100)

Source: IFPRI/ISRA survey data, 1989/90.

Notes: The poorest third and richest third of households are the lower and upper income terciles based on annual household expenditures per adult equivalent, including income in kind. The overall sample average is weighted to adjust for oversampling in market villages. Standard deviations are in parentheses.

[a]Noncrop income was earned during the harvest year October 1, 1988–September 30, 1989.

[b]Data cover harvest year April 1, 1989–March 31, 1990.

Characteristics of Sample Households

Tables 22 and 23 present summary statistics of the structural characteristics of households. As will be discussed later, a set of these variables is used to estimate the Engel functions for each zone, as described in Chapter 3. The tables present average values for each zone. Also shown are averages for three subsets of each zone to illustrate variability associated with income group and proximity to market infrastructure. Total expenditure per capita is used to rank households into income categories.

Household size is larger in the southeast (14 people per household on average) than in the center (11 people per household). Farms in the southeastern Groundnut Basin cultivate more land (12 hectares versus 10) but land cultivated per capita is just under 1 hectare in both zones.

Average annual consumption expenditures are approximately 41,000 FCFA per capita in the southeast and 49,000 FCFA in the center. Average expenditures in market villages are higher than sample averages in both zones (46,000 and 61,000 FCFA respectively). Average expenditures by the wealthiest third of sample households (53,000 FCFA in the southeast and 70,000 FCFA in the center) are substantially greater than those of the poorest third of households (30,000 and 33,000 FCFA, respectively). Livestock holdings and credit received by households for food and farm inputs are extremely variable; standard deviations are consistently larger than mean values, but care must be taken in making generalizations in view of the small sample. Standard deviations are also larger than means for noncropping income per capita in the central Groundnut Basin; in the southeast they are slightly smaller than mean values.

Characteristics of Farming Systems and Agricultural Markets

Agricultural production in the Groundnut Basin has strong backward linkages through demand for groundnut seed, animal traction services, and hired labor. Since the 1980 collapse of the government-financed input distribution and credit program, use of fertilizer, fungicides, and insecticides is much more limited than previously.[18] The absence of credit has severely limited purchases of new traction equipment but probably increased demand for equipment repairs made by local blacksmiths. Although low demand for chemical inputs and new equipment may be constraining aggregate output, low demand for imported inputs means that groundnut production has smaller leakages than other Sahelian cash crops that require large amounts of fertilizer and pesticides (cotton and irrigated rice, for example).

Forward production linkages are also important. Most cereal processing is still performed manually by members of the household. Home processing is not counted as an expenditure because data to value the services were not available. Inclusion of home processing "expenditures" would, however, increase the forward production linkages considerably. Liberalization of cereal markets in the mid-1980s made it possible for private individuals to assemble and market cereals; several sample households earn nonfarm income from cereal marketing.

Marketing and processing of cash crops (groundnuts and cotton) continue to be government controlled. The groundnut marketing structure licenses a limited number of private traders to purchase groundnuts at the farmgate and transfer them to Senegalese processing facilities. Groundnut marketing provides local households with some

[18] For example, in 1989/90 sample households used no fertilizer on groundnut crops and fewer than 5 percent used fertilizer on cereal crops.

opportunities for nonfarm wage income, but restrictions on local processing of groundnuts severely limits the potential for forward linkages to be realized locally.

Household Expenditure Patterns

Table 24 presents the average annual expenditures per capita by zone for nine categories of goods and services. Differences across zones are not large, but the lower-income central zone spends a larger share of income on food (78 percent versus 72 percent), while the higher-income southeastern zone spends a larger share on nonfood products, particularly manufactured final goods. The composition of cereal expenditures (not shown in this table), differs substantially across the samples from the two zones, with the center spending 15 percent on imported rice, while the southeast spends only 4 percent.

Of the three definitions of tradability discussed in Chapter 3—local, national, and regional—the results here are again obtained using the national definition. National estimates are compared with local and regional estimates only when the sensitivity of results to the different assumptions underlying the various definitions of tradability is considered. And each good and service is also categorized by production sector (farm and nonfarm), permitting assessment of the extent to which the sector receiving the exogenous increase in income influences the size of the multiplier. The classification of goods and services is presented in detail in Table 25.

The local catchment area covers the geographic space within a 100-kilometer radius of the three sample villages representing each zone. Because market and road infrastructure are relatively well developed in the Groundnut Basin, most farm goods at the local level are tradables. The proximity of the southeastern Groundnut Basin to the Gambian border and the porous nature of the border make it difficult to distinguish between goods of Gambian versus Senegalese origin; thus, the national catchment area

Table 24 Average annual per capita expenditure by product, southeastern and central Groundnut Basin, Senegal, 1989/90

Product group	Southeastern Groundnut Basin		Central Groundnut Basin	
	(FCFA)	(percent)	(FCFA)	(percent)
Cereals	13,694	33.2	17,802	36.3
Processed foods	9,281	22.5	13,046	26.6
Meat, fish, and dairy	2,681	6.5	4,071	8.3
Pulses	2,392	5.8	2,354	4.8
Fruits and vegetables	1,815	4.4	1,128	2.3
Total food	29,863	72.4	38,401	78.3
Manufactured final goods	8,786	21.3	8,190	16.7
Handicrafts	1,402	3.4	883	1.8
Energy	908	2.2	785	1.6
Service	289	0.7	785	1.6
Total nonfood	11,385	27.6	10,643	21.7
Total current expenditure	41,248	100	49,044	100

Source: IFPRI/ISRA survey data, 1989/90.

Note: The year ran from October to September in the southeast and from April to March in the central basin.

Table 25 Classification of goods into farm and nonfarm and tradable (T) and nontradable (NT) categories, southeastern and central Groundnut Basin, Senegal, 1989/90

Item	Local	National	Regional
Farm goods			
Imported starches (rice and wheat)	T	T	T
Other starches (*fonio* and tubers)[a]	T	NT	NT
Coarse grains[a]	T	NT	NT
Pulses			
Groundnuts	T	T	T
Cowpeas[b]	T	T	NT
Locally processed meat and fish[b]	T	T	NT
Livestock[b]	T	T	NT
Fresh meat, fish, milk, and eggs	NT	NT	NT
Fruits and vegetables			
Tomato, cabbage, eggplant, carrot, and other[a]	T	NT	NT
Pepper, onion, mango, gumbo, spices, leaves, and sorrel	NT	NT	NT
Nonfarm goods			
Other foods, drinks, and tobacco			
Cola nuts and regional spices[b]	T	T	NT
Vinegar, soft drinks, and herbal drinks[a]	T	NT	NT
Cigarettes, processed milk, coffee, tea, salt, sugar, processed spices, and vegetable oil	T	T	T
Ice, groundnut butter and cake, processed grain, snack foods, and local spices	NT	NT	NT
Nonfood goods and services			
Imported manufactures			
Medicines, toiletries, housewares, furniture, cloth, clothing, linens, cleaning supplies, stoves, spare parts, electronics, jewelry	T	T	T
Senegalese manufactures			
Matches, furniture, soap, bleach, batteries, cloth, and clothing[a]	T	NT	NT
Local manufactures and handicrafts			
Housewares, jewelry, pottery, medicines, furniture, and basketwork	NT	NT	NT
Energy			
Wood, charcoal	NT	NT	NT
Gas, gasoline, kerosene, and oil	T	T	T
Services			
School, medical, tailor, laborers, hairdressing, transport, and so forth	NT	NT	NT

Source: Authors' classification based on IFPRI/ISRA survey data, 1989/90.
[a]Items change from tradable at the local level to nontradable at the national level.
[b]Items change from tradable at the national level to nontradable at the regional level.

includes both Senegal and the Gambia. Tradables at the national level are defined as all goods imported to or exported from the Senegal-Gambia region.

Moving from the local to the national catchment area assumptions, the major change in the classification of the goods is the movement to nontradables (and thus the demand-constrained group), of coarse grains, *fonio*, tubers, some vegetables, some

processed food and drink, and some Senegalese manufactures (items identified by the *a* superscript in Table 25).

The regional catchment area includes Senegal and all contiguous countries plus Côte d'Ivoire.[19] The major change in moving from the national to the regional catchment area is the reclassification as nontradable of cowpeas, processed meat and fish, livestock, and some processed foods (items identified by the superscript *b* in the table).

Multiplier Model Parameters

Consumption coefficients

MBSs are estimated using the modified Working-Leser model, as outlined in Chapter 3. After numerous attempts to use the same set of explanatory variables for the two zones, running both individual and pooled models, it was decided that better estimates could be obtained by using slightly different specifications for each zone. Explanatory variables common to both zones are per capita expenditure, household population, cultivated area in hectares, and the dummy variable for market village.

The market village dummy is highly significant (positive for tradables and negative for nontradables) in the models for farm products in the center zone but not at all significant in the southeast. The household population variable is most often significant for the nonfarm sectors and goods. Total expenditure is only significant for nonfarm tradables in the center, probably because of a high degree of multicollinearity between the per capita expenditure variable and other variables. Farm size is a significant explanatory variable for farm tradables in the southeast and for nonfarm nontradables in the center.

In the central zone, the model includes the share in household population of adult females 15 years or older, the share of adult males 15 years or older, the share of females between the ages of 5 and 15, and the share of all children less than 5 years of age. For the southeast, these disaggregated variables posed greater problems of multicollinearity than they did in the center. Therefore, more aggregated demographic variables—the share of all females 5 years of age or older and the share of all males 5 years of age or older—are used to specify household age and gender composition.

The shares of adult women and of children under five years are significant explanatory variables for farm tradables and nontradables in the center (more women means more farm tradables, particularly imported cereals). This is contrary to expectations, since having more women provides more labor for processing coarse grains, reducing the need for imported rice. The household composition variables are not significant in the model for the southeast. Two other variables—noncropping income per capita and the number of beef cattle—are used in the southeast; their inclusion in the model for this zone improved model fit and the significance of parameters. Conversely, in the center, including the age of the household head and the household's

[19] The countries contiguous to Senegal are Guinea Bissau, Guinea Conakry, Mali, and Mauritania. The Côte d'Ivoire, although not a contiguous country to Senegal, is also included in the regional catchment area because high volumes of cola nuts and fruits are traded between the two.

ethnic group as explanatory variables improved the model's fit and the significance of the parameters.[20] Mean values and standard deviations for the explanatory variables are reported in Tables 22 and 23.

Regression fits are generally satisfactory for the four sector-level models (tradables and nontradables, and farm and nonfarm, permuted) with adjusted R squares in the 0.6 to 0.7 range for the center and the 0.4 to 0.7 range for the southeast. Goodness-of-fit for the national level models is generally better than those for the local and regional models. Regression models were also run for the 20 more disaggregated goods categories shown in Table 25. The models for products comprising a significant share of expenditure in all households (cereals, for example) had good statistical properties; models for goods that represent a zero level of expenditure for many households (energy, for example) had poor statistical properties.

Production and Savings Coefficients

Table 26 provides a list of the value added, intermediate deliveries, and savings parameters used in the multiplier model for each zone. Given that these parameters do not vary substantially when definitions of tradability change, one set of estimates based on the national definition of tradability is used for all three catchment areas.

Table 26 Technological coefficients and savings ratio used to calculate growth multipliers in southeastern and central Groundnut Basin, Senegal, 1989/90

Sector	Farm tradables	Farm nontradables	Nonfarm tradables	Nonfarm nontradables
Southeastern Groundnut Basin				
Intermediate deliveries from nontradable sectors				
Farm	0.28	0.03	0.01	0.03
Nonfarm	0.09	0.07	0.10	0.20
Value-added/gross output	0.63	0.89	0.49	0.69
Central Groundnut Basin				
Intermediate deliveries from nontradable sectors				
Farm	0.40	0.05	0.01	0.03
Nonfarm	0.03	0.04	0.10	0.20
Value-added / gross output	0.57	0.94	0.49	0.69

Sources: See text for derivations; data are from the IFPRI/ISRA surveys, 1989; Martin 1988; and Chapter 4.
Notes: Values in the table are estimated using the national definition of tradability; the same values are used for multiplier estimates in all catchment areas. The savings ratio is 0.06 in both basins.

[20] There are several plausible explanations for some variables working in one zone but not in another. In the southeast, the sample households are almost entirely Wolof, which reduces the value of an ethnicity variable. Also more cattle are owned, and there is more variability in levels of ownership across households than in the center. The noncropping income variable is only available for a full harvest year (October 1 through September 30); this period does not correspond with the period covered by the data for the center zone (April 1 through March 31).

Intermediate deliveries of hired labor and other purchased inputs to the farm tradables sector (groundnuts) and to the farm nontradables sector (coarse grains) are estimated using IFPRI/ISRA labor data and depreciation costs for traction equipment reported in Martin 1988. A high seeding ratio and cost of groundnut seed account for the large coefficients or intermediate deliveries from farm nontradables to farm tradables. The coefficients for intermediate deliveries from the nonfarm nontradables sector to the farm sector are lower, and they represent use of hired labor and depreciation on animal traction equipment. Use of animal traction is ubiquitous in the Groundnut Basin and causes the intermediate deliveries coefficients from nonfarm to farm to be higher for Senegal than for other countries where animal traction is less common.

Coefficients for the four other categories of intermediate deliveries and the savings ratio are taken from the Burkina Faso analysis presented in Chapter 4. These intermediate delivery coefficients are generally small. And as the sensitivity analysis conducted in Chapter 4 showed, they are unlikely to influence multiplier results strongly, particularly for the nonfarm sector, which also has low value-added shares. The 6 percent savings rate is considered a reasonable estimate of savings for West Africa in general; it is used here as it is in the other two West African cases.

Marginal Budget Shares and Implications for Growth Multipliers

Results for the Overall Sample, by Zone

The MBSs in Tables 27 and 28 show, for each definition of tradability, the share of an additional dollar of income spent on selected tradable and nontradable goods by sample households. The discussion in this section concentrates on results obtained using the national definition of tradability and concludes with some general observations about the sensitivity of the results to changes in assumptions about the elasticity of supply embodied in the different levels of tradability.

The most striking result is the relatively large MBS for tradables (0.65 in the southeast and 0.68 in the center) versus the relatively small share for nontradables (0.35 in the southeast and 0.32 in the center). Of the four countries covered in this study, Senegal has the smallest marginal expenditures on nontradable consumption goods and, therefore, the least potential to realize indirect growth by relieving demand constraints.[21]

The smaller consumption expenditures on nontradables, compared with other countries are explained by the openness of the Senegalese economy. Households in the central Groundnut Basin have high MBSs for imported rice (16 percent) and for nonfarm tradables such as housewares, textiles, clothing, and processed foods (17 percent). The local handicraft sector appears to be less well developed in Senegal than in

[21] In Burkina Faso, Niger, and Zambia, the MBSs for nontradables were found to be 0.67, 0.47 and 0.67, respectively.

