**WP 2000-19**
**March 2000**


# Working Paper

Department of Applied Economics and Management
Cornell University, Ithaca, New York 14853-7801 USA

## Asset, Activity, and Income Diversification Among African Agriculturalists: Some Practical Issues

**Christopher B. Barrett**
*Cornell University*

**Thomas Reardon**
*Michigan State University*

It is the Policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

# Asset, Activity, and Income Diversification Among African Agriculturalists: Some Practical Issues

**Christopher B. Barrett**
*Cornell University*

**Thomas Reardon**
*Michigan State University*

Final version
March 2000

Barrett is the corresponding author at 351 Warren Hall, Dept. of Agricultural, Resource and Managerial Economics, Cornell University, Ithaca, NY 14853-7801 USA, tel: 607-255-4489, fax: 607-355-9984, email: cbb2@cornell.edu. We thank Abdillahi Aboud, Mesfin Bezuneh, Michael Carter, Jean Paul Chavas, Dan Clay, Layne Coppock, Peter Little, and Kevin Smith for helpful discussions that helped shape parts of this paper. This work was made possible by support provided in part by the US Agency for International Development (USAID) Agreement No. LAG-A-00-96-90016-00 through the Broadening Access and Strengthening Input Market Systems Collaborative Research Support Program (BASIS CRSP). All views, interpretations, recommendations, and conclusions expressed in the paper are those of the authors and not necessarily those of the supporting or cooperating institutions.

# Asset, Activity, and Income Diversification Among African Agriculturalists: Some Practical Issues

**SUMMARY**: This paper starts from the premise that diversification of assets, activities, and incomes is important to African rural households, in that diversification into nonfarm income constitutes on average about 45 percent of incomes, and the push and pull factors driving that diversification are bound to persist. From that premise, we noted that the empirical study of diversification has been beset by practical problems and issues relating to (1) definitions and concepts, (2) data collection, and to (3) measurement of the nature and extent of diversification. The paper addressed each of those problems. Two points are of special interest to the overall conceptualization of diversification research. The first is that empirical studies have exhibited a wide variety – bordering on confusion – of systems of classification of assets, activities, and incomes as pertains to diversification behavior. We argued that the classification should conform to that used in standard practice of national accounts and macro input-output table construction, classifying activities into economic sectors that have standard definitions, and the classification of which does not depend on the location or functional type (wage- or self-employment) of the activity. We further argued that given a sectoral classification, it is useful to make a functional and locational categorization of the activity, and keep each of these three dimensions of the activity – sectoral, functional, and locational – separate and distinct so as to avoid confusion. The second is that it is useful to have an image of a production function in mind when analyzing the components of diversification behavior: (1) assets are the factors of production, representing the capacity of the household to diversify; (2) activities are the ex ante production flows of asset services; (3) incomes are the ex post flows of incomes, and it is crucial to note that the goods and services produced by activities need to be valued by prices, formed by markets at meso and macro levels, in order to be the measured outcomes called incomes. "Livelihoods" is a term used frequently in recent diversification research, and while its meaning differs somewhat over studies, it generally means household and community behavior, with respect to holdings and use of assets and the productive activities to which the assets are applied. The link between livelihoods and incomes needs to be made by valuing the output of livelihood activities at market (and/or virtual) prices. That valuation permits an analytical link between household/community behavior (thus a micro view of diversification) and the aggregate functioning of markets (thus a link with the meso and macro levels and the policies pertaining thereto).

## 1. Introduction

Diversification is the norm. Very few people collect all their income from any one source, hold all their wealth in the form of any single asset, or use their assets in just one activity. There are several reasons for this: risk reduction, realization of economies of scope, diminishing returns to factor use in any given application, response to crisis, liquidity constraints, etc. At the more aggregate level of households or communities or regions, scarcity of productive resources and

specialization according to comparative advantage accorded by superior technologies or skills or by greater endowments leads to considerable inter-individual diversity in activities and incomes. So no matter the unit of analysis, diversification is ubiquitous.

This is especially true in rural areas of low-income countries, where high transactions costs induce many residents to self-provision in several goods and services, where increasing population pressures often result in landholdings too small to absorb all of a household's labor supply, and where limited risk-bearing capacity and weak financial institutions create strong incentives to select a portfolio of activities in order to stabilize income flows so as to stabilize consumption and minimize the risk of entitlements failure. The result of each of these mechanisms is diversified employment and income patterns. The available comparative evidence suggests diversification of rural household income sources is greatest in rural Africa (Reardon et al. 1998) and nearly as high in Latin America (Reardon and Berdegue, 1999), with about 40-45% of rural household incomes from nonfarm sources in these areas.

Some observers argue that diversification is accelerating in rural Africa (Bryceson and Jamal 1997, Little et al. 1999) as the roll-back of state commercial activities and widespread humanitarian disasters have both opened space for new private sector activity and compelled creative coping strategies. Others claim diversification is just a transitory phenomenon associated with stress (Saith 1992). There are, however, several reasons to expect diversification of incomes and assets to continue to be important in Africa for at least the next several decades.

The first three reasons might be described as "pull" factors. First, income diversification commonly increases with total household income in African rural households (Reardon 1997), both because households have the means to hurdle investment entry barriers to nonfarm activities and because greater wealth in the local economy generates increased demand for nonfarm goods and services, per Engel's Law. If income growth continues, then so should diversification increase. Second, rural development expands market access, inducing a shift from the production of traditional goods (e.g., baskets) to satisfy local rural demand (Hymer and Resnick, 1969) to modern goods for urban and foreign markets (e.g., clothing or metal manufactures), thereby stimulating diversification of the rural economy away from farming (Stewart and Ranis, 1993). Third, long-term trends in infrastructure improvement, town growth, and increasing population density lead to development of the rural nonfarm sector (Anderson and Leiserson, 1980).

Meanwhile, diversification continues not only because smallholders are drawn to it but also because some are forced. Risk reduction in the face of climatic, epidemiological, and market variability, and resource constraints provide such "push" factors behind rural income and asset diversification and will almost surely persist for the forseeable future in rural Africa.

The broad pattern of continue diversification is consistent with increasing specialization according to comparative advantage. One tends to observe a gradual shift from household and individual level diversification, to individual-level specialization but still with household sectoral diversification, to household-level sectoral specialization with intra-sectoral diversification.

Specialization occurs as the local market for a particular good or service expands, and requisite investments in human and physical capital are made.

Diversification and its implications for development and policy are now drawing considerable attention from scholars,[1] policymakers and donors, because of the relevance of the theme to policy and development action. An improved understanding of diversification behavior may help in (1) the identification of effective means of targeting transfers disproportionately populated by the poor or the food insecure, or (2) redressal of impediments to the smooth functioning of factor markets in labor, land and capital that condition on- and off-farm investment that affect the poverty and environmental effects of diversification out of agriculture.

Poverty policy generally aims to improve the asset holdings of the poor, either by endowing them with additional financial, fixed, human, natural, or social assets, by increasing the productivity of assets they already hold, or both. Diversification patterns reflect individuals' voluntary exchange of assets and their allocation of assets across various activities so as to achieve an optimal balance between expected returns and risk exposure conditional on the constraints they face (e.g., due to missing or incomplete markets for credit, labor, or land). Because it offers a glimpse as to what people presently consider their most attractive options, the study of diversification behavior thus offers important insights as to what sorts of policy or project interventions might be effective in improving the asset holdings of the poor.

But the study of asset, activity, and income diversification to date has lacked common definitions or well-established conventions on the collection or classification of data or on the use of indicators to capture observed diversification behaviors. We hope this paper contributes in some measure toward filling some of that gap.

In this paper, we address some practical issues concerning (1) the characterization of diversification patterns, including a basic taxonomy of assets, activities and incomes in rural areas of Africa; (2) practical measurement techniques for gathering and analyzing information on diversification patterns, and (3) interpretation of measures of diversification, especially with respect to welfare.

The report proceeds as follows. Section 2 discusses patterns, determinants, and effects of income diversification in Africa. Section 3 treats conceptual and definition issues. Section 4 treats data collection, and Section 5, measurement issues. Section 6 concludes.