Table 27 Average and marginal budget shares by definition of tradability, southeastern Groundnut Basin, Senegal, 1989/90

Item	Local		National		Regional	
	ABS	MBS	ABS	MBS	ABS	MBS
			(percent)			
Tradables	88.9	87.1	49.8	65.3	34.5	55.6
Farm	45.1	22.6	14.6	12.3	8.5	5.9
Imported starches	3.9	6.0	3.9	6.0	3.9	6.0
Coarse grains	29.3	9.0	0	0	0	0
Pulses	5.8	0.8	5.8	0.8	4.6	–0.1
Preserved meats and livestock	4.9	5.5	4.9	5.5	0	0
Fruits and vegetables	1.2	1.3	0	0	0	0
Nonfarm	43.8	64.5	35.2	53.0	26.0	44.7
Processed foods	21.2	28.0	21.2	28.0	12.0	19.7
Manufactured final goods	20.4	33.6	11.8	22.1	11.8	22.1
Energy	2.2	2.9	2.2	2.9	2.2	2.9
Nontradables	11.1	12.9	50.2	34.7	65.5	49.4
Farm	4.8	0.1	35.4	10.4	40.3	15.9
Starches	0	0	29.3	9.0	29.3	9.0
Fruits and vegetables	3.2	0.4	4.4	1.7	4.4	1.7
Meats, milk, and fresh fish	1.6	–0.3	1.6	–0.3	6.6	5.2
Nonfarm	6.3	12.8	14.9	24.3	25.2	33.5
Services	0.7	1.3	0.7	1.3	0.7	1.3
Handicrafts	3.4	9.4	4.7	14.4	4.7	14.4
Processed foods	1.3	4.0	1.3	4.0	11.6	13.2
Manufactured final goods	0.9	–1.9	8.2	4.6	8.2	4.6
Energy	0	0	0	0	0	0

Source: Estimated from IFPRI/ISRA survey data, 1989. See Table 25 for the commodity composition of each group.

Notes: ABS is average budget shares; MBS is marginal budget shares.

some of the other countries in the Sahel, perhaps because households have easier access to inexpensive imported products or ones manufactured in Dakar.

It is probable that the introduction of groundnuts as a cash crop in the late 1800s was the initial stimulus for the more open Senegalese economy. When the French introduced Senegalese farmers to groundnut production, they also made imported rice available so that food security was ensured for households moving into cash crops. Rice has since become one of the principal cereals consumed in Senegal and is growing in importance even in zones with adequate coarse-grain production. Early groundnut traders also introduced other imports (textiles and housewares, for example) which they traded for groundnuts or sold to farmers on credit, thereby capturing rights to the farmer's groundnut harvest (Amin 1969). This hundred-year history of cash cropping and imported consumer goods may have stunted growth in the local manufacturing sector by reducing both the demand for and the supply of handcrafted nonfarm products (see Hymer and Resnick 1969).

Although overall marginal expenditure on nontradables is similar across zones, the relative importance of certain nontradable goods in marginal spending differs. In general, a larger share of incremental income goes to nonfarm products such as

Table 28 Average and marginal budget shares, by definition of tradability, central Groundnut Basin, Senegal, 1989/90

Item	Local		National		Regional	
	ABS	MBS	ABS	MBS	ABS	MBS
			(percent)			
Tradables	87.8	85.1	59.5	68.1	51.6	52.7
Farm	45.7	36.1	23.6	25.3	18.1	14.6
Imported starches	15.3	15.7	14.4	12.9	14.4	12.9
Coarse grains	20.8	7.5	0	0	0	0
Other starches	0.2	–0.1	0	0	0	0
Pulses	4.8	1.6	4.8	1.6	3.7	1.7
Preserved meats and livestock	4.4	10.8	4.4	10.8	0	0
Fruits and vegetables	0.2	0.6	0	0	0	0
Nonfarm	42.1	49.0	35.9	42.8	33.5	38.1
Processed foods	25.3	21.2	25.3	21.2	22.9	16.7
Manufactured final goods	15.5	27.5	9.3	21.3	9.3	21.1
Energy	1.3	0.3	1.3	0.3	1.3	0.3
Nontradables	11.2	14.9	40.5	31.9	48.4	47.3
Farm	5.0	3.7	28.1	14.6	32.5	25.4
Starches	0	0	21.9	10.2	21.9	10.2
Fruits and vegetables	2.1	1.8	2.3	2.5	2.3	2.5
Meats, milk, and fresh fish	3.9	1.9	3.9	1.9	8.3	12.7
Nonfarm	6.2	11.2	12.4	17.3	15.9	21.9
Services	1.6	0.2	1.6	0.2	1.6	0.2
Handicrafts	1.8	7.0	1.8	7.1	1.8	7.1
Processed foods	1.3	1.3	1.4	1.3	4.9	5.7
Manufactured final goods	1.2	2.0	7.3	8.0	7.3	8.2
Energy	0.3	0.7	0.3	0.7	0.3	0.7

Source: Estimated from IFPRI/ISRA survey data, 1989/90. See Table 25 for the commodity composition of each group.

Notes: ABS is average budget shares; MBS is marginal budget shares.

handicrafts and processed food in the southeast, while the center spends more on farm products such as fruits, vegetables, meat, and fish. However, the center still spends slightly more on nonfarm nontradables than farm nontradables. The center may spend more on basic foods that are farm products because average incomes are lower than in the southeast. The center also spends more of its incremental income on manufactured final goods than the southeast. This can be explained by its proximity to Dakar: center households can easily purchase nontradable goods manufactured there in lieu of local handicrafts.

Understanding the differences across zones is important. Once demand constraints are removed, elastic supplies of the most-wanted goods will help maximize growth. The increased demand for nonfarm products in the southeast should not be difficult to meet because the products tend to be produced during the noncropping season when labor—the major input—can be easily mobilized. The supply of manufactured final goods produced in Dakar should also be elastic, given that urban unemployment is high. But there is a caveat: wages must not be pushed up by inflation in prices of staple foods. The MBS for nontradable local cereals is about 10 percent.

Given that the center has erratic rainfall and degraded soils, zones such as the southeast, with more productive potential for cereals, must meet the increased demand in both zones and maintain supplies to urban areas.

Influence of Markets and Income Groups on Marginal Expenditure

Tables 29 and 30 compare the expenditure patterns of the overall sample with those of three selected subgroups—the poorest third of households, the wealthiest third, and households located in market villages. Marginal spending on nontradable goods increases the size of the growth multipliers; hence, groups that have the largest marginal expenditure on nontradables receive special attention.

Table 29 Average and marginal budget shares by income group and presence of market, southeastern Groundnut Basin, Senegal, 1989/90

Catchment area and sector	Overall sample		Market village		Poorest third		Richest third	
	ABS	MBS	ABS	MBS	ABS	MBS	ABS	MBS
	(percent)							
Local								
Tradables								
Farm	45	23	42	41	51	12	39	36
Nonfarm	44	64	46	56	39	60	50	70
Total	89	87	88	97	90	72	89	106
Nontradables								
Farm	5	0	5	–3	5	10	4	–8
Nonfarm	6	13	7	6	5	16	7	2
Total	11	13	12	3	10	26	11	–6
National								
Tradables								
Farm	15	13	18	19	14	8	16	20
Nonfarm	35	53	39	43	31	59	39	42
Total	50	66	57	62	45	67	55	62
Nontradables								
Farm	35	10	29	19	42	12	27	7
Nonfarm	15	24	13	19	13	21	18	30
Total	50	34	42	38	55	33	45	37
Regional								
Tradables								
Farm	9	6	14	14	8	1	11	15
Nonfarm	26	45	31	38	21	47	32	37
Total	35	51	45	52	29	48	43	52
Nontradables								
Farm	40	16	32	24	47	19	30	13
Nonfarm	25	33	23	24	24	33	27	35
Total	65	49	55	48	71	52	57	48

Source: Estimated from IFPRI/ISRA survey data, 1989/90. See Table 25 for the commodity composition of each group.

Notes: ABS is average budget shares; MBS is marginal budget shares. The poorest third and the richest third of households are the lower and upper income terciles, based on annual household expenditures per adult equivalent, including income in kind valued at market prices.

The main analytical results for this section should be taken from the MBS for nontradables using the national definition of tradability in Tables 29 and 30. The MBS for nontradables indicates the share of incremental local income that will be spent on demand constrained goods; it is the main force determining the size of multipliers in the model. The tables also give parallel results using the local and regional definitions of tradability, to illustrate the sensitivity of results to changes in assumptions. Differences in MBSs for a given definition of tradability across zones reflect differences in consumption patterns across zones, since the same mapping of goods and services into tradability categories is used in both the center and southeast samples.

Using the preferred national definition of tradability, the richest third of households in the southeast and the poorest third of households in the center spend the most incremental income on nontradable goods. In the southeast, the difference between

Table 30 Average and marginal budget shares by income group and presence of market, central Groundnut Basin, Senegal, 1989/90

Sectors and catchment area	Overall sample		Market village		Poorest third		Richest third	
	ABS	MBS	ABS	MBS	ABS	MBS	ABS	MBS
	(percent)							
Local								
Tradables								
Farm	46	36	37	12	48	56	39	15
Nonfarm	42	49	51	80	41	28	47	68
Total	88	85	88	92	89	84	86	83
Nontradables								
Farm	6	4	6	2	6	4	6	6
Nonfarm	6	11	6	6	5	12	8	11
Total	12	15	12	8	11	16	14	17
National								
Tradables								
Farm	24	25	25	10	23	30	22	15
Nonfarm	36	43	43	71	34	24	40	59
Total	60	68	68	81	57	54	62	74
Nontradables								
Farm	28	15	19	4	32	30	23	6
Nonfarm	12	17	13	15	11	16	15	20
Total	40	32	32	19	43	46	38	26
Regional								
Tradables								
Farm	18	15	19	1	18	16	18	9
Nonfarm	34	38	37	38	32	33	37	41
Total	52	53	56	39	50	49	55	50
Nontradables								
Farm	33	25	23	13	35	43	26	12
Nonfarm	16	22	20	48	15	8	19	38
Total	49	47	43	61	50	51	45	50

Source: Estimated from IFPRI/ISRA survey data, 1989/90. See Table 25 for the commodity composition of each group.

Notes: ABS is average budget shares; MBS is marginal budget shares. The poorest third and the richest third of households are the lower and upper income terciles, based on annual household expenditures per adult equivalent, including income in kind valued at market prices.

poor and rich is not large (33 and 37 percent, respectively). The difference is more pronounced in the center, where the poor spend 46 percent of incremental income on nontradables and the rich only 26 percent. The relative position of households in market villages also differs by zone. In the center, they spend only 19 percent of incremental income on nontradables while, whereas they spend 38 percent in the southeast.

Given even a relatively small margin for statistical error, it is hard to tell from the Senegalese data whether the rich or the poor, or market villagers have a higher propensity to consume nontradables. On a more positive note, the results in Tables 29 and 30 indirectly make the point—rather strongly—that the more usual practice of assuming that virtually all goods are tradable, and thus only supply-constrained, largely assumes away the economic complexity of areas such as the central and southeastern basins. Overall, trying to account for some of this complexity through adoption of the middle ground—application of the tradability mapping under the national definition—is a distinct improvement for Senegal over making no assumptions at all.

Growth Multipliers

Estimated farm and nonfarm growth multipliers for the overall sample and the three sample subgroups are presented in Tables 31 and 32: households in market villages, households in the poorest income tercile, and households in the wealthiest income tercile. Results are reported for each of the three definitions of tradability for purposes of comparison, although the preferred national definition is offered as the correct set of assumptions.

The farm multiplier shows the amount of additional income generated by an exogenous increase in tradable farm income (increased income from improved technology for tradables or from a devaluation, for example). The nonfarm multiplier is the potential additional income generated by an exogenous increase in tradable nonfarm income if the supply of nontradables were perfectly elastic (increased income from improved groundnut processing or food-for-work programs, for example). This net new income is the result of meeting new demand for nontradable items through local production; nontradables cannot, by definition, be imported to or exported from the zone.

Using the preferred national definition of tradability, farm multipliers for the overall sample are 2.2 in the southeast and 2.5 in the center. These are significantly large multipliers, even if they are subsequently reduced by 30 percent to allow for a possibly inelastic supply of nontradables or classification of too many items as nontradables.

Using the national definition, the share of the farm growth multiplier explained by consumption expenditures is 54 percent—a smaller share than that found in other countries covered in this study. This is explained by the unusually strong farm production linkages found in Senegal. The value-added share for farm tradables in Senegal's Groundnut Basin is much lower than in other countries. The inputs that reduce value-added at the level of producer of the final product are all nontradable—groundnut seed, animal traction services, and hired labor—and thus have a strong positive impact on the size of the production multiplier (see Table 26).

Weak production links in the nonfarm sector explain the relatively large difference between the farm and the nonfarm multipliers. Production linkages in fixed-price

Table 31 Value of the regional value-added multiplier, southeastern Groundnut Basin, Senegal, 1989/90

	Local		National		Regional	
Sample	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**
Overall sample						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.42	0.03	0.63	0.19	0.81	0.33
Nonfarm	0.33	0.30	0.61	0.53	0.92	0.77
Total	1.75	1.32	2.24	1.72	2.73	2.10
Consumption	0.24	0.38	0.54	0.72	0.67	0.82
Market villages						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.37	0.99	0.82	0.14	0.99	0.47
Nonfarm	0.22	–0.76	0.54	0.67	0.73	0.62
Total	1.59	1.23	2.36	1.81	2.72	2.09
Consumption	0.03	0.13	0.58	0.75	0.67	0.82
Poorest third						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.61	0.17	0.66	0.22	0.92	0.42
Nonfarm	0.44	0.41	0.54	0.47	0.98	0.81
Total	2.05	1.58	2.20	1.69	2.90	2.23
Consumption	0.46	0.66	0.53	0.71	0.70	0.84
Richest third						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.29	0.95	0.59	0.16	0.73	0.27
Nonfarm	0.19	–0.82	0.73	0.63	0.92	0.77
Total	1.48	1.13	2.32	1.79	2.65	2.04
Consumption	–0.19	–0.54	0.57	0.75	0.88	0.81

Source: Results from the model.