## 2. Patterns, Determinants, and Effects

[1] For surveys of the evidence and literature, see Haggblade et al. (1989), von Braun and Pandya-Lorch (1991), Bernstein et al. (1992), Saith (1992), Reardon (1997), Ellis (1998), Reardon et al. (1998) , Reardon et al. (2000), Ellis (forthcoming).

## 2.1. A brief description of salient patterns in income diversification in Africa

Table 1, drawn from Reardon (1997), shows shares of nonfarm income in total rural household income for 27 case studies in Africa. That review provides some surprising departures from traditional images of nonfarm activities of rural households in Africa.
(a) The average share of nonfarm income is high, around 45 percent.
(b) Nonfarm wage labor income commonly, if modestly, exceeds self-employment income.
(c) Nonfarm earnings are typically substantially greater than either agricultural wage employment earnings or migration earnings outside of southern Africa.
(d) The most worrying finding was the poor distribution of nonfarm earnings in rural areas, despite the importance of these earnings to food security and farm investments. The rich almost always seem to draw a higher share of income from nonfarm sources than do the poor. This poor distribution suggests significant entry barriers and market segmentation.

## 2.2. Determinants of diversification

Many reasons induce rural diversification out of farming. Sometimes diversification is born of desperation, sometimes of opportunity. Risk may play a role, but is not a necessary condition for individuals to choose to diversify. Some diversification is related to diminishing or time-varying returns to labor or land. Some is attributable to market failures (e.g., for credit) or frictions (e.g., for mobility or entry into high-return niches). And still another cause is risk management, either *ex ante* mitigation through portfolio choice or *ex post* coping through adaptation to shocks.

Where returns to productive assets vary across time (e.g., land, labor or livestock across dry and wet seasons) or among individuals within a household or households within a community, data aggregated across time, individuals, or households will exhibit diverse assets, activities and incomes even if there is complete Ricardian specialization according to comparative advantage.

For example, if men and women earn different market wages for cultural or physical reasons, it may be optimal for a risk-neutral household to allocate all male labor to off-farm wage labor while the women work exclusively on farm in production agriculture. Or if one family member has a special talent for weaving, metal working, pottery, or some other skill-based trade, heterogeneous intra-household skill endowments would lead to a rational division of labor with the skilled individual pursuing his or her trade while the others work in less uniquely skilled occupations (e.g., farming).

At the household level, either of these cases will appear as diversified activities and incomes even if the individuals are wholly specialized. Similarly, a household in the semi-arid tropics may allocate all its labor to on-farm production agriculture during the wet season, when the returns to on-farm labor are high, then reallocate all its labor to non-farm activities(on-farm nonagricultural pursuits or off-farm wage labor) during the dry season. Seasonality no doubt suffices to explain a nontrivial part of the diversification commonly observed in annual data.

This observation is not a criticism of compiling aggregate data nor a plea to collect and maintain

all data at an individual level at high temporal frequency. That is costly and often infeasible. Moreover, if people are even somewhat forward-looking or (cooperatively or non-cooperatively) interactive, then they adjust consumption, investment, production, and savings behaviors in response to predictable, seasonal variation . Rather, we merely wish to point out that in aggregate data, diverse activities, assets, and incomes can sometimes be quite simply explained.

Somewhat more sophisticated explanations turn on incomplete markets (e.g., for land, labor, credit, or insurance). Missing land markets, for example, can help explain why a skilled blacksmith who inherits land spends scarce time farming although his comparative advantage lies in smithwork. Were land markets are operative, he might rent out or sell his land and devote all his time to blacksmithing. But in the absence of land markets,[2] and in the presence of labor market imperfections that preclude his simply hiring others to work his land for him,[3] his optimal use of labor time may well include time spent on relatively less productive farming, else his land asset returns nothing to him. Observed diversification of labor activities and income for this hypothetical individual would then be attributable primarily to the absence of markets.

Similarly, a smallholder household endowed with much labor but relatively little land will, in the absence of well-functioning land markets, typically apply some labor to their own farm, and hire some labor out for off-farm wage employment in agriculture. Because individual factors of production – not just labor, but also draft animals, land, etc. – face diminishing returns in most productive activities, when individuals or households are not endowed with the exact ratio that maximizes profits at prevailing (shadow) prices and there are not well-developed asset markets through which they can exchange assets to achieve the optimal mix, then diversification is the natural response. Individuals rationally allocate assets across activities to equalize marginal returns in the face of quasi-fixed complementary assets (e.g., land) or mobility barriers to expansion of existing (farm or nonfarm) enterprises. For the poorest, this typically means highly diversified portfolios with very low marginal returns, or desperation-led diversification (Barrett 1997, Little et al. 1999, Reardon et al. 2000).

In remote areas where physical access to markets is very costly and causes (household-specific) factor and product markets failures, households diversify their production patterns simply to satisfy own demand for some diversity in consumption patterns (Omamo, 1998). This is the microeconomic analogue to the classic trade theoretic model in which movement from free trade to autarky reduces specialization so that local demand for multiple goods and services can be satisfied through own production.

---

[2] We use the concept of "absence of markets" in the sense of de Janvry et al. (1990), meaning that for the household under study, risk premia, transport and search costs.etc., would make it irrational to participate in the market even if it exists in the area.

[3] Moral hazard problems that necessitate labor supervision are the typical issue here, but in some places with low population densities, there might not be enough labor available even were the moral hazard problem entirely absent.

We must note, however, that missing markets can cut both ways, either encouraging or discouraging diversification. For example, missing credit markets can either induce or reduce rural diversification. Imperfect or missing credit markets can impede diversification into activities or assets characterized by substantial barriers to entry. Smallholders typically cannot afford to purchase a truck and enter the long-haul transport niche of the food marketing channel, no matter how profitable it might be (Barrett 1997).

On the other hand, if non-farm or off-farm options can be accessed easily, but credit markets are thin or missing, non-farm earnings can be a crucial means for overcoming working capital constraints to purchasing necessary variable inputs for farming (e.g., fertilizer, seeds, equipment, labor) or to making capital improvements (e.g., bunds, ridges, irrigation) to one's farm (Reardon et al. 1994, Savadogo et al. 1998, Reardon et al. 1999). Or credit may be available, but land is unacceptable as collateral while evidence of steady off-farm cash income will suffice to enable one to borrow. Relatedly, many farmers feel a deep attachment to agriculture as a way of life and are willing to pay, in the form of foregone profits, to maintain the family farm. In the presence of working capital constraints, off-farm earnings may be essential to maintaining a viable farm that requires purchased inputs or that cannot generate enough cash income to satisfy the household's cash requirements (for taxes, consumption goods purchases, school fees, medicines, etc.). There is some evidence of such motivations for off-farm labor by farm families even in North America (Weersink et al. 1998).

In the absence of credit or insurance markets, individuals are typically unable to smooth consumption in spite of a strong desire to do so. When financial markets (for credit and insurance, in particular) are complete, economic theory suggests that individuals consume only the permanent portion of their income and save any transitory positive earnings and dissave to offset any transitory negative earnings. Or, if they are risk averse they purchase insurance to relieve themselves of income risk. For many institutional, infrastructural, technological, and informational reasons, financial markets are highly incomplete in rural Africa so individuals must take action outside of financial markets in order to reduce consumption variability driven by real income variability. Diversification is a primary means many individuals reduce risk.

Diversification is widely understood as a form of self-insurance in which people exchange some foregone expected earnings for reduced income variability achieved by selecting a portfolio of assets and activities that have low or negative correlation of incomes (Alderman and Paxson 1992, Reardon et al. 1992, 1998, 2000). Note that the notion of self-insurance is an *ex ante* concept. Diversification is a means by which individuals mitigate their risk exposure. So coupling weakly covariate pursuits diversified across sectors (e.g., crop production and seasonal metalworking) or across space (e.g., migration) can reduce aggregate income variability in the household. If, as is widely believed, risk aversion is decreasing in income and wealth, then the poor will exhibit greater demand for diversification for the purpose of *ex ante* risk mitigation than do the wealthy.