Notes: Tradable represents the initial $1.00 exogenous increase to income. "Total" is the sum of the initial increase (1.00) from tradables and the additional spending in the nontradable parts of the farm and nonfarm sectors. Consumption is the proportion of the total multiplier attributable to consumption linkages. This was calculated as (total multiplier – production multiplier) / (total multiplier – 1) ×100. Production multipliers were calculated by setting marginal budget shares to zero, that is, consumption is assumed to be exogenous. These values were 1.57 for the farm and 1.20 for the nonfarm sector. Production multipliers do not vary by catchment area or subsample.

multipliers consist of the demand for nontradable inputs, including hired labor. They can be computed easily here by setting all MBSs to zero, implying the absence of consumption linkages. The remaining part of the estimated multiplier is all attributable to production linkages. Using this approach, new income generated through production linkages when the farm sector in the southeast receives an exogenous income shock of $1.00 is $0.57 while that in the nonfarm sector is only $0.20. In the center, comparable numbers are $0.77 and $0.20.

Evidence on the relative contribution to local economic growth of poor versus wealthy households is mixed. Using national definitions, the poor in the central zone have substantially larger farm multipliers (3.0 versus 2.3) than the wealthy. Conversely, in the southeast the wealthy have larger multipliers (2.3 versus 2.2), albeit only slightly so. Similarly, caution should be exercised in comparing multipliers from market villages

Table 32 Value of the regional value-added multiplier, central Groundnut Basin, Senegal, 1989/90

	Local		National		Regional	
Sample	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**	**Farm**	**Nonfarm**
Overall sample						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.77	0.08	1.05	0.27	1.46	0.54
Nonfarm	0.26	0.31	0.43	0.42	0.65	0.58
Total	2.03	1.39	2.48	1.69	3.11	2.12
Consumption	0.25	0.49	0.48	0.71	0.64	0.82
Market villages						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.73	0.05	0.78	0.09	1.21	0.38
Nonfarm	0.16	0.24	0.34	0.35	1.59	1.21
Total	1.89	1.29	2.12	1.44	3.80	2.59
Consumption	0.13	0.31	0.49	0.54	0.73	0.87
Poorest third						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.77	0.08	1.55	0.61	2.07	0.96
Nonfarm	0.28	0.32	0.51	0.48	0.30	0.40
Total	2.05	1.40	3.06	2.09	3.37	2.30
Consumption	0.27	0.50	0.62	0.82	0.68	0.85
Richest third						
Tradable	1.00	1.00	1.00	1.00	1.00	1.00
Farm	0.81	0.11	0.84	0.13	1.09	0.29
Nonfarm	0.26	0.30	0.46	0.44	1.04	0.84
Total	2.07	1.41	2.30	1.57	3.13	2.13
Consumption	0.28	0.51	0.41	0.65	0.64	0.82

Source: Results from the model.

Notes: Tradable represents the initial $1.00 exogenous increase to income. Consumption is the proportion of the multiplier attributable to consumption linkages. This was calculated as (total multiplier – production multiplier) / (total multiplier – 1) × 100. Production multipliers were calculated by setting marginal budget shares to zero, that is, consumption is assumed to be exogenous. These values were 1.77 for the farm and 1.20 for the nonfarm sector. Production multipliers do not vary by catchment area or subsamples.

to those from the overall sample. In the center, households in market villages have smaller multipliers (2.1) than the overall sample (2.5), the wealthy (2.3), and the poor (3.1), using national definitions. The smaller multiplier is due to larger marginal expenditures on imported rice and tradable nonfarm products. In the southeast, the market has a positive influence on national multipliers, making them slightly larger (2.4) than those for the overall sample (2.2), the poor (2.2), and the wealthy (2.3). It is primarily expenditures on farm nontradables (coarse grains, meat, milk, fruits, and vegetables) that account for the larger multiplier in southeastern market villages.

Policy Implications and Conclusions

The Senegalese Groundnut Basin, a traditional cash crop zone, witnessed a rapid expansion of export cropping in the 1960s, was the focus of considerable policy attention

through parastatals to maintain momentum in the 1970s, and fell on relatively hard times in the 1980s. A 50 percent devaluation of the FCFA in January 1994 created the conditions for groundnut producers to benefit from a major exogenous income shock. Kelly et al. (1995) estimate that households in the central and southeastern Groundnut Basin could eventually realize a net increase in real income of as much as 16 and 25 percent from devaluation. This is the type of increase in tradable-sector income that can serve as a motor for broad-based growth in the Groundnut Basin. Yet the high political and social costs of such a strong policy adjustment underscore the need to ensure that maximum advantage is gained from the devaluation. This report shows that income shocks to groundnut producers will rapidly lead to pressure on the prices of inputs used in groundnut production and on the prices of some consumer goods. It also suggests where bottlenecks will occur.

In Senegal, attention must be paid to ensure that input costs for production of tradable groundnuts, particularly quality groundnut seed and animal traction equipment, are not unduly bid up by escalating demand. These items are largely nontradable and the supply is somewhat inelastic. Even supplies of tradable inputs, such as fertilizer and other chemicals, may be inelastic as a result of upstream import policies or rigidities in domestic supply systems. Policymakers also need to ensure that bottlenecks do not prevent the private sector from operating; this implies paying attention to input-linked markets such as credit.

The other major cost of production is labor, the classic nontradable. Events that affect food prices relative to the prices of groundnuts and other exportables are likely to affect production costs of tradables, through wage demands in the hired labor market and possibly through farm resource shifts. Since sample households spend 70 to 80 percent of total income and 55 to 60 percent of incremental income on food products, there is ample reason to be concerned about the potential for exogenous income growth in the Groundnut Basin to lead to price inflation in food products, with a possible upward pressure on wages.

Increasing demand pressure on food in the Groundnut Basin will not be a problem if more food becomes available at constant or declining unit cost. If this is not the case, sustaining growth in the groundnut sector will require a food policy that (1) encourages imports (from foreign or domestic sources) to the cereal-deficit central Groundnut Basin and (2) facilitates expansion of local cereal production and marketing in zones with high productivity potential. Past Senegalese experience suggests that relative price declines for millet are not likely to encourage massive shifts out of rice into millet consumption in places where rice consumption is already high, such as urban areas (DIAPER III 1994). Senegal has considerable scope to prevent rapid escalation of grain prices through rice imports. But this capacity should be thought of as putting a ceiling on the price of millet, not determining it.

Although the Senegalese Groundnut Basin is more open to world markets than the other study areas, sample households still spend 40 to 50 percent of average income and about one-third of increments to income on nontradable goods and services. Half to two-thirds of the marginal expenditures on nontradables are on nonfarm goods and services. These items do not have a ready market outside Senegal at prevailing prices

and transport costs; hence, growth in employment from increased production of these items has been demand constrained. Promotion of employment in the largely urban, nonfarm sectors cannot be sustained without the growth in purchasing power from the rural tradables sector—in this case, primarily groundnuts.

Estimated farm multipliers show that each new dollar of rural income earned in the tradables sector can lead to approximately $1.00 of additional income in the zones studied if the supply of nontradable goods demanded by rural households is elastic (the range is from $0.75 to $2.11 across zones and definitions of tradability). Anywhere from 25 to 50 percent of these increments occur in the rural nonfarm sector. Thus, in Senegal, one path to sustained increases in nonfarm employment is through stimulation of the export crops sector.

The share of farm growth multipliers estimated for the Groundnut Basin that can be attributed to consumption is low for Africa, 40 to 60 percent. This is because there are important backward production linkages to nontradable items used in groundnut production, such as local equipment and seed. The multiplier methodology used does not account for forward production linkages, which can be substantial for some industrial crops such as groundnuts. Nevertheless, consumption linkages account for an important share of the action and must not be ignored.

On the hypothesis that some nonfarm tradables might also have a comparative advantage in production in the Groundnut Basin, incremental income was estimated for the overall sample following an exogenous increase of $1.00 in tradable nonfarm income. Growth multipliers were consistently lower for the nonfarm sector, regardless of tradability definitions, because of lower production linkages to nontradables. This result underscores the importance of getting the farm sector moving if general economic growth is to be achieved in Senegal.

Also examined is the extent to which selected household characteristics—location in a market village and income class—influence a household's contribution to economic growth through consumption expenditures. The sample is small, and care must be taken not to overgeneralize from these within-sample comparisons. No clear pattern emerged with respect to the relationship between the size of the multiplier and income class. In the central zone, poor households appear to purchase more nontradable goods and services from incremental income than the rich do. In the southeast, the picture is slightly reversed. This implies that targeting programs narrowly to provide an initial income shock would probably not be useful for growth purposes in Senegal, although poverty alleviation goals might be served. For growth, policymakers should aim for policies that will produce income increases that are widely spread across a broad segment of the Senegalese rural population.

Households in market villages appear to have somewhat lower multipliers than the overall sample, although differences were generally not very large. Market-village households in the southeastern Groundnut Basin had somewhat larger multipliers than their counterparts in the central Groundnut Basin. Households in market villages stand to benefit more from demand-led growth than nonmarket village households because the former are more heavily engaged in the production of nonfarm nontradable goods.

In sum, this report on the southeastern and central groundnut basins supports the view that stimulating traditional export agriculture is a viable mechanism for getting overall rural economic growth going. Although specific studies of comparative advantage are not undertaken here, conventional wisdom and detailed analysis by Martin (1988) strongly support the view that Senegal's comparative advantage lies in groundnuts. Stimulating the groundnut sector—by passing on the gains from devaluation, cost-cutting technological change, and sectoral policy reforms—will lead to significantly multiplied growth in other sectors. Conversely, it is hard to envision growth in other sectors of the Senegalese economy without a continuing income stream from groundnut exports. Nontradable nonfarm activities cannot provide an entry point for generalized economic growth because they are fundamentally demand-constrained activities dependent on a continued stream of demand from other sectors.

CHAPTER 7

Eastern Province, Zambia and Gazaland District, Zimbabwe

As in previous chapters, this chapter uses available household survey data collected by IFPRI and its collaborators for other purposes to examine the relations between farm and nonfarm growth linkages.[22] The data set for Zambia permits empirical estimation of consumption parameters and growth multipliers from initial growth in the tradables sectors in two distinct agroecological regions, with detailed investigation of differences observed across the distribution of farm sizes. Although the Zimbabwe data are more qualitative in nature, they permit a view of significant differences in household demand patterns between larger commercial farm households and more traditional, smaller communal sector farms.

The Study Regions

While data on the importance of the rural nonfarm economy in Zambia and Zimbabwe are fragmentary, they generally support Hazell and Haggblade's (1989) figures for Sub-Saharan Africa as a whole. Census data from Zimbabwe show that, in 1982, about 20 percent of total full-time employment in rural areas and rural towns was in rural nonfarm economic activity (Zimbabwe, Central Office 1985). In Zambia, Headland and Lundahl (1983) found that the rural nonfarm economy accounted for 30 percent of secondary rural employment in two study regions. Due and Mindenda (1985) found that the rural nonfarm economy contributed 24 percent of total rural cash income in three provinces in Zambia, and Marter and Honeybone (1976) reported that about 90 percent of rural households received some income from nonfarm activity. Most rural nonfarm firms are small, averaging only 1.6 workers in Zambia. Women play an important role in rural nonfarm activities, owning some 60 percent of all rural nonfarm firms in Zambia (Milimo and Fisseha 1986).

[22] A shorter form of the present chapter covering Zambia only and omitting disaggregated results for the expenditure analysis by total expenditure decile was published in Hazell and Hojjati 1995.

Zambia

The Zambian data were collected in a study region comprising nine agricultural districts in the Eastern Province. The survey was conducted in 1985/86 by a joint team from IFPRI, the Rural Development Studies Bureau of the University of Zambia, and the Eastern Province Agricultural Development Project. A sample of 330 farm households were selected on a regionally representative basis, and interviews were conducted monthly. Detailed information was collected on all aspects of the household economy, including sources of income and employment, farm inputs and outputs, and household consumption of self-produced foods and purchased goods and services of all kinds. The survey did not include any nonfarm households in local towns (Celis, Milimo, and Wanmali 1991).

The study region has two distinct agroecological zones—the Eastern Plateau and the Luangwa Valley. Annual rainfall ranges from 850 millimeters to 1,050 millimeters in the higher-altitude plateau; it is concentrated between the months of November and April. Agricultural activities are confined to this period. Sowing starts with the onset of rains and harvesting is completed by the end of May. More than 80 percent of the human population and all of the cattle are concentrated in the plateau region, and oxen cultivation is becoming widespread. Farms are larger in this region (2.74 hectares on average) than in the valley.

Maize is the dominant crop on the plateau, accounting for more than 80 percent of the cultivated area. Both traditional and hybrid varieties of maize are grown. Hybrid maize is cultivated exclusively as a market crop. Groundnuts are the other major crop in the plateau region. About 67 percent of the sample households used fertilizers in the survey year, mainly on maize, and more than 55 percent of the cropped area was fertilized (Jha and Hojjati 1993).

The valley is thinly populated, receives less rainfall, has higher temperatures, and is heavily infected with *tsetse* flies, carriers of trypanosomiasis. Maize and groundnuts are important in this zone too, but crops like sorghum, rice, millet, and cotton also occupy significant areas. Groundnuts and cotton are the only cash crops in this zone. Use of hybrid maize is practically nonexistent, and fertilizer use is negligible. Thus, all three major technological options—hybrid maize, fertilizer, and animal traction—are absent from the valley. Farms are smaller in this zone (0.97 hectares on average) and hoe cultivation prevails. The valley region is also lacking in infrastructure and support systems. Cash income is mostly from nonfarm sources.

Zimbabwe

The study region is Gazaland District in Manicaland Province. There is considerable diversity in the agroecological conditions and farming systems in the region. It is useful to distinguish among communal farming areas and the Middle Sabi and Chipinge areas where commercial farming is concentrated. The communal areas are characterized by poor land and small farm sizes (0.91 hectares on average), whereas Middle Sabi and Chipinge have rich soils and much larger farms (averaging 159 and 169 hec-

tares, respectively). Households in the communal farming areas grow hybrid maize, local maize, millet, vegetables, fruits, tobacco, and wheat. Cotton, fruits, and vegetables are dominant in Middle Sabi, and fruits, vegetables, tobacco, and wheat in Chipinge. Maize is a much less important crop in the commercial farming areas.