A related, but distinct role of diversification is to cope *ex post* with shocks to income. When crops fail or livestock die, households must reallocate labor to other pursuits, whether formal

employment off-farm (e.g., wage labor), informal employment off-farm (e.g., hunting), or nonagricultural activities on-farm (e.g., weaving, brewing). Reardon et al. (1992) find that households' capacity to cope with the drought shocks of the mid-1980s in Burkina Faso were strongly associated with the extent of their non-farm diversification patterns. Barrett and Arcese (1998) similarly show that wildlife poaching in Tanzania in part responds to agroclimatic shocks that affect farm labor productivity. Much as risk preferences and differential access to wealth likely contribute to greater demand for *ex ante* diversification by poor people, so too are the poor more likely to diversify *ex post* as a coping response to shocks. They simply have less ability to self-insure through cashing in nonproductive assets than do the relatively wealthy.

One implication of the "diversification as risk management" rationale is that the need for self-insurance is a function of the availability of substitute social insurance, provided through transfers by the government, by non-profit agencies, by community or family members. Since social insurance can at least partly substitute for self-insurance, one would expect greater need for asset, activity, and income diversification where social insurance is relatively scarce.[4] This may help account for the unusually high dependence of African farm households on non-farm income, as governments, communities, and relief agencies offer meager and frequently tardy safety nets, and the social fabric of traditional safety nets appears to be stretched or unraveling in many places.

The final explanation for diversification patterns is the existence of economies of scope in production. Economies of scope exist when the same inputs generate greater per unit profits when spread across multiple outputs than dedicated to any one output. The concept is thus distinct from that of economies of scale, in which per unit profits are increasing as the amount of all inputs to production grows. Economies of scale tend to favor specialization. Most empirical studies of African agriculture find no significant economies of scale beyond a very small farm size, attributable in large part to the absence of sophisticated water control or mechanization. In this setting, there is little pressure to concentrate production in a single crop. Given widespread recommendations for crop rotation and integrated crop-livestock systems, there are likely significant economies of scope, however, although we are unaware of formal empirical tests of this hypothesis in the context of African agriculture.

Diversification across crops is less likely attributable to risk management – since the yields of different crops are highly, if imperfectly covariate – than to economies of scope due to soil and water management and to heterogeneous land quality (fertility, drainage, slope, etc.). An interesting further point relates to how economies of scope might vary with farm size, and thus with wealth. In a study using data from Wisconsin dairy farms, for example, Chavas and Aliber (1993) found significant economies of scope that were declining with farm size. If this is true in African agriculture as well, then the smallest operators face the greatest incentive to diversify activities and income.

[4] Weersink et al. (1998) find empirical support for this hypothesis in comparisons of the diversification patterns of New York and Ontario dairy farmers.

### 2.3. Effects of diversification

Reardon et al. (1998) note that there is little controversy as to the short-term effects of participation in nonfarm activity on food access. As discussed above, a given household copes with a drought or other harvest shortfall by, among other things, working off-farm and raising the cash to fill the food deficit. A case study from Burkina Faso before and after the 1984 drought illustrates the typical effects: households with greater income diversification were able to buy food and weather the effects of the drought, and tended to have higher overall incomes than those who were not able to supplement their farm incomes with rural nonfarm (RNF) incomes (Reardon and Matlon, 1989). Moreover, RNF income is often a major source of savings for farm households in poor areas, which are then used for food purchase in difficult times (Reardon and Mercado-Peters, 1993).

The controversy begins to emerge when one is dealing with longer-term food security effects. Namely, is it true that working off-farm (or in cash cropping) will reduce household food availability and lead to malnutrition due to the competition between the farm work and food production? The data do not tend to support such a position. As part of a multi country study (covering 13 case studies in Africa, Asia, and Latin America) investigating whether malnourished poor households depended more on non-farm income sources as compared to non-malnourished households, von Braun and Pandya-Lorch (1991) found that the differences were not significant.[5]

Does diversification improve rural equity? Overall, the evidence is quite mixed over developing countries, as reviewed in Reardon et al. (2000). Such findings are typically derived either by comparing farm income Gini coefficients against total income Gini coefficients, or by Gini decomposition analysis with respect to changes in different income sources (Lerman and Yitzhaki 1985, Boisvert and Ranney 1990, Adams and Alderman 1992) or to exogenous shocks (Reardon and Taylor 1996).

Reardon (1997) found that over most of the available data in Africa there tends to be a strong positive relation between nonfarm income *share* and total household income, and therefore an even more pronounced relationship between the *level* of nonfarm income and total income. In other low- and middle-income regions, such a relation is far less common, suggesting there are features of rural markets in Africa that especially impede entry of the poor and cause nonfarm income diversification to be largely distributionally regressive.

Thus, an important factor determining the net distributional effects of diversification patterns is the nature of barriers to entry into or mobility within certain non-farm subsectors. If diversification into high-return non-farm activities (e.g., long-haul transport, salaried employment) requires a substantial sunk investment in equipment or skills (fixed or human productive assets),

[5] RNF activities also influence rural food security through their various effects on farming. Evidence and hypotheses concerning the effects of nonfarm income diversification on agricultural systems is found in Reardon (2000).

only those with reasonable liquidity and the capacity to undertake such investment will have access. There is widespread evidence that *ex ante* wealth conditions subsequent investment patterns, creating a type of asset poverty trap in which the poor have trouble breaking out of a diverse set of low-return activities while the wealthy are able to diversify into more lucrative ones (Rosenzweig and Binswanger 1993, Barrett 1997, Dercon 1998, Reardon et al. 2000). Meanwhile, the poor will only be able to enter low-return activities where entry and exit are frictionless. Dercon and Krishnan (1996) observe such patterns in rural Ethiopia and Tanzania, Barrett (1997) documents this pattern of differentiated entry into the food marketing channel in Madagascar, and Reardon et al. (2000) offer a comparative review of this problem across various settings in low- and middle-income countries. In the medium run, it is probable that this will lead over time to an increasingly skewed distribution of land and other assets in rural Africa. There is already evidence of this in Western Kenya (Francis and Hoddinott, 1993) and in Rwanda (Andre and Platteau, 1998).

## 3. Definitional and Conceptual Issues

The literature on rural diversification is plagued by unclear definitions. This section therefore addresses questions surrounding variable selection and definition. Figure 1 shows the relation between the two main variables of interest – assets and incomes – mediated by productive activities. Individuals[6] own assets, some of which (nonproductive assets) generate income directly and others of which (productive assets) generate income indirectly through their allocation to productive activities such as farming or furniture manufacture or commerce. The income from those activities, plus any income generated by non-productive assets (e.g., household valuables, social ties), together constitute total income, shown at the bottom of the figure. We discuss assets, activities, and incomes in turn.

We make no claim for the superiority of one variable – assets, activities, or income – over another. Each has advantages and disadvantages relative to the others. Rather, we want to emphasize the complementarity of these measures. Income offers a measure of more direct interest but also one in which it can be difficult to distinguish choice from chance. Portfolio theory focuses on asset allocation, but assets can be very difficult to value correctly in settings like rural Africa. Activities are of no direct theoretical relevance themselves, can be difficult to value, and necessarily miss the generation of income from nonproductive assets, yet activities measurement offers clear intermediate measures of asset allocation *ex ante* for the purpose of income generation, and thereby help identify individuals' explicit diversification choices, detached from the effects of shocks to productivity and income.

Overall, we believe it best, when possible, to use multiple indicators of diversification behavior as independent checks on the inference one reaches using any single indicator. This is not just because the measurement errors associated with each type of variable will typically be

[6] The analysis can be repeated at any higher unit of analysis (e.g., household, clan, village, region, nation) simply by aggregating across individuals.

independent of one another, but also because wealth and incomes are not necessarily well correlated in rural Africa.

### 3.1. Assets

Assets are stocks of directly or indirectly productive factors that produce a stream of cash or in-kind returns (or what economic theorists typically call "endowments"). Common examples include bank deposits, human capital land, livestock, machinery, stores, transport equipment, etc.. Portfolio theory, on which much of the diversification literature depends, emphasizes assets as the subject of agent choice when trying to maximize expected income, minimize income variability, or some combination of the two. So assets are a logical subject for study of diversification behavior. Indeed, asset and income distributions are analytically inextricable from one another.

Assets can be usefully, if crudely, divided into two categories (see Figure 1).[7] Productive assets are those that are used as inputs into production processes. The mains types of productive assets are human capital (time, skills, health), real property (land, livestock, water, forest), financial capital, and fixed capital (e.g., farm or manufacturing equipment). Nonproductive assets yield income through generating either transfers or capital gains (including negative capital gains, i.e., capital losses) when one liquidates the asset. The main subcategories of nonproductive assets are household valuables (e.g., jewelry and precious metals), and social claims (e.g., on family or friends, government, churches or other groups). Both sorts of assets offer a store of wealth and a source of income. But productive assets must be allocated to one or more activities in order to generate income.

For the sake of simplicity, Figure 1 does not distinguish assets on the basis of ownership. Any of these assets may be privately held by individuals, collectively held by a restricted group of individuals (a household, an extended family, a community, etc.), or collectively held without access restrictions. The latter is typically referred to as open access property or a "public good," while the second is often labelled a "club good". The nature and distribution of rights over assets will generally affect the returns to the asset, the distribution of those returns, and the rate of accumulation or depreciation of the asset. A large literature on common property issues and on the effects of alternative property rights regimes addresses these topics, which fall outside the scope of this paper. But in many cases, analysts of diversification behavior will want to distinguish assets not only by whether they are productive or nonproductive, but also based on ownership characteristics.

Some assets are highly mobile across alternative allocations. Financial capital can be applied easily to almost any activity. But not all assets can be allocated across all productive activities. "Asset fixity" results when particular assets are only useful in particular activities, e.g., mechanical harvesters in crop production, milking equipment in livestock production, or customized

[7] A variety of alternative, more detailed asset classification schemes exist. See Maxwell and Smith (1992), Reardon and Vosti (1995), or Ellis (forthcoming) for some other methods.

manufacturing equipment. Activity-specific assets are difficult to reallocate across uses, so their returns tend to be highly variable, as compared to more fungible assets. Much of the cost of such assets is "sunk," in the sense that it is unrecoverable from sale on a secondary market. In the presence of uncertainty, rational investors invest less in assets characterized by higher sunk costs (Chavas 1994, Dixit and Pindyck 1994).

The key problem with studying asset diversification is that goods and services markets are typically better developed in rural Africa than are assets markets. So while it may be relatively easy to establish the income value of home-consumed output based on the prevailing local market price, it may be extremely difficult to establish the value of the human capital, land, or business assets held by a household. As a consequence, where incomes can be summed across assets and activities into a single, money-metric aggregate, assets typically must be treated as a vector of physical quantities not amenable to aggregation.[8]

### 3.2. Activities

Activities are the particular uses to which productive assets are put, so activities are *ex ante* flows of asset services that map the stock concept of assets into the *ex post* flows of income. For example, livestock can be allocated to crop production (plowing and manuring), to providing transport services (pulling carts), to milk production, or to reproduction (calf breeding), all activities that generate income flows. Land can be allocated to crop production, livestock production, manufacturing, commerce, or services (e.g., recreation). Activities use productive assets, often a combination of multiple complementary assets, to generate incomes. For example, rice income is the product of allocations of land, labor, and perhaps cash (transformed into purchased inputs), irrigation or other farm equipment, or animals (for traction and/or manure).

Activities are a convenient intermediate measure, the means by which productive assets and incomes are linked. The drawbacks to using data on asset allocation across activities are that: (a) activities themselves are difficult to value, (b) like assets, they therefore become difficult to aggregate into a single measure that spans asset categories, and (c) activities necessarily miss the income that accrues from nonproductive capital. It is reasonably straightforward to study the activity allocation of a single asset (e.g., shares of land or labor allocated to different activities), but there is no clear method by which one can sum such allocations across assets. If "unearned" income accruing from nonproductive assets is not equally distributed across the population, then ignoring income (i.e., transfers, capital gains) earned through nonproductive assets can lead to significant bias if one is trying to characterize income patterns and integrate the study of diversification behavior into consideration of poverty reduction, agricultural development, or environmental protection strategies.

[8] Livestock are commonly an exception to this rule in that one can usually establish current market values and thereby aggregate across animals, weighted by their values, to establish the total value of the herd.

### 3.3. Incomes and their classification by source

Since most analysts understand the motivation to diversify as income maximization, income stabilization, or both, income is an obvious candidate variable for study. Income is the cash or in-kind cash-equivalent yield from a household's assets. Yet if income is stochastic, the observation of *ex post* income realizations may yield a misleading picture of decision-makers' *ex ante* efforts to diversify. Since income is the end result of the transfers and capital gains garnered from nonproductive assets and the returns from the allocation of productive assets to particular activities, an alternative, *ex ante* approach is to study the diversification of assets or activities, as the previous two subsections discussed.

Incomes are typically classified by their source. But the language used can be confusing. The terms "off-farm," "non-farm", "nonagricultural," "nontraditional," etc. appear routinely and in seemingly synonymous ways. Perhaps this is because the nature of diversification varies so markedly across agroecologies, cultures, and seasons, or maybe it's because few studies aim to study diversification behavior but, instead, describe diversification patterns *ex post* based on surveys designed for another purpose. But since comparative work in particular depends on using a standardized set of definitions for variables, we think it important to address conceptual and definition questions explicitly.

The basic distinctions among activities and incomes are to be made along sectoral and spatial lines, although those lines are sometimes blurry.[9] As we emphasize in the next subsection, in order to maintain a logical correspondence between micro and macro analyses, we think it most helpful to follow standard national accounting sectoral classifications. So the key discretionary choices of diversification researchers revolve more around distinguishing the sector of the activity, whether it is self- or wage- employment (see subsection 3.3.2), and its location (on-farm, i.e., at-home, or off-farm, i.e., away-from-home, and for the latter, whether it is local or migratory).

Table 2 depicts the components of rural household income using a three-way classification of earned income (i.e., income from productive assets) by (a) sector (e.g., farm vs nonfarm), (b) function (wage- vs self employment), and (c) space (local vs migratory). Each of the dimensions of the classification is discussed further below.

#### 3.3.1. Sectoral composition

The basic classification of activities is the **sectoral** distinction common to national accounting systems: primary (agriculture and mining and other extractive), secondary (manufacturing), and tertiary (services). This leads directly to the distinction between "agricultural income" – that related to the production or gathering of unprocessed crops or livestock or forest or fish products – and "nonagricultural income" – all other sources of income. We advocate assignment of

[9] Saith (1992) similarly emphasizes "locational" and "linkages" approaches to defining diversification patterns, although his definitions do not map precisely to ours.

activities to sectors in a manner consistent with national accounting practices in order that one can aggregate individual and household level data to sectoral, regional, and national levels consistently with the macroeconomic accounts that typically drive policymaking. That is, standard accounting practice already exists for sectoral assignment of various activities, but this needs to penetrate household work. To date, such micro-macro correspondence has been too rare.

The basic assignment rules are the following.
(a) The primary sector activities are production processes that produce **raw** agrifood products with one of the production factors being natural resources (land, rivers/lakes/ocean, air). The process can involve "growing" (cropping, aquiculture, livestock husbandry, woodlot production) or "gathering" (hunting, fishing, forestry).
(b) The secondary sector activities are production processes that use raw physical intermediate inputs (such as maize, milk, iron, wood) and process them into manufactured goods (such as maize flour, cheese, pails, furniture).
(c) The tertiary sector activities are production processes that produce services (transport, commerce, banking, and so on) using physical capital and labor.

Notice that the sectoral assignment has to do only with the nature of the product combined with the types of factors used in the production process. It is **very important** to note that, for a sectoral assignment of an activity, it does **not** matter:
(a) where the activity takes place (in the domicile, on the farm premises, in town, abroad),
(b) at what scale (in a huge factory or by a single person enterprise),
(c) with what technology (meaning what combination of labor, capital, land, and intermediate inputs) – for example, it would not affect the sectoral assignment whether the production process uses big, imported looms or small wooden handlooms, or giant cassava processing equipment or a hand-held grater and a cauldron –,
(d) whether the participant earns profit or labor income (wages or salary) from the activity (the "functional" distinction discussed in subsection 3.3.2).