The survey was conducted in 1987/88 in Gazaland District by IFPRI, Zimbabwe's Department of Physical Planning in the Ministry of Local Government, Rural and Urban Development (Wanmali and Zamchiya 1992). A sample of 297 farm households were selected to represent the different subregions. Data were collected on income, employment, and the amounts of money spent on different goods and services for consumption and farm business purposes. Again, the survey did not include nonfarm households in the local towns. The data are not nearly as complete as those for Zambia, and the scope of the analysis that could be undertaken for this study was therefore restricted.

Analysis of Growth Linkages in Zambia

Sources of Farm-Nonfarm Linkages

Conceptually, five different linkages might be important in Zambia, two in factor markets and three in product markets. The factor market linkages involve direct investment and labor flows among farm and nonfarm enterprises. Product markets include backward production linkages from agriculture to rural input suppliers and forward production linkages from agriculture to processors and distributors, and consumer demand linkages generated as a result of increasing farm incomes. Growth multipliers of the sort estimated in the present report specifically examine backward production linkages and consumer demand linkages, which are thought to account for most of the intersectoral linkages in zones such as Eastern Province.

While farm activity receipts probably finance investment in village-level nonfarm activity, there is less evidence to suggest any significant capital transfers to specialized nonfarm businesses in the local towns. This is partly because many of these firms are owned by whites and Asians, but also because the dominance of public marketing agencies undermines the traditional role of the trader in mobilizing surpluses within the regional economy. The three principal sources of rural household income are own agriculture, wage agriculture, wage nonagriculture, and local nonfarm business. Migration, whether long-term or seasonal, is an important factor flow but outside the domain of this study. The distribution across the year of the other three principal sources of income (other than migration) in the sample is shown in Table 33.

For production linkages, farmers purchase inputs for agriculture (backward linkages) and require agroprocessing and marketing services (forward linkages) for their products. Table 34 shows the average per hectare costs of these items for the valley and plateau, together with a breakdown by farm-size quartile. Farmers in the plateau region purchase twice the value of farm inputs and agroprocessing services per hectare as farmers in the valley. The dominant cost in both regions is fertilizers followed by milling and, in the plateau, oxen hire. Total per hectare expenditure on local inputs is only 50 percent larger in the plateau, so the strength of the total demand linkages to the

Table 33 Seasonality in wage and nonfarm business earnings of the average farm household in Eastern Province, Zambia

Month	Valley			Plateau		
	Wage earnings		Nonfarm business	Wage earnings		Nonfarm business
	Agriculture	Nonagriculture		Agriculture	Nonagriculture	
	(percent annual earnings in category)					
January	8.9	2.3	2.9	12.3	5.9	9.9
February	11.2	3.8	6.7	11.1	13.5	4.4
March	9.0	13.1	4.0	7.1	11.1	9.7
April	7.0	15.4	5.5	7.1	9.1	6.9
May	3.9	4.6	0.2	4.2	8.2	0.0
June	6.1	7.1	8.4	7.9	5.3	12.8
July	1.7	4.6	10.8	10.3	4.9	6.7
August	3.1	7.7	7.4	5.2	7.4	6.7
September	6.2	27.7	10.6	10.0	10.3	7.6
October	3.5	8.5	19.2	7.8	12.5	9.3
November	20.1	1.4	12.1	11.2	8.3	8.8
December	19.3	3.4	12.2	5.8	3.5	17.3

Source: IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

regional economy is not as large as the initial differences in total expenditures would suggest. Fertilizer is imported into the region (and country), and hence it represents a demand leakage as far as the local (national) economy is concerned.

The smallest farms use inputs and milling most intensively in both regions. This is also true for local inputs, so agricultural growth focused on small farms can be expected to lead to the strongest production linkages within the regional economy.

In addition to recurrent input costs, farmers also make longer-term, on-farm investments that lead to additional demand linkages to the nonfarm economy. However, as Table 35 shows, these investment costs are small and are used almost exclusively for livestock in the plateau region; hence they represent demand linkages to the farm sector itself. Investment costs are almost nonexistent among the valley farmers.

Household expenditures for consumption purposes are the dominant type of demand linkages in Eastern Province. The average household spends 1,058 kwacha (K) on goods and services for consumption each year, compared to K346 for farm inputs, and K15 for on-farm investment. Table 36 provides additional details about household consumption. The average household consumes goods and services valued at K3,191 each year, but since K2,133 are homegrown foods, purchased items only amount to K1,058 (not shown in the table). Food, alcohol, and tobacco account for 85 percent of the total value of consumption and for 47 percent of total purchases. Of the nonfoods consumed, clothing and footwear and consumer nondurables (such as fuel and soap) are the most important.

As household incomes increase, the demands for farm inputs and agroprocessing and marketing services typically increase in direct proportion to farm output. But household consumption demands are more complex, with varying income elasticities of

Table 34 Mean annual farm input expenditure per hectare by farm size quartile in the plateau and valley regions, Eastern Province, Zambia, 1986

Input	Plateau					Valley				
	All farms	Farm size quartile				All farms	Farm size quartile			
		1	2	3	4		1	2	3	4
	(kwacha)									
Local inputs	66.46	140.36	56.74	44.72	26.66	42.38	44.26	43.63	46.01	36.50
Milling	40.01	87.52	35.68	24.27	14.46	29.29	37.03	32.93	29.82	20.73
Veterinarian	0.08	0.00	0.04	0.25	0.02	0.00	0.00	0.00	0.00	0.00
Abattoir	0.75	1.01	0.51	0.92	0.55	4.49	0.98	8.70	1.77	5.64
Hired oxen	10.49	23.83	8.02	7.04	3.50	0.00	0.00	0.00	0.00	0.00
Hired tractor	0.33	0.00	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.00
Hired truck	0.98	0.00	3.95	0.00	0.13	0.00	0.00	0.00	0.00	0.00
Hired other machinery	0.25	0.00	0.00	0.09	0.09	0.50	0.00	0.00	0.00	1.76
Repair of tractor or machinery	9.05	13.50	5.88	11.71	4.88	4.63	6.25	1.90	6.89	3.74
Cooperative fees	0.58	0.35	1.98	0.01	0.06	0.00	0.00	0.00	0.00	0.00
Other	3.95	14.16	0.68	0.44	0.84	3.47	0.00	0.00	7.53	4.63
Other inputs	152.79	297.34	94.95	113.27	109.04	61.52	137.75	7.76	106.42	16.02
Fertilizer	139.78	283.71	86.63	98.86	93.64	48.50	114.55	0.00	87.28	10.87
Pesticides	0.15	0.18	0.11	0.00	0.31	0.73	0.00	0.00	1.98	0.59
Seeds	4.80	1.52	4.86	3.70	9.14	3.20	2.54	3.84	5.26	1.00
Fuel, oil, and lubricants	0.70	0.57	0.00	0.96	1.21	2.39	11.32	0.00	1.19	0.10
Bags purchased	7.37	11.37	3.34	9.75	4.74	6.70	9.34	3.92	10.71	3.46
Total	219.25	437.70	151.69	157.99	135.70	103.90	182.01	51.39	152.43	52.52

Source: IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

Note: Farms were ranked by size, then divided into four groups, each having the same number of farms. The group with the smallest average size is the fourth quartile; that with the largest is the first quartile.

demand for individual commodities. The next section is therefore devoted to an analysis of how consumer expenditure patterns in the study region respond to income increases.

Household Expenditure Analysis

The measure of total consumption expenditure used in the regressions includes the value of all foods grown and consumed by the households. These foods were valued at retail market prices. Estimation followed the procedures outlined in Chapter 3.

The explanatory variables selected for estimation of the budget share equations are presented in Table 37. It is assumed that households with larger farms will have access to larger amounts of homegrown foods. Since the Z_j variables are expressed in per capita terms, family size has been included so that the model permits this variable to influence both the intercept and the slope of the individual Engel functions.

Table 35 Mean annual farm investment expenditures by farm size quartile in the plateau and the valley regions of Eastern Province, Zambia, 1986

Investment	Plateau					Valley				
	All farms	Farm size quartile				All farms	Farm size quartile			
		1	2	3	4		1	2	3	4
	(kwacha)									
Livestock expenditure	18.28	34.30	12.61	23.49	3.07	1.22	2.06	2.22	0.00	0.00
Cattle	15.78	30.74	10.57	22.12	0.00	0.00	0.00	0.00	0.00	0.00
Goats	0.44	1.76	0.00	0.00	0.38	0.07	0.00	0.25	0.00	0.00
Pigs	0.53	1.67	0.00	0.00	1.04	0.00	0.00	0.00	0.00	0.00
Doves	0.02	0.00	0.00	0.00	0.00	0.09	0.00	0.31	0.00	0.00
Poultry	1.26	0.13	2.04	1.38	1.65	1.06	2.06	1.66	0.00	0.00
Machinery expenditure	0.06	0.15	0.01	0.00	0.15	0.00	0.00	0.00	0.00	0.00

Source: IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

Note: Farms were ranked by size, then divided into four groups, each having the same number of farms. The group with the smallest average size is the fourth quartile; that with the largest is the first quartile.

Table 36 Annual consumption expenditure by the average farm household, Eastern Province, Zambia, 1986

Commodity group	Plateau	Valley	Total
	(kwacha per household)		
Food, alcohol, and tobacco[a]	2,495.05	3,128.07	2,634.00
Cereals and cereal products	836.13	942.61	859.50
Fruits, vegetables, and legumes	1,030.77	1,398.05	1,111.39
Meat and fish	323.72	520.00	366.81
All other food (nontobacco)	149.56	100.46	138.78
Alcohol	146.84	152.43	148.07
Cigarettes and tobacco	7.86	14.53	9.30
Clothing and footwear	226.87	113.69	202.02
Consumer nondurables	168.34	93.90	152.00
Durables and housing	98.06	48.23	87.12
Transport	50.12	34.83	46.76
Health and education	41.92	45.92	42.80
Social obligations	23.58	34.53	25.98
Total expenditures	3,103.94	3,499.17	3,190.68

Source: IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

[a]Includes the value of home-produced foods consumed by the household.

Table 37 Independent variables included in Zambia regressions

Variable	Unit
Intercept	Kwacha
Reciprocal of per capita expenditure	Kwacha
Log of per capita expenditure	. . .
Log of family size	Log of people
Log of family size / per capita expenditure	. . .
Farm size per capita	Hectare
Farm size / total expenditure	. . .
Number of adult females (over 11 years) as proportion of family size	Percent
Number of women / per capita expenditure	. . .
Number of adult males (over 11 years) as proportion of family size	Percent
Number of men / per capita expenditure	. . .
Age of household head	Years
Age of household head / per capita expenditure	. . .
Education of household head	Years
Education of household head / per capita expenditure	. . .
Dummy for household head:	
male = 1; female = 0	. . .
Dummy for agricultural districts:	
Chiwizi = 1; otherwise = 0	. . .
Nkhoka = 1; otherwise = 0	. . .
Mphata = 1; otherwise = 0	. . .
Chipili = 1; otherwise = 0	. . .
Sinda = 1; otherwise = 0	. . .
Chaweya = 1; otherwise = 0	. . .
Kasendek = 1; otherwise = 0	. . .
Makangil = 1; otherwise = 0	. . .
Cash income from off-farm wage and other sources as proportion of total expenditure	Percent

Eight dummy variables are used to capture the influence of location on household expenditure behavior. These variables summarize the combined effects of differences in infrastructure, distance to nearest town, and other location-specific characteristics. They are delineated on the basis of local government branches. The ordinary least squares (OLS) results were statistically satisfactory, and most of the explanatory variables were significant and of the sign expected.

There are 197 food items and 58 nonfood items included in the survey data. Where relevant, items are also subdivided into those that are locally produced, homegrown, and imported. Although this amount of detail is helpful, some aggregation is desirable for the Engel curve estimation because some commodities are strong substitutes for others, and an expenditure on one is not independent of the other. Also, where expenditure observations are few or the budget share is tiny, individual Engel curves would be difficult to estimate.

All food and nonfood goods and services are classified into 12 basic groups: cereals and cereal products; fruits, vegetables, and legumes; meat and fish; all other food; alcohol; cigarettes and tobacco; clothing and footwear; consumer expendables; durables and housing; transport; health and education; and social obligations.

Table 38 summarizes the expenditure behavior of the average farm household. These results were obtained by evaluating the MBSs and the expenditure elasticities in equations (5) and (7) at the sample mean values for all independent variables.

Together, food, alcohol, and tobacco account for 85 percent of total household expenditures, leaving only a small share of the budget for nonfoods. This is not unusual in poor agricultural regions. Hazell and Röell (1983), for example, report an ABS for food of 81 percent for farm households in the Gusau region of northern Nigeria. However, the expenditure elasticity for food, alcohol, and tobacco is less than unity, implying that its budget share would decline as total incomes increased. This is also reflected in the MBS; only K75 of an additional K100 of total expenditure would be allocated to food, alcohol, and tobacco, while K25 would go to nonfoods. Clearly, farm sector growth has the potential to strengthen the local demand for nonfoods in the Eastern Province region.

Fruits, vegetables, and legumes account for 35 percent of the ABS and 37 percent of any increment to total expenditure. These shares are unusually large; Hazell and Röell (1983) report an ABS of only 7.5 percent and an MBS of 8.7 percent for fruits,

Table 38 Expenditure behavior of the average farm household, Eastern Province, Zambia, 1986

Commodity and locational group	ABS	MBS	Expenditure elasticity
	(percent)		
Commodity group			
Food, alcohol, and tobacco	84.53	74.55	0.88
Cereals and cereal products	28.96	16.71	0.58
Fruits, vegetables, and legumes	34.74	37.25	1.07
Meat and fish	11.65	11.02	0.95
All other food except alcohol	4.31	4.36	1.01
Alcohol	4.59	5.01	1.10
Cigarettes and tobacco	0.29	0.18	0.64
Clothing and footwear	5.63	8.62	1.53
Consumer expendables	4.63	5.02	1.07
Durables and housing	2.17	4.87	2.25
Transport	1.17	3.28	2.81
Health and education	1.11	1.94	1.74
Social obligations	0.70	1.72	2.45
Locational group			
Food			
Locally produced and purchased	12.82	13.08	1.02
Homegrown	68.97	58.05	0.84
Imported	2.68	3.42	1.31
Nonfood			
Locally produced	2.90	6.74	2.31
Imported	12.56	18.71	1.49
Total nontradables	75.87	66.27	0.87
Food	72.96	59.54	0.82
Nonfood	2.90	6.74	2.31
Total tradables	24.13	33.73	1.40

Source: Estimated from the Working-Leser model in Chapter 3 with data from IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

vegetables, and legumes. In Eastern Province, dominant foods in this subgroup are pumpkins and mangos.

Cereals and cereal products also account for a substantial share of the base budget (29 percent), but their importance declines quickly as incomes rise. The expenditure elasticity is only 0.58, and the MBS (17 percent) is about half the ABS.

All the nonfood groups have expenditure elasticities greater than unity, implying that they would all increase in importance in the budget if incomes rose. The relative increases would be greatest for transport, social obligations, and durables and housing, while the largest absolute increases would be for clothing and footwear, consumer expendables, and durables and housing.

Locational Linkages

To capture the locational linkages inherent in the expenditure data for Zambia, a second classification of all goods and services was undertaken. For Zambia, it was not possible to repeat reliably the classification of goods and services by tradability categories at three levels as was done in the West African cases, where data availability and knowledge of local trade patterns permitted such a direct classification. Rather, an older approach to classifying goods was used, based on what is known about production patterns in the Zambian study areas, with somewhat looser classification at the national level into tradables and nontradables. In Zambia five production groups were defined: homegrown foods, locally produced and purchased foods, imported foods, locally produced nonfoods, and imported nonfoods.

Homegrown foods are defined as all foods that are homegrown or collected from the bush. They include home prepared meal, ground and whole maize, sorghum flour, finger millet flour, rice, sweet potatoes, cassava, potatoes, beans, cowpeas, groundnuts, greengram, pumpkin, cabbage, lettuce, onions, tomatoes, banana, mango, orange, lemon, papaya, beef, buffalo, frog, goat, rabbit, mice, mutton, mole rat, bush pig, pork, chicken, duck, dove, organ meat, eggs, caterpillars, fish, fresh milk, milk powder, cheese, lard, honey, varieties of local beer, soda ash, and other fruits, vegetables, and meat.

Locally produced and purchased foods are taken to be all purchased foods that are produced within the region. They include rice, bread, buns, brown sugar, as well as all the homegrown foods listed above, when they are purchased by households.

Imported foods are not produced within the region. They include cooking oil, white sugar, salt, and when purchased from a shop, butter, margarine, and roller and breakfast meal.

Locally produced nonfoods: Of the nonfoods consumed by the sample households, the following are classified as locally produced: social obligations (ceremonies, bride price, gifts, and payments to relatives), schooling, traditional and modern medical care, repairs, improvements to and construction of houses, transportation, fuel (firewood and charcoal), timber and planks, tailoring, and shoe repair.

Imported nonfoods are cloth and sewing materials, shoes, soap and cleaning powder, razor blades, candles, paraffin, kitchen utensils and glass wear, bicycles, linens,

blankets, electrical appliances, stoves, mattresses, watches and clocks, jewelry, cosmetics, stationery, and medicines.

Table 38 shows that 69 percent of the average household's budget is allocated to home-produced foods, 13 percent is spent on other locally produced foods, and 3 percent is spent on locally produced nonfoods. That is, about 85 percent of the total budget is allocated to goods and services produced within the region, and only 15 percent is allocated to regional imports. A very high proportion of any increase in total expenditure also goes to items typically produced within the region; the MBS for all foods and nonfoods produced within the region is 78 percent. This demonstrates strong household demand linkages to the local economy, but linkages that are predominantly of benefit to the farm sector rather than to the local nonfarm economy. Indeed, only 7 percent of the marginal budget is allocated to locally produced nonfoods. But with an elasticity of 2.3, local nonfoods will likely become more important in the budget as incomes increase.

An important implication of these results is that increases in the region's main export crops (maize, groundnuts, and cotton) could, by increasing farm incomes, generate strong growth in the local demand for a wide range of farm products. Many of these—some fruits, vegetables, meats, and fish—are relatively high-value products and, to the extent that their supply could be increased locally, this would lead to additional rounds of increased local farm incomes.

The production classification of goods rather than the tradability classification in many cases still clearly indicates whether incremental expenditures are on demand-constrained goods or not. Household expenditures on imported goods represent a direct leakage from the local economy. To deal with this problem for products that were not clearly imported to Zambia, all major goods and services groups consumed were loosely classified into tradable and nontradable groups, using a definition of tradability roughly equivalent to the national definition in the West African cases.

There is little reason to believe that locally produced nonfood goods are exported from the study region. Many nonfood goods, such as items of clothing or household furnishings, are specifically tailored to local tastes and are not likely to be in great demand in urban areas. It is also unlikely that they could compete in other rural areas because of poor road connections and the probable availability of similar goods not burdened by interregional transportation costs. Most local nonfood expenditures are on services, which are nontradables by definition. Consequently, for the purposes of this chapter, it is assumed that all locally produced nonfood goods and services are nontradables. On the other hand, many foods are tradables, either as regional exports or imports. They include roller meal, breakfast meal, white maize, rice, dry groundnuts, beef, cattle, margarine, butter, cooking oil, white sugar, and salt.

The results of these assumptions (at the bottom of Table 38) show a high ABS and MBS for regional nontradables (76 percent and 66 percent, respectively). In contrast, the ABS was 25 percent and the MBS was 32 percent in Gusau, northern Nigeria (Hazell and Röell 1983). Such high budget shares imply strong demand linkages to the local economy. However, there is one cautionary note: the MBS for nontradables is less than the ABS, and the expenditure elasticity is only 0.87. This

implies that the importance of nontradables in the budget will decline as income increases.

This last result is contrary to the result found in household expenditure studies for Nigeria (in Gusau, for example, Hazell and Röell (1983) report an expenditure elasticity for nontradables of 1.3) or for Niger in Chapter 5 of this report. However, it is similar to results for Burkina Faso in Chapter 4 and Senegal in Chapter 6. The low elasticity in the Eastern Province of Zambia arises from the dominance of nontradable foods that themselves have low expenditure elasticities. In contrast, at 2.3, the elasticity for nontradable nonfoods is quite high. However, with an MBS of only 7 percent, these demand linkages to the local nonfarm economy will remain relatively small until household incomes rise significantly.

Contrast across Farm Size and Expenditure Deciles

One objective of the expenditure analysis in each of the case studies is to see how changes in income distribution that accompany growth affect the aggregate demand for different goods and services, and particularly how these changes affect the strength of the aggregate demand linkages to the local economy. For this purpose, analysis of the expenditure patterns of households by different income or farm size groups provides especially pertinent results.

Per capita expenditure and farm size were used to classify households into different groups. Surprisingly, these two variables are not correlated (the correlation is only –0.03), so the ensuing two sets of farm classifications are quite different. Tables 39 and 40 present the MBSs for different commodity groups by per capita expenditure deciles and farm size deciles, respectively. To derive these results, all the household characteristic variables were evaluated at their decile means.

Nonfoods become more important as per capita expenditure or farm size increases. The biggest increases occur for clothing and footwear, durables and housing, transport, and social obligations. Many of these are locally produced and, in fact, the MBS for locally produced nonfood increases from 2.7 percent to 8.9 percent between the bottom and top per capita expenditure deciles, and from 6.2 percent to 8.4 percent between the bottom and top farm size deciles. These are still rather small MBSs in terms of supporting much local nonfarm activity. Nevertheless, income increases in the hands of the richer or larger farm households lead to strong consumer demand linkages to the local nonfarm economy. The opposite is true for farm production linkages (Table 34).

Growth Multipliers

The limitations of the fixed-price model, as discussed in Chapter 2, may not be a significant problem in Eastern Province. First, although it is a static equilibrium approach that ignores the growth effects of additional investment, the results in Table 35 suggest that these investment linkages are small in Eastern Province. Second, because the model does not incorporate any explicit specification of the labor market, it does not allow for inelasticity in the supply of nontradables. Although this is a potentially seri-

Table 39—Marginal budget shares by per capita expenditure decile, Eastern Province, Zambia, 1986

Item	Per capita expenditure decile									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
	(percent)									
Commodity group										
Food, alcohol, and tobacco	83.07	78.04	77.27	76.61	74.25	73.43	72.75	70.41	71.17	69.26
Cereals and cereal products	26.31	22.30	22.83	23.17	15.07	15.31	11.47	11.30	11.29	8.51
Fruits, vegetables, and legumes	40.31	37.66	33.82	35.97	38.54	37.31	37.79	35.85	37.96	37.22
Meat and fish	7.34	8.88	9.60	8.37	12.09	10.82	13.77	13.22	12.08	14.20
All other food (except alcohol and tobacco)	5.46	5.04	5.20	4.44	4.06	4.19	4.03	3.87	4.06	3.18
Alcohol	3.68	4.11	5.70	4.55	4.38	5.59	5.46	5.88	5.50	5.68
Cigarettes and tobacco	–0.02	0.05	0.12	0.10	0.12	0.22	0.22	0.29	0.29	0.48
Clothing and footwear	5.33	7.32	7.97	8.62	8.41	9.13	8.60	9.86	10.09	10.47
Consumer expendables	5.33	5.41	4.41	4.61	5.66	5.19	4.41	5.51	4.32	4.98
Durables and housing	2.91	3.98	4.18	4.22	4.56	4.99	5.76	5.26	6.25	6.63
Transport	1.35	2.25	2.57	2.31	3.54	3.62	4.22	4.30	4.05	4.56
Health and education	1.52	2.05	2.13	2.08	1.96	1.71	2.08	2.28	1.79	1.56
Social obligations	0.49	0.94	1.47	1.52	1.62	1.93	2.18	2.37	2.33	2.53
Locational group										
Food										
Locally produced and purchased	6.04	9.98	12.73	12.06	13.48	14.84	15.31	18.26	16.09	17.96
Homegrown	73.73	64.46	61.17	61.95	57.30	55.47	53.98	48.39	52.15	48.06
Imported	3.30	3.60	3.37	2.60	3.47	3.12	3.46	3.76	2.93	3.24
Nonfood										
Locally produced	2.67	4.78	5.90	6.17	6.71	6.95	8.15	8.79	8.38	8.85
Imported	14.26	17.18	16.82	17.22	19.04	19.61	19.11	20.80	20.45	21.88
Total nontradables	76.05	69.46	68.98	69.87	65.35	65.34	63.57	61.81	62.76	60.77
Food	73.38	64.68	63.07	63.69	58.64	58.38	55.42	53.01	54.39	51.91
Nonfood	2.67	4.78	5.90	6.17	6.71	6.95	8.15	8.79	8.38	8.55
Total tradables	23.96	30.54	31.02	30.14	34.66	34.66	36.43	38.19	37.24	39.26
Average farm size (hectares)	2.95	2.15	1.84	2.12	2.74	02.16	2.73	2.20	2.24	2.32
Average family size	9.39	7.62	7.25	6.03	5.76	5.43	5.86	4.53	4.44	3.43
Per capita expenditure (kwacha)	206.35	292.91	362.24	431.61	514.71	594.70	689.85	911.97	988.95	1,328.28

Source: Estimated from the Working-Leser model in Chapter 3 with data from IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

Notes: All household characteristic variables are evaluated at decile means. The first decile is the poorest.

Table 40—Marginal budget shares by farm size decile, Eastern Province, Zambia, 1986

Item	Farm size decile									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
	(percent)									
Commodity group										
Food, alcohol, and tobacco	77.37	77.72	76.52	76.88	75.03	75.59	74.63	74.33	71.37	67.58
Cereals and cereal products	20.40	16.59	15.36	17.30	13.61	19.50	17.64	17.21	15.12	14.63
Fruits, vegetables, and legumes	34.74	40.42	39.76	39.26	40.40	39.64	38.40	34.98	35.39	29.59
Meat and fish	13.15	11.96	13.81	10.84	11.25	7.65	9.43	11.07	9.94	12.07
All other food (except alcohol and tobacco)	3.96	4.02	2.76	4.31	4.42	3.99	4.26	5.06	4.83	5.52
Alcohol	4.69	4.38	4.40	4.98	5.07	4.70	4.79	5.97	6.09	5.83
Cigarettes and tobacco	0.43	0.35	0.43	0.20	0.28	0.11	0.11	0.04	0.00	–0.06
Clothing and footwear	7.61	7.02	7.85	7.71	2.12	8.59	8.87	8.71	9.50	11.38
Consumer expendables	4.24	4.56	4.46	4.97	4.62	5.39	4.91	5.34	5.58	5.30
Durables and housing	4.97	4.77	5.00	4.28	5.19	4.38	5.01	4.08	5.25	6.00
Transport	2.42	2.73	3.02	2.88	3.48	2.84	3.09	3.53	4.23	4.86
Health and education	1.63	1.44	1.21	1.71	1.54	1.81	1.96	2.16	2.34	2.87
Social obligations	1.76	1.76	1.95	1.57	2.02	1.40	1.53	1.85	1.72	2.01
Locational group										
Food										
Locally produced and purchased	13.23	12.73	14.10	12.72	14.03	11.66	12.09	15.92	14.21	15.88
Homegrown	61.43	61.99	59.73	61.87	57.97	61.89	59.31	54.88	53.34	47.66
Imported	2.71	3.00	2.69	3.29	3.03	3.04	3.23	3.53	3.82	4.04
Nonfood										
Locally produced	6.21	6.14	6.50	5.92	6.93	6.20	6.39	7.11	7.49	8.39
Imported	16.41	16.13	16.98	17.20	18.04	18.21	18.98	18.56	21.14	24.02
Total nontradables										
Food	66.49	68.04	67.68	68.47	65.85	68.65	67.70	67.04	63.69	61.22
Nonfood	6.21	6.14	6.50	5.92	6.93	6.20	6.39	7.11	7.49	8.39
Total tradables	33.52	31.96	32.32	31.53	34.15	31.35	32.30	32.96	36.31	38.78
Average farm size (hectares)	0.33	0.64	0.84	1.16	1.46	1.79	2.28	3.07	4.12	7.79
Average family size	5.63	5.31	4.79	5.54	4.63	5.57	6.62	6.35	7.57	8.00
Per capita expenditure (kwacha)	641.67	616.89	732.33	546.07	751.24	581.78	567.88	533.90	567.66	686.53

Source: Estimated from the Working-Leser model in Chapter 3 with data from IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

Notes: All household characteristic variables are evaluated at decile means; the first decile is the poorest. The marginal budget share for food, alcohol, and tobacco declines across both the per capita expenditure and the farm size, mostly because of a decline in the marginal budget shares for cereals and cereal products and fruits, vegetables, and legumes.

ous limitation in Eastern Province, given a very low population density and seasonal labor bottlenecks, there is evidence of countercyclical seasonal movements of labor between the farm and nonfarm sectors (Table 33). These movements suggest some degree of complementarity between the two sectors in labor use. Third, the model describes a self-contained regional economy and in doing so ignores spillovers to or from major urban areas or to other rural areas in Zambia. Here, as elsewhere, this criticism is correct, but only strengthens results that show intersectoral linkages to be high, even leaving some sources out.