However, researchers and government/donor technical staff commonly assign activities to sectors in arbitrary ways inconsistent with the above classification and assignment rules, themselves derived from standardized national accounting practices. For instance, it is common to observe researchers ranking at-home cheese making as a primary sector activity (agriculture), or agroindustry (such as cassava processing firms or plants) as agriculture. Such discrepancies occur for any of several reasons.
(a) The researcher erroneously takes into account location, scale, or technology in making the sectoral assignment. For example, activities done at-home with crop or livestock products as inputs and done at small scale and with labor-intensive technologies are often erroneously classified as agriculture. Although they are indeed closely linked with agriculture and the household farm economy and culture, they are not agriculture.
(b) The researcher focuses on the economic agent (e.g., the person that just milked the cow (agriculture), who is also the person that is making the cheese (manufacture).
(c) Government or donor agricultural divisions often want as broad a definition of agriculture as possible to increase their mandate or because it makes practical/operational sense to treat certain

subjects joint with agriculture. (Hence the tussles one observes between agriculture and industry ministries as to "who gets" agroindustry.)
(d) The researcher confuses "off-farm" (a location indicator) with "nonfarm" (a sectoral indicator). Thus, agricultural wage employment income should be classified as agricultural (sector) and off-farm (location) income, but it is not nonfarm income. Conversely, nonfarm activities can take place "on-farm" (or the less confusing term, at-home), as noted above.
(e) The researcher confuses production linkages with classification in the same sector, as with agroindustry, which has production linkages upstream from farming in farm input provision, and downstream from farming in agrifood processing and distribution.
(f) The researcher bases sectoral classification on the degree of commercialization of the activity (whether it is "home-production" just for consumption at home, or whether the product is sold).

An aside is perhaps needed here to clarify the distinction between whether the activity is "home-production" or whether the labor or product is sold and generates cash or in-kind receipts. It is common for farm and nonfarm activities in rural areas to have components of both. For example, a woman cooks rice dishes and feeds her family from part of the output and sells the rest in a street stall. Strictly speaking, just as one imputes a value to own-farm production consumed at home and counts that as part of gross income, one should similarly impute a value to home production at the prevailing market price. The production of home-consumed goods and services requires labor time and other asset services and thus is a form of diversification. However, in survey practice it is common to impute value only to home-consumption of nonfarm production when part of the product is sold (such as in the rice dish preparation example above). It may be difficult to impute values to all household production because many non-marketed activities have no clear counterpart in local markets and thus calculating an opportunity cost and applying it in imputation is difficult. There have, however, been some recent advances in methods for valuing nontraded goods and services (Jacoby 1993, Barrett and Sherlund 2000).

### 3.3.2. Functional composition

Given a sectoral assignment of an activity, one next makes a "functional" distinction. The basic one is between wage-employment and self-employment.

The assignment of particular rural activities to functional categories is often difficult in practice. Reardon (1997) emphasizes the importance of using the appropriate survey instrument to enumerate each activity and other points regarding the practice of functional classification. We raise several such points here.

First, as many small rural enterprises involve one family member managing and another family member as an "employee", at issue is how to classify the latter. From the household income viewpoint, it is self-employment. From the individual income viewpoint, however, it is in theory wage-employment. But in practice the wage might not be in cash, and might only be sharing in consumption good or services bought by the manager, access to loans, and so on, all of which are difficult to enumerate. So it is often easier to count both as self-employment and assign shares of the net income of the enterprise. Alderman (1993) notes, "Strictly speaking, the measure that is

most easily obtained is a measure of returns to labor, management, and assets. It is more difficult to estimate profits distinct from labor or to estimate a production function. However, the separation of labor income from profits per se is not necessary to determine total income" (for that activity).

Second, there are ambiguities in classification of a given activity between self-employment and wage-employment in the developing country rural economy. In practice, there is a continuum from "clearly wage-employment", through a grey area where an activity could be classified as either wage- or self-employment, to "clearly self-employment". Activities which are "clearly wage-employment" involve (at least an implicit) employment contract where the employer can give orders to the employee. An unambiguous example is an employee in a small rural firm, such as a butchery at a rural market. Self-employment labor demand is derived from the demand for the product/service. Activities which are "clearly self-employment" involve the ownership of a firm that produces goods or services, the buyer of which cannot give orders to the firm, and takes the products "as sold". An unambiguous example is the charcoal producer who collects wood, processes it, and sells bags of charcoal by the roadside. Another common example is the retail merchant operating from a small shop or roadside stand.

There may, however, be numerous grey area activities, for the following reasons.
(a) African rural firms are usually small, 1-2 persons (Chuta and Liedholm, 1990). The owner of a small firm providing services such as hair-dressing or home granary repair takes instructions from the client, often performs the service at the client's home, and uses little physical capital.
(b) Small manufacturing firms such as furniture makers often take purchase orders and specific instructions from clients, undergo inspection by the client during production, and modify the product to suit the client. The above two situations are referred to as "agency contracts," non-employment contracts in which the buyer of services gives detailed and precise instructions to the agent without actually becoming the manager of the production process. Hence, in the African rural economy, where firms are small-scale and operate with low capital/labor ratios, there is often ambiguity in the distinction between an employment contract and an agency contract.

### 3.3.3. Spatial composition

Given a sectoral and functional categorization of an activity, there is finally a **spatial** categorization. There are two broad categories with some important subcategories. First, an activity can be “local”, with two sub-categories: (a) at-home (or the more ambiguous term “on farm”);[10] (b) local away-from-home, with subcategories of (i) countryside or strictly rural, (ii) nearby rural town, and (iii) intermediate city. Second, an activity can be “distant away-from-

[10]In rare circumstances, one comes across rural African households whose real property is scattered quite widely in space, so that one could work on real property operated by the subject but beyond daily commuting distance from the (principal) home. In such unusual cases, one can add a fourth spatial category, distant on-farm. Hereafter we ignore the possibility of this category since it is rare in rural Africa.

home" (or the simpler but sometimes ambiguous term, "migratory"), with subcategories: (a) in-country rural (e.g., in inter-zone migration), (b) in-country urban (such as to a distant metropolitan area), and (c) foreign. The local versus in-country versus foreign distinction has several advantages. It permits one to judge how dependent the household is on the local economy and its vicissitudes, to study local intersectoral linkages between the farm sector (agricultural) and nonfarm (non-agricultural) sectors, to study rural-urban linkages within the country, and to marry micro-level observations up to macro-level observations of workers' remittances and other unrequited transfers in the balance of payments.

Several practical issues arise in assigning a given activity to one of the above categories. First, a household can be "rural" (located in the countryside) but its activities may be a mix of urban and rural. There is, however, ambiguity in the way researchers use terms such as "rural nonfarm income" because at times they mean the nonfarm income (earned anywhere) by rural households, and other times they mean the nonfarm income earned only in rural areas by rural households. It becomes even more complicated when urban households earn rural income, a common phenomenon in Latin America (Reardon and Berdegue, 1999). National surveys often use only the location of residence of the earner and do not distinguish location of the activity. Our recommendation is simply to be clear about the definition used.

Second, the definition of "local" is usually arbitrary and case-specific. Researchers use a variety of definitions. The most common is some administrative unit in which the household is located, such as a district or province; the use of this is that it is immediately understood by local leaders and is unambiguous. The inconvenience is that it does not necessarily have any economic meaning. Another common practice is to employ an economic definition of local, say in terms of the area where the household makes most of its consumption expenditures, or an area easily reached by day workers by local transport means (which may be merely walking). Sometimes the latter is referred to as "daily commuting distance" which of course depends on the means of transport and road quality.