The Model

The model used on the Zambia data is identical to the one in Chapter 3, with two exceptions mandated by the local situation and data availability. First, tradable nonfarm activity is not separately considered. Second, the farm tradables sector is disaggregated for the plateau and the valley. In the terminology of Chapter 3, the four sectors are tradable farm production in the valley (*T*) and plateau (*M*) regions; nontradable farm items (*A*); and nontradable nonfarm items (*N*).

It is necessary to distinguish between tradable production in the valley and in the plateau in order to capture important differences in the technology used. Farmers in the valley use more traditional technologies and crop varieties, especially for maize, the main tradable crop, whereas many farmers in the plateau use modern maize varieties and fertilizers. Nontradable farm items comprise a mix of livestock products and fruits and vegetables, together with various foods that are gathered or hunted in the bush. They are classified as nontradables because of their perishability and the absence of interregional marketing channels. Their production technology is assumed to be similar in the valley and plateau regions. Nonfarm nontradables consist mostly of agroprocessing, artisan work, and wholesale and retail trading, and encompass both rural and urban activity. The region does not produce any significant amounts of nonfarm goods for export.

Model Results

The model's coefficients are estimated using the available survey data described earlier, together with various sources of secondary information. The coefficients are summarized in Table 41 and the results in Table 42. Two scenarios are defined: a base model and a variant for sensitivity analysis in which fruits and vegetables are reclassified as tradables.

The base model has large value-added multipliers of 2.57 for the valley and 2.48 for the plateau. In other words, an additional kwacha (K1.00) of value added, generated in tradable farm production in the valley through technological change, leads to another K1.57 of value added in the regional economy. Most of the indirect income is generated in the farm nontradables sector, whereas the nonfarm sector only increases its income by K0.20. This is because the region's households allocate the lion's share of their incremental expenditure to nontradable foods (espe-

Table 41 Semi-input output parameters for the Zambian study region

Coefficient	Tradable agriculture		Nontradable agriculture (A)	Nontradable nonagriculture (N)
	Valley (T)	Plateau (M)		
Input-output coefficients				
Nontradable agriculture (a_{Ai})	0.01	0.01	0.01	0.01
Nontradable nonagriculture (a_{Ni})	0.02	0.03	0.02	0.10
Value added to gross output ratio (v_i)	0.90	0.80	0.95	0.80
	Rural			
	Valley (V)	Plateau (P)	Urban (U)	
Household coefficients				
Marginal budget shares				
Nontradable agriculture (β_{Ah})	0.61	0.58	0.44	
	(0.23)[a]	(0.22)[a]	(0.30)[a]	
Nontradable nonagriculture (β_{Nh})	0.073	0.068	0.15	
Leakage ratio (s_h)	0.05	0.10	0.15	
Value-added shares				
Nontradable agriculture (V_{Ah})	0.475	0.475	. . .	
Nontradable nonagriculture (V_{Nh})	0.15	0.15	0.50	

Source: Estimated from the IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

[a]Alternative coefficient for a model experiment in which fruits and vegetables are reclassified as tradables.

Table 42 Regional income multipliers for valley and plateau agriculture

Sector	Base solution		Fruits and vegetables reclassified as tradables	
	Valley	Plateau	Valley	Plateau
Sector incomes				
Tradable agriculture	1.00	1.00	1.00	1.00
Nontradable agriculture (A)	1.37	1.28	0.30	0.29
Nontradable nonagriculture (N)	0.20	0.20	0.10	0.12
Total	2.57	2.48	1.41	1.41
Household incomes				
Valley, rural (V)	1.72	0.67	1.17	0.17
Plateau, rural (P)	0.72	1.68	0.17	1.17
Urban (U)	0.13	0.13	0.07	0.07
Total	2.57	2.48	1.41	1.41

Source: Results of the multiplier model in Chapter 3 using data from IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986.

Note: All figures are the income increase induced by a K1.00 increase in the income of tradable agriculture in either the valley or plateau regions.

cially fruits and vegetables), and because the farm sector requires relatively few nontradables as intermediate inputs to production. The dominance of the consumer demand linkages is also confirmed by calculating the multipliers under the assumption that all the MBSs are zero. This leads to multipliers of 1.02 and 1.05 in the valley and plateau, respectively.

In keeping with the small income gains in the nonfood sector, urban households gain relatively little additional income from farm sector growth (K0.13 for each K1.00 of additional value added in agricultural goods). Nearly all the multiplier gains are captured by the farm households themselves, again because of the importance of farm nontradables in the multiplier.

The large multipliers would have to be scaled down sharply if the supply response of the nonfarm nontradables sector were inelastic. This is shown by the sensitivity analysis in the last two columns of Table 42, which report the multiplier results when fruits and vegetables are reclassified as tradables (and thus are constrained by supply, rather than demand). In this case, the multiplier is the same for the valley and the plateau and, at only 1.41, it is now closer to the multiplier estimates for Sub-Saharan Africa given by Haggblade, Hazell, and Brown (1989) and Haggblade and Hazell (1989). Of the K0.41 of nontradable income generated by each additional K1.00 of income in farm tradables, 30 percent (K0.07) arises in the nonfarm (urban) sector. Consumption linkages to farm nontradables therefore continue to dominate, even though fruits and vegetables (which account for 37 percent of the marginal budget in Table 38) have been reclassified as tradables.

These multiplier results confirm weak linkages between the farm and nonfarm sectors in Eastern Province, both in the plateau and valley regions. As farm households gain more income, they prefer to spend that income on additional foods, particularly horticultural and livestock products. Potentially, this could generate large multipliers within the farm sector itself, but only if the supply of these kinds of perishable foods is elastic. Agricultural research and improved marketing channels could play an important role in fostering the needed supply response.

The dominance of demand for nontradable foods in marginal expenditure in Zambia is similar both to the West African country cases of the present report and to previous work. Hazell and Röell (1983) report a similar pattern of demand for Gusau in northern Nigeria. They postulate that poor roads and transport systems, together with long distances from villages to towns, discourage farm households from diversifying their consumption into nonfoods. A similar situation probably exists in Eastern Province, in which case stronger farm-nonfarm growth linkages may not emerge until the level of infrastructure has been significantly upgraded.

Analysis of Growth Linkages in Zimbabwe

The household survey data set from Gazaland in Zimbabwe is much more limited than the Zambian data. In the absence of data on consumption of home-produced foods, gifts, in-kind payments, and barter trade, the consumption analysis is restricted to cash expenditures. One attractive feature of the Gazaland data set is that it permits compari-

son of the cash expenditure behavior of smallholders in the communal areas with that of large-scale commercial farmers in the Middle Sabi and Chipinge areas.

Nonfarm activity is important for the communal farmers; only 60 percent report farming as their primary occupation. Nonfarm occupations include trading, teaching, office work, extension work, driving, and personal services. In comparison, nearly 100 percent of the farmers in Middle Sabi and Chipinge report farming as their primary occupation.

Cash expenditures are available for household consumption and farm inputs (Table 43). These are expressed in three ways: as shares of total consumption or farm cash expenditure, as per capita costs, and as per hectare costs. The expenditure groups are largely self-explanatory. Food and personal services include fruits, vegetables, poultry, meat products, dairy products, tea, and coffee, beer, tobacco, photo services, general provisions, blacksmith, and tinsmith. Consumer durables include household uten-

Table 43 Comparison of purchasing expenditure behavior of the average household in Zambia, 1986, and Zimbabwe, 1987/88

	Zimbabwe			Zambia	
Item	**Communal**	**Middle Sabi**	**Chipinge**	**Plateau**	**Valley**
			(percent)		
Consumption					
Food and personal services	38	49	29	43	40
Clothing and footwear	22	22	2	22	20
Health and education	10	8	9	3	8
Consumer durables	21	7	4	22	22
Building and construction	3	5	19	1	0
Fuel and energy	3	8	34	3	3
Bus and road transport	2	0	3	6	7
Post and telecommunication	1	1	0	0	0
Total	100	100	100	100	100
Farm					
Machinery and implements	21	89	92	. . .	0
Inputs	79	7	1	100	100
Veterinary and agricultural extension	. . .	4	7	. . .	0
Total	100	100	100	100	100
	(Zimbabwe dollars)			(kwacha)	
Per capita expenditure					
Consumption	144.00	895.00	3,425.00	187.00	567.00
Farm	36.00	270.00	1,311.00	54.00	43.00
Per hectare expenditure					
Consumption	385.00	64.00	85.00	666.00	762.00
Farm	68.00	9.00	96.00	163.00	53.00
Farm size (hectares)	0.91	158.06	169.18	2.74	0.97
Family size (persons)	5.82	3.64	3.94	6.01	5.94

Source: Estimated from the IFPRI, Rural Development Studies Bureau, Eastern Province Agricultural Development Project, and National Food and Nutrition Commission survey, Eastern Province, Zambia, 1986, and IFPRI, Department of Physical Planning, Government of Zimbabwe Survey, Gazaland, Zimbabwe, 1987/88.

sils, china and glassware, watches, charcoal braziers, bicycles, wooden furniture, beds, mattresses, and linens.

The average smallholder in the communal farming areas has an annual per capita cash expenditure of Z$180 (in Zimbabwean dollars), of which 80 percent is allocated to household consumption. This is considerably less than the cash expenditure of commercial farmers; they spend Z$1,165 per capita in Middle Sabi and Z$4,736 in Chipinge. Again, about 80 percent of total cash expenditure is allocated to household consumption. However, one cannot conclude from this that the commercial farmers have stronger links to the local economy. First, commercial farmers use a lot more land to generate their larger per capita cash expenditures. When expressed on a per hectare basis, the smallholders actually outspend the commercial farmers by a large margin.

Second, the composition of their expenditure patterns is different. Commercial farmers spend much larger shares of their cash farm costs on machinery and implements. They also spend much more on fuels and energy; these account for 37 percent of cash consumption expenditure in Chipinge. All these items are imported into the region.

Food and personal services account for large shares of the cash consumption of all types of farms, but smallholders spend proportionally more on clothing and footwear, durables, and bus and road transport. In addition to fuels and energy, commercial farmers spend larger shares of cash expenditure on building and construction (especially in Chipinge).

These results are insufficient to determine whether the expenditure patterns of smallholders or commercial farmers generate stronger regional income multipliers. Although the necessary data on noncash expenditures are not available for estimating a model of the regional economy, the last two columns of Table 43 show how strikingly similar cash expenditure data for smallholders in Zimbabwe are to data for the valley and plateau farmers in Eastern Province, Zambia. Only the composition of their cash farm costs differ significantly: Zambian smallholders do not incur any expenditures on machinery and implements. On this basis, there is every reason to believe that consumption linkages in Zimbabwe are just as high as in Zambia, and production linkages may be even higher.

Insights from the Southern African Cases

This chapter has shown that the farm-nonfarm growth linkages are surprisingly strong in Eastern Province, Zambia, particularly if fruits and vegetables are counted as nontradables characterized by an elastic supply. Under that assumption, regional growth multipliers are estimated at about 2.5. That is, each K1.00 of additional value added generated in farm tradables as a result of technological change leads to another K1.5 of income in the regional economy. This is about three times the size of the multiplier estimated for typical regions in Sub-Saharan Africa by Haggblade, Hazell, and Brown (1989). The Zambian case shows a surprising similarity to the West African results in this regard.

Because Zambian farmers spend large shares of incremental income on nontradable foods, and because farm production and investment linkages are still very weak,

most of the growth multiplier arises within the farm sector itself. Only K0.20 of income (or 13 percent of the multiplier) is generated in the local nonfarm economy. Households mainly producing nonfarm goods in the region's towns also gain little income from the multiplier; only K0.13 compared with nearly K2.4 for rural households mainly producing farm goods.

These results imply that, at current per capita income levels, farm sector growth will lead to only modest levels of diversification out of farming in the regional economy. However, the farm-nonfarm linkages might be strengthened by (1) investments in rural infrastructure and transport systems that better link the villages and towns, and (2) continued policy reform to create a more enabling economic environment for the region's farmers and nonfarm entrepreneurs.

The strong household demand linkages for farm nontradables could be a powerful force for regional economic growth. This requires, however, that the supplies of many important nontradable foods, especially fruits and vegetables, be elastic. If they are inelastic, then the size of the multiplier shrinks dramatically from 2.5 to 1.4. Agricultural research and improved marketing channels, especially ones that draw more households into market participation, could play an important role in promoting the needed supply response.

CHAPTER 8

Conclusions

Promoting Growth in Demand-Constrained Sectors of Rural Africa

Recent economic reform paradigms for improving growth in small, open African countries have properly focused on providing improved incentives for local production of tradables through devaluation, liberalization, and austerity. Since the economies of most African rural areas are semi-open, the initial income stimulus still has to originate from rightward shifts of the supply curve for tradables. Direct shifts occur, for example, as the result of new technologies for export production or marketing that lower unit costs of production. For tradables, indirect shifts occur as a result of some event in the nontradable sectors that shifts productive resources to the tradable sectors (such as a yield increase for a subsistence, nontradable food that permits increased export crop production while maintaining a constant level of local food output).

Thus growth will initially show up in those sectors where trade is profitable at prevailing transfer costs to external markets. Technological change or other supply-shifters in the nontradable sectors that neither lead to net resource shifts into tradables nor change a home good into an exportable are only likely to lead to mountains of unsold produce by the roadside, such as the mountains of maize in the middle belt of Nigeria in the late 1970s, and falling producer revenue under conditions of price-inelastic demand.

For growth linkages to be part of a sustained pattern of economic development, the initial income shock from the tradable sector must be regularly reproduced; the supply of tradables must be a continually running engine of growth. The commodity groups most likely to provide such an engine are a matter of comparative advantage, which is not dealt with in this report. Conventional wisdom suggests that traditional farm exports are most likely to play this role: groundnuts, cotton, or livestock. The experiences in Niger and Burkina Faso during periods when coastal demand was strong (prior to 1979 and since 1994, for example) indicate that some new exportables such as cowpeas, onions, poultry, or vegetables may also have great potential for regional exports.

Breakthroughs capable of being sustained over time have to be achieved through decreases in the unit costs of production, as in technological change, or decreases in

the unit costs of distribution, as in infrastructure development and economies of scale. Only breakthroughs that eventually lead to output increases in the truly tradable sectors can escape from demand constraints.

Technological progress or infrastructural development that turns nontradables into tradables, practically the definition of agricultural commercialization, is consistent with the view that tradables must lead growth. Mathematically speaking, the scope for demand-led growth, as measured by growth multipliers, goes down with decreases in the share of nontradables in final and intermediate demand patterns (that is, with declines in the share of the local economy that is demand-constrained). However, the process of commercialization also raises the equilibrium level of income that can be sustained over time, through efficiency gains from specialization and increased investment. The supply-side effects of investment on productivity are undoubtedly more important to sustained growth than the demand-led effects lost by making some nontradables into tradables.

As shown in Chapter 2, the earlier growth linkages literature was preoccupied with the direct contribution of agriculture to industrialization. It assumed that agricultural items such as food staples are tradable goods. Consumer spending of additional rural incomes from exogenous sources—such as technological change—on these items was considered a "leakage" for growth, in the sense that it simply displaced exports of grain from rural areas or encouraged further imports of grain to the study zone. This assumption combined with expenditure survey results showing high marginal propensities to consume agricultural products in rural Africa led to the conventional wisdom that the scope for additional demand-led growth from an initial supply-side shock, as in growth linkages theory, is low in Africa.

The analysis of expenditure patterns in the country cases is consistent with earlier literature surveyed in Chapter 2, in that additions to income are largely spent on food. However, the big difference is that most of the foods purchased—depending on the tradability assumptions adopted—are either directly nontradables or have large nontradable inputs (like processed foods or groundnuts), at the national-level catchment area.

In all the country cases, increments to rural incomes spent on farm items primarily concern grains, livestock products, fruits, and vegetables. In the Burkina Faso sample, basic cereals accounted for a large share of increments to income. In Niger and Senegal, fresh animal-based proteins are especially important. In Zambia, spending on fruits and vegetables is key. Since most of these items are nontradables, the shares of income group-specific multipliers due to consumer and intermediate demands for farm nontradables are quite high. Furthermore, the nontradable nonfarm sector as defined in this report largely involves farm people processing raw products, such as local vegetable oil, fritters, or baskets made in the same rural village that the raw materials were grown in.

The implication is that demand stimulus in rural Africa is capable of inducing considerable net new employment within the farm sector itself, provided that a sustainable way is found to achieve an initial boost in income from the rural tradables sector for a large number of rural people, and provided that the supplies of farm nontradables—such as grain (in Burkina Faso and Senegal), livestock products (all cases), and fruits

and vegetable—sand nonfarm nontradables are somewhat price-elastic. If the supply of these items does not rise rapidly once income growth starts, demand pressures will raise their relative prices and discourage production of exportables.

The farm growth multipliers estimated in the four full country cases, assuming a perfectly elastic supply of nontradables, range from 1.96 in Niger to 2.88 in Burkina Faso, using the preferred definition of tradability at the national level. This implies that an additional $1.00 of local household income from the tradables farm sector could lead to a maximum of $0.96 to $1.88 of additional national income from new production in the nontradables farm and nonfarm sectors. Roughly speaking, the true national pay-off from generating extra income in the farm tradables sector may be two-to-three times as high as the initial income shock. But all this depends on getting tradable agriculture moving in the first place, which many already think is the key to development in Africa, and ensuring that the supply of nontradable food staples, in particular, is price elastic.

Why All the Fuss about Linkages If Promoting Tradables Is the Engine of Growth?

Growth multiplier analysis may seem to suggest that policy should just focus on promoting the initial income shock in the tradables sector. If so, then what is learned by all this detailed attention to nontradables, other than that promoting growth in farm tradables is even more important than was thought? There are two problems with limiting policy reforms in Sub-Saharan Africa to the promotion of the production of tradables through the usual mechanisms. First, the possibilities for stimulating the tradables sectors are limited, and once this has been done, the issue is how to get maximum impact on growth from those efforts. Second, the difficult policy reforms necessary to stimulate the tradables sector can be rapidly choked off through demand-driven rises in the prices of nontradable consumer goods and intermediate inputs. As seen in Chapter 2, the level of food prices (and other wage goods) were a major concern in the historically larger and more closed economies of South Asia in particular.

Under the pure supply-side view, the increased demand of workers and farmers with growing incomes for wage goods such as food and for nontradable intermediate inputs is always met by increased imports at a constant world price, using the newly acquired foreign exchange from increased production of tradables. Furthermore, there are no demand constraints, since nearly everything except factor services is considered tradable (even if not traded) and all resources are fully employed (or not employable), therefore new demand cannot be a stimulus for net new production.

However, if African wage goods and intermediate inputs are in fact largely nontradable, in the sense that they are not traded, and close tradable substitutes do not exist for them at prevailing price ratios, the demand side of adjustment behaves like a closed economy. Increased local production of farm exports leads quickly to increased local demand for various foods, services, and local manufactures that cannot be easily met through increased imports or decreased exports of these goods. The result is upward

pressure on wages relative to the price of exportables and, inevitably, decreased international export competitiveness, *unless* local production responds to these pressures.

The existence of large sectors of nontradable production and consumption in rural areas of Africa suggests the possibility of multiplied growth from bringing underused resources into production by demand stimulus. Knowledge of where demand pressures are likely to occur under growth permits pinpointing of those subsectors where the price-elasticity of supply really matters for sustaining the growth potential of export booms promoted by macroeconomic policy reform. The type of farm-sector model used here is probably less useful in this regard than inspection of the disaggregated MBS, taking into account tradability characteristics. If a fuller modeling is done of these issues, it should probably involve social accounting matrices (SAMS), which have many of the drawbacks of fixed-price multipliers but much greater sector disaggregation. The growth linkages approach does have the benefit of illustrating that the potential for maximum growth arising out of economic reforms in the semi-open economy can depend largely on the alleviation of supply constraints for nontradables.

Specific Insights from Household Expenditure Patterns

The ABSs and MBSs estimated in the country chapters are summarized for highly aggregated goods categories in Table 44. Results show that the ABS for food and drink runs from 85 percent in the Burkina Faso case of a bad drought year to 72 to 78 percent in Senegal in a normal year. In all cases, the MBS for aggregate food and drink is less than the ABS (that is, demand for food is inelastic with respect to income), as Engel's law would predict.

Yet, the MBSs for food are still so high that the absolute impact on food supplies of an increase in incomes will still be quite large. Improvements in incomes in the study zones can be expected to put demand pressure on food supplies. In the poorer areas, the pressure will be greater on basic staples. In richer areas, the pressure will be greater on higher priced (more preferred) calories, since consumers are sufficiently better off to begin the process of substituting higher priced calories (rice and fish, for example) for lower priced ones (millet) as income rises. Conversely, the MBS of nonfood commodities is high only in Senegal (20 to 27 percent), and reaches very low levels in Burkina Faso with a 9 percent MBS. Services seem more important in Niger (with an MBS of 16 percent) than elsewhere. This may stem in part from the finding that payments for specific services to clerics (*marabouts*) seem especially important in the Niger sample: healer's services, baptism, marriage, blessings given, and so forth.

Whether demand pressure will result in relative price increases for food that are more than transitory depends on the tradability of food and its elasticity of supply. If food is a tradable, such as imported maize, the usual assumption is that small countries can import as much of it as they can pay for at a constant world price. However, if much of the food category is nontradable, implying that imported substitutes are not easily available at constant prices, relative food prices will rise under income growth

Table 44 Rural household expenditure behavior in the study zones

	Burkina Faso, 1984/85		Niger, 1989/90		Senegal, 1989/90				Zambia, 1985/86	
					Southeastern Groundnut Basin		Central Groundnut Basin			
Expenditure item	ABS[a]	MBS[b]	ABS[a]	MBS[b]	ABS[a]	MBS[b]	ABS[a]	MBS[b]	ABS[a]	MBS[b]
					(percent)					
All food and drink[c]	85	75	75	62	72	55	78	62	84	74
Nonfood commodities	9	14	15	22	27	44	20	38	12	19
Services	6	11	10	16	1	1	2	0	3	7
By tradability and sector[d]										
Farm nontradables	57	45	10	17	35	11	28	15	73	60
Nonfarm nontradables	13	22	21	30	15	24	12	17	3	7
All tradables	29	33	69	53	50	65	60	68	24	33

Source: Chapters 4, 5, 6, and 7.

Notes: Numbers may not add to 100 due to rounding.

[a]Average budget share (ABS) is the percent of total consumption expenditures on that item.

[b]Marginal budget share (MBS) is the percent of total increments to expenditure on that item. The expenditure elasticity of demand (often used as proxy for the income elasticity of demand) is MBS/ABS.

[c]Includes processed foods.

[d]Processed farm items are included in nonfarm. Tradability is defined at the national level, meaning that nontradables are rarely exported to or from the (non-African) world market.

and possibly stay high for some time. The more inelastic the food supply is over time, the more a sustained increase in rural incomes will raise relative food prices.

The lower half of Table 44 sheds light on the impact of rising rural income on demand for nontradables. In Zambia, 76 percent of all consumer expenditures in the sample were on nontradables—primarily on farm goods. Two-thirds of increments to income went to nontradables, as was the case in Burkina Faso. The MBS for nontradables was 47 percent in Niger and only 35 and 32 percent in Senegal.

Niger alone of the four full case studies shows that the budget for nontradables as a group increases as income increases (MBS > ABS). Niger is also the only country case where this is true for farm nontradables. Among farm goods in Niger, the prime nontradable commodities with elastic demand are perishable livestock products such as meat, milk, and eggs. Livestock products and services have similar demand characteristics in the other country studies, but their ABSs are considerably lower. The other components of farm nontradables in those countries (principally millet and sorghum in Burkina Faso and Senegal and other homegrown foods in Zambia) are sufficiently inelastic in demand with respect to income that they outweigh the elastic response of livestock products and services, making farm nontradables, as a group, inelastic. Demand for farm nontradables is especially inelastic with respect to income in Senegal, as higher-income house-

holds appear to be in the process of a secular shift in their staple consumption patterns for millet (a nontradable internationally) to rice, a tradable at all levels.

For nonfarm items, nonfood commodities are income-elastic everywhere, but tend to be largely imports or import-substitutes with respect to the world market. Services and many processed food commodities are nonfarm nontradables with income-elastic demand in all the countries studied.

In sum, detailed analysis of the expenditure data in the country chapters shows that rising rural incomes in the study zones, should they occur, are likely to put considerable upward pressure on the relative prices of many farm goods, mainly local food items, some nonfarm goods, and services. Many of these items are nontradables at the national level of tradability and therefore do not have a highly elastic supply of imports to alleviate these pressures. The corollary to this is that the goods and services that rural people most want to spend increments to income on are in many cases precisely those items that are demand-constrained. Increases in demand for these items will not provoke more trade, but will stimulate more production, provided that local supply has any price responsiveness at all. This knowledge of demand patterns cannot indicate how to continue to provide the initial income stimulus, but it does show that there are multiplied returns to providing such a stimulus through the traded sectors. These multiplied returns are an opportunity for rural growth that should not be neglected.

Magnitude and Sensitivity of the Growth Multipliers in the Case Studies

The sensitivity of the estimated growth multipliers to changing assumptions about tradability and supply constraints is apparent in Table 45, which summarizes estimates of rural growth multipliers under different definitions of tradability that are not mutually compatible. Since designating a good as a tradable in this analysis implies that it has a flat demand curve and an upward-sloping supply curve (and vice versa for nontradables), a given good cannot be a tradable under one definition and then be considered a nontradable under another for the purpose of comparison of results. The underlying assumptions about supply response are incompatible with each other under the different definitions of tradability. Adopting a restricted local catchment area, as in classical linkages studies, is equivalent to assuming that most goods are tradables, and thus are treated as supply-constrained in the analysis. At the opposite end of the spectrum, limiting tradables to those goods that are either traded regionally with world markets or are close substitutes for goods thus traded makes most items consumed in the rural study zones nontradables, and thus demand-constrained in the analysis.

The numerical implications of changing tradability assumptions for growth multipliers are major. An extra $1.00 of rural income from the tradables sector in Burkina Faso, for example, leads to a net additional income gain of $1.88 from the production resulting from net new consumer demand and net new intermediate demands, when tradability is defined nationally. This falls to only $0.31 using the more restricted local catchment area. The estimate of net additional income from these sources rises to $3.33 per dollar of new tradable income when only those goods tradable on world

Table 45 Estimated total extra income generated by $1.00 in extra income from production of tradables (including the initial $1.00)

Tradability	Burkina Faso, 1984/85	Niger, 1989/90	Senegal, 1989/90		Zambia, 1985/86 [a]
			Southeastern Groundnut Basin	Central Groundnut Basin	
			(US$)		
Impact of an extra $1.00 of income from farm tradables					
Local	1.31	1.77	1.75	2.03	1.41
National	2.88	1.96	2.24	2.48	2.48
Regional	4.33	3.34	2.73	3.11	n.a.
Impact of an extra $1.00 of income from nonfarm tradables					
Local	1.40	1.84	1.32	1.39	1.41
National	3.07	2.03	1.72	1.69	2.48
Regional	4.62	3.47	2.10	2.12	n.a.

Sources: Chapters 4, 5, 6, and 7.

Notes: "Tradability" means the good in question, or close substitutes, could have been imported from or exported to the catchment area in question (even if it was not) . Tradability defined with respect to the national catchment, for example, means that the good could have been traded to or from adjoining West African countries but not necessarily to or from world markets.

[a]In the Zambia study, initial income shocks from the tradable sector are not broken down by farm or nonfarm origin. Tradability is defined in a manner consistent with a national catchment (that is, potential exports to or from Zambia to Southern Africa Development Council markets). The local catchment results for Zambia are the national catchment area results with fruits and vegetables reclassified as tradables.

markets or close substitutes for such goods are considered as tradables. These simple simulations serve to illustrate the importance of explicitly considering tradability, and the importance of assumptions about supply constraints. The national catchment area in Table 45 is the catchment assumption consistent with our base assumptions of what is truly supply-constrained.

Table 45 also shows multipliers calculated for the hypothesis that growth will begin with an income infusion from rural nonfarm tradables. This would be the case, for example, if the study countries suddenly began to develop and exploit a comparative advantage in the export of handicrafts or manufactured products. Since rural people are assumed to spend income from farm and nonfarm tradables the same way, the differences in the multipliers in the lower half of Table 45 relative to the upper half are due to the differences in intermediate demands for nontradables and value-added shares for the nonfarm sectors, compared with the farm sectors.