Third, there is some ambiguity and case-specificity as to what is "rural", and thus at what point a diversification activity moves from being a local nonfarm activity to a migration nonfarm activity. There is a gap between research practice and current official classifications. On the one hand, some researchers (e.g. Abramovay, 1998) classify rural using economic/social criteria and not only demographic/spatial terms. This tends to mean that rural is countryside, rural town, and even intermediate city. (A term common in Latin America is "rur-urban" for rural towns and intermediate cities.) They justify this by noting the close production-linkages and expenditure-linkages between rural and urban activities, especially between agriculture and "rur-urban" nonfarm activity, and by noting that commuting is common between rural households and rural towns (and urban households to agricultural jobs). On the other hand, by contrast, it is common for governments to specify demographic limits for rural (e.g., all population agglomerations of 5000 or less persons) that do not necessarily have economic justification. Sometimes these cutoff points are at what researchers consider excessively low populations, so that areas officially classified urban appear quite rural. In Asia, by contrast, one tends to find that rural is classified as "outside the major metropolitan areas". In any case, what is classified as rural in one country may

be urban in another due to preferences of governments, density of population and size of rural towns, and so on.

Fourth, it is common in Africa for migration to be seasonal (especially outside of areas where there is long-term migration to work in mines) and circular.[11] There is also, of course, permanent migration within rural areas and between rural and urban areas. In theory, none of these categories of migration presents ambiguity in classification, but in practice there are methodological issues to consider.
(a) Some activities are "mixed" in that they have local and migratory components (such as livestock commerce where the merchant travels outside of the local area to purchase animals and then returns to sell them). Such mixing can also be between countryside and rural town, such as itinerant merchants.
(b) It is not always clear whether the income from the migrant is current earned income of the household (that is, the migrant keeps his/her status as a household member) or whether the income is "transfer" income that a non-household member (perhaps a family member who permanently migrated) sends to the household. One thus needs to define household member. It is common to fix some minimum amount of time during the year that the person has to be in residence in the household. Use of national survey data can be frustrating in this domain, because if migration remittances are reported, there is a lack of clarity as to whether they are earned or unearned (transfer) income.

### 3.4. The relation between livelihoods and the assets-activities-incomes approach

In recent years, a literature has emerged that emphasizes "livelihood" diversification.[12] The literature exhibits some variation in definitions of "livelihood," as reflected in these prominent selections:

1) Chambers and Conway (1992: 7): livelihood "comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living."

2) Ellis (forthcoming): "a livelihood comprises the assets (natural, physical, human, financial, and social capital), the activities, and the access to these (meditated by institutions and social relations) that together determine the living gained by the individual or household."

---

[11] By circular migration, we mean migration for a period longer than just a season, but with subsequent return. A good example offered by young men who move to a city to work and build up savings for a few years until they can return to their home area, acquire a wife, land, livestock or perhaps a local business, and then remain in their rural home thereafter. Bigsten (1996) offers a nice description of such patterns.

[12] This literature is nicely reviewed by Davies (1993), Ellis (1998 and forthcoming), and Bryceson (1999).

3) Ellis (forthcoming); "... income at a given point in time is the most direct and measurable outcome of the livelihood process."

Given the importance of the livelihoods concept for current action by NGOs and donors in rural African development, it is useful to explore the relation between this concept and the concepts on which we focus in this report (diversification of incomes, assets, and activities). We believe there is significant "value added" to the debate, and the clarification of discussions and the design of actions, to do this.

The livelihoods approach has contributed several important points to the rural development discussion: (1) it emphasizes the plural "activities" and hence links to the idea of diversification; (2) it implies an ongoing process and thus is not just a static concept; (3) it emphasizes assets as a driving force of the capacity to undertake activities; (4) it implies that a diversification of assets is the counterpart of the diversification of activities which one can call types of employment.

The definitions or description of a livelihood is akin to a description of a production function, with activities (flows of output) determined by access to and use of assets (factors), and thus similar to the general flow that we described in Figure 1. However, several further observations about the livelihoods approach are in order.

First, prices and wages are missing from the model implied by the livelihoods concept, and thus the valuation of the outflows of output (or costs of asset or factor use), which is necessary to derive incomes from the livelihood "production" process. The valuation of that activity to produce income requires multiplying the price (wage, or price of the product) times the flow of output from the activity or the labor into the activity. This point is important not just because one needs to add prices to the model to make a direct link between livelihoods and incomes. Adding prices to the model also allows us to make a link between general economic or market conditions, policy shocks, and incomes. Prices thus allow us to link the macro and meso levels at which policies and projects are made and implemented with the essentially micro level of the livelihoods approach.

Second, while an analyst can compare incomes or asset holdings or employment over project or target areas, because these are empirical measures expressed in monetary or physical units, one cannot similarly compare "livelihoods" because, by the definitions cited above, these are processes. Thus, at a minimum, studying livelihoods is not an alternative to studying incomes, assets, and employment, in the same way that studying the process of farming is not a substitute for understanding how much wheat is grown, what price it fetches, nor how much labor, fertilizer, seed, and water are used per unit of land. Moreover, by carefully understanding the latter inputs and outputs, assets and activities, one can more systematically characterize the production process itself - and thus take steps to compare them. Using the production function analogy again, by knowing the relative levels of use of various inputs to produce a unit of output, one can describe the production technology in terms of its factor bias, say "labor using and capital saving." By analogy one could do this for livelihoods, but taken as relative weights of use of assets to produce an activity (maintain an employment or produce goods and services). Hence, a particular activity

might be skill-intensive and labor-using but not require much capital. A given household or community might produce 100 dollars of income with that 'technology' while another might do the same with intensive use of capital and little use of labor.

The ability to draw conclusions about relative asset or factor intensities in producing income is important because it relates the process of earning income to the mix of assets held, and thus their "shadow prices" or implicit prices to the user. For example, if the household has lots of unskilled labor and little capital it will tend toward using "livelihood processes" or production technologies that are labor intensive and capital saving. Such livelihoods may have different risk and return profiles than less labor- and more capital-intensive livelihood strategies, leading to different stochastic income streams across households (Rosenzweig and Binswanger 1993, Dercon and Krishnan 1996, Dercon 1998). However, that household might find that such a technology is not sufficiently "productive" (the labor used has low productivity of income, given prices) and may want to increase its use of capital. Adding capital to its portfolio for that purpose would then be "asset diversification". The cost of and payoff to doing that are determined both by the institutional factors highlighted in current definitions of livelihoods, but also by factor and output markets, and policies that affect them.

Third, although livelihoods describes a process, because it does not make explicit the presence of prices, it cannot make explicit the role of price risk as a determinant of factor choice or asset use, nor of the aggregation of output from livelihood processes as affecting overall prices. It cannot thus show how an insurance scheme can change livelihood processes, nor how a change in livelihoods can cause a glut resulting in falling prices and (net seller) producer welfare. In the same vein, livelihoods cannot explain why and how the growth of a town nearby can change livelihood "outputs" nor "technologies" because that urbanization affects product and factor prices and market size, and hence economies of scope. That becomes the fundamental rift between market studies and policies and livelihood discussions, and more fundamentally yet, between competitiveness and poverty alleviation debates.

## 4. Data Collection Issues

This section discusses some of the data collection challenges facing diversification researchers. Section 5 then reviews the construction and use of alternative diversification indicators one can construct using the data collected. This is not meant as a "cookbook" for data collection on diversification behaviors. Rather, we wish to call attention to issues researchers should confront explicitly prior to designing or fielding surveys meant to inform diversification issues.

### 4.1. Why has there been a relative dearth of surveys on incomes and assets?

Income and asset data have been collected less comprehensively in Africa than in other developing regions for several reasons.

First, the general tendency for analysts focusing on household poverty, expenditure, and

consumption has been to steer clear of collecting income data and instead to collect expenditure data from which they construct proxies for total income, poverty, and other welfare measures. Glewwe and van der Gaag (1988) argue that because of the complexity of accurately capturing the net returns to all activities, and problems of timing and of inclusiveness, income measures tend to exhibit considerable variability and tend to be lower than simultaneous expenditure measures, sometimes by substantial margins. This practical concern, combined with the implications of the permanent income hypothesis for consumption smoothing, motivate an increasing tendency in much formal survey work to focus data collection on expenditures rather than on incomes. But expenditure surveys are unable to address questions of diversification behavior in incomes and assets, especially where there is a need to disaggregate by sectoral incomes, by individuals, or both (Alderman, 1993).