Results show that in both Burkina Faso and Niger, nonfarm multipliers are at least as high as farm multipliers, and perhaps slightly more so, even if the number of exportable nonfarm items in Burkina Faso is probably rather limited. In Senegal, farm multipliers are definitely higher than nonfarm multipliers. Because of differences in available data, the Zambia study did not differentiate between income shocks from farm and nonfarm tradables. The difference in the Senegal cases relative to the other two

Sahelian studies is due to the importance of groundnut production in the Senegalese study zone, which is an intensive cash cropping area. Groundnuts use nontradable intermediate inputs intensively, which leads to two unusual results. First, in the southeastern Groundnut Basin, production linkages are even stronger contributors to the overall farm sector growth multiplier than consumption linkages. And second, the farm sector growth multiplier is noticeably larger than the nonfarm one.

The model allows computation of the shares of overall multipliers attributable to consumption linkages (from consumer demand for nontradables) and production linkages (from intermediate demand for nontradables). Results differ considerably by country. The share of farm linkages defined at the national level of tradability attributable to consumption alone was calculated for each country in the study by setting the MBS for both farm and nonfarm nontradables to zero in the multiplier formulae to derive the shares of the overall multipliers from production alone. Subtracting these figures from 100 percent yields the following results: 54 and 48 percent of farm linkages in Senegal come from the consumption side alone, 79 percent in Niger, 93 percent in Burkina Faso, and 98 percent in Zambia. While the multiplier methodology used does not include forward production linkages (the benefit to furniture factories in the capital from a sawmill upstream) it is clear that consumption linkages cannot be ignored, even where production linkages are important, as in Senegal.

The Consistency of Growth and Equity Objectives

Addressing growth and equity issues adequately requires consideration of savings and investment issues, which the present framework cannot handle. However, a surprising consequence of the fact that so many of the items that rural people consume are farm nontradables is the movement toward consistency of growth and equity policies when demand constraints are taken into account. The Asian growth linkages literature reviewed in Chapter 2 tends to stress that since the rural rich have consumption patterns more oriented to spending incremental income on manufactured goods and services, targeting income to the rich rather than the poor will have a greater stimulative effect on demand for nonfarm items than the same income targeted to the poor. The more recent Asian literature also tends to equate "nonfarm" with "nontradable." Together, spending patterns and tradability assumptions in Asia make a trade-off between growth and equity almost inevitable.[22]

[22] Another argument cited in the Asian literature for why income directed to the rich might do more for growth than income directed to the poor is that the poor tend to spend most of their income, whereas the rich have a surplus for savings and investment. The present study could not investigate this specifically, but work by Delgado and Ranade (1987) suggests that the Asian "landlord model" of surplus accumulation may not be appropriate for most of Africa. Since most African farmers are smallholders, and most are poor by world standards, directing income to the "richest third" will primarily lead to additional consumption, rather than additional investment. To the extent that this is true, the relevant issue, then, is differences in consumption patterns of the rich and poor.

The finding in the present report that many farm items in Africa are also nontradables, and thus fundamentally demand-constrained, means that the trade-off between growth and equity is not clear cut without close examination of differential consumption patterns. The key issue is which income group has a higher marginal propensity to spend increments to income on nontradable items.

As illustrated in Table 46, results from the comparable data in the West African cases show manifest differences in the consumption response patterns of nontradables for the poorest one-third of households and the richest one-third. The MBS for farm nontradables falls sharply from the bottom to the top of the income distribution in Burkina Faso and the central Groundnut Basin of Senegal. It falls slightly in the southeastern Groundnut Basin of Senegal. It actually rises slightly in Niger.

In Burkina Faso and the central Groundnut Basin of Senegal, tradable rice is substituted for nontradable millet and sorghum as income increases, as is also the case (but less so) in the more remote southeastern Groundnut Basin. In Niger, nontradable perishable meat and milk play a larger role in the diet, especially as income grows.

The MBS for nonfarm nontradables rises in all cases with income, although more sharply in Burkina Faso and the southeastern Groundnut Basin than in the other cases. Items involved are services and locally manufactured goods. This effect is expected and consistent with the earlier literature. Overall, the fall in the MBS for nontradable farm items swamps the rise in MBS for nontradable nonfarm items in Burkina Faso and the central Groundnut Basin of Senegal. In those samples, the MBS for nontradables of the poor exceeds that of the rich by about 20 percent. In the southeastern Groundnut Basin and in Niger, the MBS for all nontradables of the rich still exceeds that of the poor, but only by 3 to 4 percent.

Thus, results from most of the country samples suggest that at the national levels of tradability, the poor have higher MBSs for nontradables than do the rich, and this is

Table 46 Marginal budget shares by income group, Burkina Faso, Niger, and Senegal

					Senegal, 1989/90			
	Burkina Faso, 1984/85		Niger, 1989/90		Southeastern Groundnut Basin		Central Groundnut Basin	
Sector	Poorest third	Richest third	Poorest third	Richest third	Poorest third	Richest third	Poorest third	Richest third
	(percent)							
Tradables								
Farm	21	19	34	20	8	20	30	14
Nonfarm	8	21	17	33	59	42	24	59
Total	29	40	50	53	67	62	54	74
Nontradables								
Farm	54	32	14	20	12	7	30	6
Nonfarm	16	29	35	36	21	30	16	20
Total	70	51	50	47	33	37	46	26

Source: Chapters 4, 5, 6, and 7.

primarily because the poor have a much higher MBS for farm nontradables than do the richer households. At face value, this suggests that a dollar of income directed to the poor will have more linkage benefits for growth than a dollar directed to the rich, all else being equal. While it is not clear how robust this conclusion is in all cases, especially for Senegal, the general pattern runs contrary to the received wisdom that the rich consume more nontradables than the poor.

Table 47 gives growth multiplier results by income group, using the national-level definition of tradability for the three West African country cases.[23] Each cell is the total increment to overall income from an additional $1.00 of tradables sector income, including the initial shock. The figures in parentheses are the shares of additional income in the nontradables sectors that come from spending on farm nontradables, including farm sector nontradable intermediate inputs. For example, the interpretation of the upper left cell of Table 47 is that in Burkina Faso, the net increase in national incomes from an initial $1.00 shock to farm tradable production of the poorest one-third of households is $3.18. Of the additional $2.18 of growth from alleviation of demand constraints for nontradables, 76 percent is from net spending on farm nontradables, with the balance due to net new spending on nonfarm nontradables. Except for the

Table 47 Source of growth linkages by sector and income group in West Africa

Item	Burkina Faso, 1984/85	Niger, 1989/90	Senegal, 1989/90	
			Southeastern Groundnut Basin	Central Groundnut Basin
			(US$)	
Impact of $1.00 of tradable farm income on overall income				
Poorest third of households	3.18	2.03	2.20	3.06
Percent from farm	(76)	(25)	(66)	(55)
Richest third of households	2.45	1.96	2.32	2.30
Percent from farm	(55)	(35)	(59)	(41)
Impact of $1.00 of tradable nonfarm income on overall income				
Poorest third of households	3.39	2.11	1.69	2.30
Percent from farm	(72)	(26)	(22)	(84)
Richest third of households	2.62	2.02	1.79	1.57
Percent from farm	(50)	(36)	(16)	(13)

Source: Chapters 4, 5, 6, and 7.

Notes: Tradability is defined with respect to trade to or from a national-level catchment area. The numbers in parentheses are the shares of the sector indicated in net additional income from new demand. They are computed as the ratio of the sector's income growth to total income growth, excluding the initial shock to tradables.

[23] Note that the Zambia chapter does not explicitly investigate the link between definitions of tradability and whether spending by the poor creates more net income overall than spending of the same amount by the rich, but an examination of MBSs by tercile suggests that the same results hold at the national level of tradability in Zambia.

southeastern Groundnut Basin, the computed growth multiplier is higher for income increments going to the poor than for increments going to the rich, although it is relatively high in almost all cases.

Therefore, one may conclude that taking a broader view of the nontradables sector than local manufactures is vital to understanding growth multipliers in Africa, from the standpoint not only of correctly seeing how large they are, but also of seeing that they are probably largest for the poorer households. In both size and income distribution, the key ingredient is the fact that many farm items are nontradables. Additions to income in rural Africa are spent relatively intensively on nontradable farm items by everyone, but especially by the rural poor. The estimated multipliers may overstate the true additional growth to be had from alleviating demand constraints by 20 to 40 percent, and the higher growth effects of directing income to the poor may not be a strong result for all locations. Yet there are still clear patterns of high multipliers (even when discounted), high shares coming from nontradables, and higher propensities of the poor to consume demand-constrained items. These findings are too widespread over too disparate a set of subsamples to ignore in pondering African agricultural development strategies.

Growth Strategy Priorities for Agricultural Development in Africa

To the question "Is Africa different?" one would have to say that the study zones are a different blend of open and closed economies than those typically described for Latin America or Asia. On the one hand, comparative advantage is key to sustaining growth, as in small, open economies. On the other, relaxing demand constraints for nontradables is key to maximizing rural output, as in geographically large, closed economies.

Increasing commercialization of the rural economies of Africa will reinforce the importance of tradables as sources of rural income over time. As growth occurs in the tradables sectors, the composition of consumption will change, and some nontradables will become more important in consumer budgets than before, given income-elastic demand for these items. The individual chapters give considerable detail on which types of commodities will become more important.

If millet were to become a tradable in Burkina Faso as a result of improved trade policies and infrastructure, for example, sustained equilibrium rural incomes would increase, as subregions either specialized in millet (if that were their comparative advantage) or something else (perhaps cotton, groundnuts, livestock, or handicrafts) if it were not. Either way, equilibrium income would grow. As millet exports increased, millet would in effect cease to be constrained by inadequate local demand and would be constrained by supply. To continue the example, Burkina Faso's relative expenditure share of fruits, vegetables, meat, fish, milk, local services, local and national manufactures, and many other demand-constrained nontradable items would increase, even as the share of expenditure going to millet is reclassified to the tradables category.

The choice of which rural tradables sector to stimulate to spur growth depends on comparative advantage and not on growth multipliers. Income shocks from both farm

and nonfarm tradables increase net additional employment outside the shocked sector principally through consumption linkages to the farm nontradables sector. To take the metaphor further, the "engine of growth" is found by shifting the supply curve of tradables to the right by reducing either the unit costs of production or distribution of those items. Yet, the number and content of the cars that the engine can pull will depend on how widespread the initial income shock is and how smoothly the rural economy can supply the additional items demanded.

Explicit consideration of the demand side in development strategy emphasizes the advantage of spreading a given amount of growth widely over large numbers of people. In the cases studied, for example, a $1 million increase in rural incomes widely spread would quickly lead to at least another $1 million in growth from net new demand for nontradables, but $1 million in new income to a small cadre of producers would go primarily to savings and investment in that small sector. Ignoring the demand side tends to emphasize the benefits to growth from capital accumulation made possible by the concentration of incomes; including the demand side recognizes the substantive growth benefits of widely distributed income growth.

The empirical analysis above is based on the assumption of a price-elastic supply of nontradables, including, most particularly, farm nontradables. In the Asian context, demand linkages were thought to occur when underemployed labor was drawn into nonfarm production. Given the primacy of labor in the cost structure of the informal nonfarm sector, it was thought that the elasticity of supply of these nonfarm items would be high. In the African zones investigated here, a high share of the nontradables in question involve farm commodities, either directly as farm goods or indirectly as nonfarm processed items. Realizing the growth potential offered by strong demand linkages to the farm sector from both farm goods themselves and nonfarm items will require a price-elastic supply of those things that rural people wish to consume more of as their incomes go up. Reaping the fruits of export-led growth will thus require policy attention to increasing the supply response of nontradable wage goods such as coarse grains and other food items that currently have large MBSs.

The estimated multipliers can be thought of as upper bounds that will be reduced if nontradables have price-inelastic supplies. The literature surveyed in Chapter 2 suggests that multipliers in West Africa may be overstated by as much as 40 percent, because the underlying supply conditions are inelastic for the nontradables likely to be demanded as income grows. Even accepting this figure as an upper bound, the magnitude of the growth multipliers estimated in this study are still extremely high. The sense of the policy message conveyed by a growth multiplier of 2 is not fundamentally different from that conveyed by one of 3, but it is tremendously different from previous estimates of, say, 1.2.

Further research should look at the issue of how policy can increase the elasticity of supply of those nontradables that currently have large MBSs in consumption. Ultimately the dynamic rural consumer items will be those whose demand is currently income-elastic, such as services, radios, batteries, beverages, fruits, vegetables, meat, and dairy products. However, the high average expenditure share for starchy staples suggests that—despite slightly income-inelastic demand for these items—they can

form either a prime source of or major bottleneck to growth. The elasticity of their supply will determine whether demand stimulus will lead to real income growth or to the choking off of growth through rising relative prices of wage goods.

Structural adjustment policies should work to revitalize export and import-substitute sectors in Africa through improved price incentives and encouragement of the private sector to invest in these activities. It seems likely that such a stimulus will be felt mainly in rural areas, which produce most of the tradables in Africa. Being able to sustain this growth will require that additional consumer and intermediate demand coming from the expansion of the exportable sector is not met with rapidly rising relative prices of nontradables.

If, on the other hand, coarse grain prices rise rapidly as cotton and groundnut exports take off, export-led growth will not be economically sustainable, or at least not efficient, because a second round effect of the growth process itself raises the unit cost of production of tradables in terms of units of nontradables. In the export crop analogy, either farmers will switch part of their export crop acreage back into food crops (Burkina Faso, Niger) or hired labor will demand higher wages to meet increased costs of subsistence (Niger, Senegal, and Zambia), leading to a less competitive export sector and not much real income growth for households in that sector.

Better knowledge of which commodities are most likely to be in demand as growth occurs points to those subsectors, other than the tradables themselves, that most require policy attention to support export-led growth. Useful policy insights can be had from inspection of the disaggregated MBS results. Further analytical insights will require a better multisectoral tool than growth multiplier models, probably incorporating a social accounting matrix approach. In some situations, the policy action required will be to improve the access of rural people to grains imported from outside the local area, thus increasing their food security. In some cases, high transport costs suggest that more attention should be given to improving local production and storage. In all cases, the analysis suggests that failure to understand the key role of wage goods supply, especially of basic foods, in sustaining growth in Africa will lead to underexploitation of the growth potential made possible by structural adjustment reforms.

Finally, the farm sector plays several particularly important roles in Africa: as the locus of comparative advantage in many cases, as the main source of nontradable wage goods, and as the main vehicle for broad-based income growth capable of putting growth multipliers into play. To better understand and support these roles is the key to promoting sustainable economic development in the region.

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