Second, there has been traditionally a widespread assumption (despite early work in the 1970s for example by Matlon 1979) among researchers that nonfarm sources of income are unimportant to most farm households in Africa (Hill 1982). The implication is that collecting data on agricultural output (such as is done in agricultural censi, themselves rare in Africa) is sufficient to estimate rural household incomes. By extension, enumerating land and livestock would then capture most rural household assets. Note that the counterpart of this assumption in the farm household modeling literature for this region is the assumption of "missing labor markets" or an assumption that the labor market is only agricultural.

Third, the difficulties of income and asset surveys often dissuade researchers from asking more than "whether" households undertake nonfarm activities, but not "how much" are net earnings from such activities. The fears center on several legitimate observations.
(a) There is often a diversity of activities by several household members over several seasons of the year, making surveys complicated.
(b) The activities are usually in the informal sector, sometimes for the purpose of avoiding regulations and taxes, and might therefore not be readily declared by respondents.
(c) The activities are often undertaken part-time and mixed with other activities (such as operating a small-scale retail commerce business mixed with household chores and farm labor in a given season).
(d) Often the units of income and costs are local and "non-standard" and payment is sometimes partially in-kind, making consistent valuation difficult.
(e) The participants are frequently illiterate and rarely keep business or wage records that ease recall.

Fourth, the rural nonfarm theme falls between institutional walls of governments and research institutions – being nonfarm means that agricultural researchers and policy institutions do not usually believe that it is in their "mandate." Being rural, informal, and usually small-scale means that those involved with industry and employment policies and research usually eschew it for urban, medium-large scale, and formal enterprises.

Nevertheless, there is no alternative to collecting asset, activity, and income data from the farm and nonfarm sectors and on-farm and off-farm locations if one wants to understand diversification

patterns, determinants, and effects. To that end, the next section discusses issues and methods related to nonfarm income, activity, and asset surveys. We focus on the nonfarm aspect because there is relatively less on this in the survey literature.

### 4.2. Designing survey instruments to recall nonfarm income and employment in Africa

This subsection reviews issues related to undertaking detailed surveys that attempt to solicit recall, as accurately as possible, say over one year, of (1) the sources of nonfarm income; (2) asset holdings and changes; and (3) activities/employment of assets. We do not treat issues of agricultural surveys here. See the following regarding elements of a multitopic survey pertinent to diversification themes: Reardon and Glewwe (2000) for a detailed treatment of agricultural data collection issues, Vijverberg and Mead (2000) on self-employment in the nonfarm sector, and Anderson-Schaffner (2000) for wage employment in both sectors, and Lucas (2000) for migration.

Several general points related to survey design should be noted. First, questionnaire design is usually (and should be) very different for wage-employment versus self-employment. Thus, two separate questionnaires are recommended to capture these. Moreover, migration income is also usually captured in a separate instrument.

Second, in African rural households it is common for:
(a) more than one adult to have a nonfarm activity;
(b) these activities to differ over household members;
(c) all adult members to participate in farm activities (that is, it is uncommon for a member of a farm household to specialize in nonfarm activity);
(d) an individual to have more than one nonfarm activity, but to consider one primary and one secondary;
(e) most females to also produce household goods and services ("z goods" in the language of the new household economics) such as childcare, cooking, and products for household use in addition to their nonfarm activity;
(f) the household head to have difficulty providing details on the earnings of the individual household members.

It is then generally best to administer the questionnaires to each adult member with nonfarm activities. This necessarily increases the time and other resources needed per surveyed household. So if diversification is to be covered properly, either survey costs must increase to maintain traditional sample sizes or sample sizes must shrink to fit standard survey budgets.

Third, it is common for activities to vary in type and sector over seasons, for households as for individuals. For example, a man might work on the farm and in agricultural wage-employment in the cropping season and then migrate to a nearby zone for the cotton harvest and then return to undertake manufacturing (say, of furniture) with the help of his son and also help to load trucks in a nearby town a few days a week (service sector) during the dry season. Thus, the income survey instrument needs to be able to distinguish activities in different seasons per individual.

Fourth, most nonfarm employment (wage- and self-) is in the informal sector in rural Africa. This is a important especially for the recall of self-employment income. That is, the informality, combined with seasonality and multi-activity, makes the recall of self-employment income relatively difficult. Moreover, our experience indicates that it is very difficult for the self-employed to report (even remotely accurately) the net income from such employment. It is thus best to design business income questionnaires with a recall of gross revenues and costs, rather than directly asking for net income. Alderman (1993: page 198) notes that one should devise "flexible accounting worksheets that allow a field staff to view gross revenues, labor, and some aggregation of costs (and perhaps assets) at one time."

Moreover, it is common in an informal rural business for funds to flow in and out during a given business day and thus even gross receipts in a given day are not easily recalled. For example, we have watched a rural tailor receive a shirt to mend, mend it, receive payment, give his wife "sauce money," receive payment from work done the day before, take more money out of his pocket to lend to his brother to fix his bike tire, and on it went. He could not tell us how much cash was received during that day. However, when we asked him to recall the pieces of work and the price charged for each type, he was easily able to recall the day's gross revenue.

This suggests that it is best (from the recall accuracy viewpoint) to design the questionnaire to recall prices and units of output or service sold over a reasonable recall period, and then the survey team calculates gross income. A similar approach is recommended for input expenditures. The difference then becomes net income, or enterprise profits.

Fifth, a special problem is presented by commerce, typically an important part of nonfarm activity of African households. Commerce can be small-scale and itinerant or fixed (such as road-side stands and small shops), or medium scale and fixed, such as a shop in a rural town. The survey challenges that cuts across all types are the following. On the one hand, it is hard to recall inventory changes because of the frequent (and for petty traders and shops, in many small transactions) and often unrecorded acquisitions of the various items sold. On the other hand, it is hard to recall operational expenses. The inventory recall issue is the thorniest. The dilemma is that, if the recall is undertaken (the enumerator visits) in the midst of a "sale cycle" there can be a bias in the income recalled (inventory purchases are valued but not all sales are recorded or sales are recorded but inventory acquisitions are not). However, if the recall is done after the cycle and a longer recall done, the specifics of the inventory changes and expenses may well not be recallable. A way of addressing this dilemma is a recall of several days to a week of sales, with purchase and sale price of the products recalled, so as to caculate the gross receipts. Similarly, rates of input expenditures can be recalled.

Sixth, local wage-employment income is usually more easy to recall, at least if it is done relatively full-time over a given period (hence, regular income). The more part time and piece-work (as opposed to wage-work), the more difficult it is to recall, and it may be necessary to treat it as self-employment and use survey methods appropriate thereto (see our discussion in section 3). Moreover, wage income is often a combination of cash and in-kind payments and sometimes barter arrangements, which complicate the recall and imputation of value to the earnings.

Seventh, migration employment presents special challenges for a survey. It is common in general income source surveys for migration income to be classified as remittances sent back by migrating household members during their migration and brought back on the return of the migrant. The latter "savings" and remittances are usually treated as net household income, tantamount to an assumption that the income spent on the migrant's consumption expenditures while on migration should be ignored. That means that migration income is undercounted, which means that income diversification is undercounted. However, this problem is usually due to the difficulty of obtaining the income information from migrants. A compromise would be to impute reasonable living expenses to the migrant to count as migration income while he/she is on migration.

In addition, there is sometimes ambiguity or confusion as to what constitutes migration income. In essence, household productive income (as opposed to transfer income) from migration is earned by members who leave the residence for a portion of the year, work outside the local area, and then return. Earnings sent back to the household are productive income, not transfers. Moreover, if the migrant buys goods in the migration area or on the return road, those should be counted as income (which is at the same time expenditure, as is any in-kind income such as a meal that is consumed). By contrast, transfers sent by non-household members (meaning those who do not reside any part of the year in the residence and there share a common pot in consumption), even if they are family members, are not productive income from migration, but are transfers.

Finally, we note a more general design recommendation that goes beyond observation of incomes and assets and touches on qualitative issues of entry barriers for diversification. There is a need to collect not just observations of what individuals are doing, but also observations of what they are *not* doing and some indicators as to why not. Economic theory tells us that the net returns to activities and assets must be equalized in equilibrium unless there are barriers to entry or exit present. In reality, such barriers are commonplace and result in sharp differences in the expected rates of returns to different assets and activities. Especially if one is studying diversification behaviors for the purpose of trying to address rural poverty and inequality, it becomes crucial to gain a solid understanding of who faces what barriers to which assets or activities.

Two general points emerge from the above discussion of income survey design. On the one hand, income diversification behavior in rural African households is so complex - over seasons, individuals, activities, and due to informality and multiactivity – that it is very risky, from the viewpoint of reasonable accuracy of recall, to take an approach that can be termed "the easy way out" of one-shot, aggregate recall. Yet the latter is common in income surveys even in rural Africa. Researchers take this path possibly in part because the above problems are not widely understood (in itself because of the rarity of such surveys), and partly because the sharpness of the tradeoff between recall error and survey cost is not well enough known. That is, researchers believe that, with relatively low loss of accuracy, they can save survey time and expense. It can be hypothesized that the bias of the recall error is negative (there is typically moral hazard not to reveal sources of wealth to outsiders, and so the extent of diversification is underestimated (Alderman, 1993).

On the other hand, the methods we propose as a general survey approach conform to the ways

that rural households most easily recall earnings and expenses (given the temporal and spatial complexity and informality of their activities). The methods are a compromise that saves time and respondent stress (and moral hazard) while maximizing recall accuracy. Moreover, shorter recall periods that are taken as representative of a season can yield detail on transactions that can be extrapolated to the season and probably create less recall error than asking for recall of the whole season or a simple aggregate net income figure for a month in that season.

### 4.3. Designing survey instruments for reporting asset portfolios

Few surveys make any systematic effort to collect comprehensive information on asset holdings. It is important to understand why one commonly encounters such reticence just as it is crucial to recognize the importance of a good enumeration of asset holdings. Assets are a sensitive issue for many rural households in Africa. There are "subjective" reasons that households have to resist accurate reporting of assets, including fear that the survey operation is the tax collection service in disguise, or reticence to reveal wealth either to other household members or to other families (as it is typical for visitors to be present at interviews as the latter take place in the home). In general, "subjective" obstacles must be met by survey administrators with understanding, patience, and adaptation. Good techniques include interviewing members individually, clearly explaining the survey's purpose and methods, and providing repeated assurances that the data will be handled with full anonymity.

There are also several "objective" reasons related to difficulty of recall or observation by the respondent.
(a) The quantity of the asset may actually not be well known, as is often the case with land the location of which is known but it is common for the area not to be accurately known by the respondent, even in local units.
(b) It may be easy to name an asset but not indicate its value because there is no local market for it.
(c) Some assets are held in common with other households and so describing their "share" is difficult.
(d) Some of the most important assets – especially components of human capital (e.g., intelligence, health) and social capital (e.g., capacity to make claims on others) – are at best imperfectly observable, if not outright unobservable.
(e) It is difficult to observe (in a survey) quality differentiation (e.g., soil quality, animal health).

Third, identifying and classifying asset ownership can be complicated and care is needed in the survey. The categories include productive and non-productive assets, ownership characteristics (individual, restricted collective, or open access). Moreover, one needs to be careful to distinguish among different sorts of rights. For example, the right to use is different from the right to sell or transfer by bequest. Productivity of assets often depends significantly upon the package of rights one holds in them. And rights are not always uniform across all things. For example, irrigated lowlands are often individual private property, but sometimes are held for communal cultivation by households or groups of households. Similarly, it is common that some livestock in a herd are owned by particular individuals while others are loaned animals, milk or offspring from which

belong to the present herder, but the animal itself belongs to the lender and so cannot be sold, used as collateral, or bequeathed to children.

Fourth, it is useful but difficult in a survey to determine barriers to acquisition – are there restrictions on access to particular sorts of assets, especially restrictions that affect some people but not others, thereby creating an uneven playing field and privileging a particular subpopulation's access to relatively lucrative activities?

Fifth, it is important to determine rates of asset depreciation. Most assets degrade over time if not maintained. Asset degradation is typically termed "depreciation." Few surveys make any effort to estimate the rate of asset depreciation, although it may be substantial (e.g., erosion of top soil, laborer fatigue, livestock weight loss, etc.)

## 5. Diversification Measurement Issues

Once one has collected detailed data on assets, activities, and/or incomes, how does one measure and represent the observed diversification behavior of individuals or households? Much as there is no unambiguously preferred variable to study, neither is there an unambiguously preferable statistical summary measure of diversification. Here we discuss three alternative ways to summarize observed diversification patterns.

The most common and easily understood measures are unquestionably levels and shares of income. One can simply report the amount of income derived from each source of income – or from some composite of multiple categories, e.g., farm versus nonfarm income – or the share of total income derived from each source. Reardon et al. (1998, 2000) offer comparative measures using these intuitive measures. Analogously, one can report the stock of wealth in different forms of assets or the amount of each productive asset allocated to a given activity (e.g., hectares by crop, labor days by activity). The advantage of using levels and/or shares is computational simplicity and ease of communication. The disadvantage is that they work best at relatively aggregate levels of analysis, for example, when one is comparing on-farm and off-farm earnings or shares of income attributable to migrant remittances. When one is interested in reasonably disaggregate analysis, it is somewhat trickier to communicate and interpret a vector of levels of shares.

At the disaggregated level of analysis, it is still often convenient to represent observed diversification patterns using a scalar measure. Either of two indices can be used. The most commonly used is the Gini coefficient, a measure familiar to students of income distribution. The Gini coefficient measures the area under the Lorenz curve as a complementary proportion[13] of the area that would be captured were the variable (assets, activities, income) perfectly equally distributed. So a value of zero represents perfect equality, in this case perfectly equal distribution

[13] A complementary proportion is just one minus the proportion.

of wealth across assets, of productive assets across activities, or of incomes across sources. By contrast a value of one reflects complete specialization. While the Gini holds appeal in its ability to summarize a vector of levels or shares in a single number and in its familiarity as a concept to many development practitioners, its drawback is computational complexity. Strictly speaking, a Gini is an integral, the area under a curve. In practical terms, people employ numerical integration techniques to come up with a reasonably accurate discrete approximation to the true Gini coefficient.

The Herfindahl index, like the Gini, has the appeal of summarizing a whole vector of levels or shares data in a single number ranging from zero to one. The Herfindahl is less familiar to most development practitioners as it has its origins in industrial organization economics, and that is its drawback relative to the Gini. The Herfindahl index is simply the sum of squared shares, $H = \sum_i s_i$ , where i indexes all the assets, activities, or income sources and s represents shares.[14] Like the Gini, the Herfindahl index is increasing in concentration, with perfect specialization taking an index value of one.

The Herfindahl's relative advantages, as compared to the Gini measure, are computational simplicity, ability to do computation and analysis "on the fly," and its sensitivity to the range of options available. (a) Since its computation requires just simple arithmetic, the Herfindahl index is far easier to memorize and digest than is the discrete approximation to an integral that comprises the Gini. (b) Because the Herfindahl requires only knowing positive observed values – since the square of a zero share is always zero and therefore does not affect the sum – one can compute Herfindahl indices as data arrive. One does not have to identify the full range of admissible assets, activities or income sources in the population before ones calculates the first Herfindahl index.

By contrast, the Gini coefficient value varies with the number of zero-valued entries. So one must know the full range of possibilities before one can estimate the first household's Gini coefficient, making it impractical to begin any Gini computation or analysis before all data have been collected, entered, cleaned, and tabulated. the Gini is generally invariant to expansion or contraction of the number of options available to the decision-maker. For example, if income is perfectly equally distributed across the only two sources feasible, the Gini coefficient will be the same as if income is perfectly equally distributed across the only three sources feasible. In both cases the index will measure one even though the household has in fact diversified its range of activities because the Gini is designed purely to measure distributional equity. By contrast, in the same example, the Herfindahl index would fall, from ½ – the sum ($½^2 + ½^2$) – to $\mathbf{a}$ – the sum of ($\mathbf{a}^2 + \mathbf{a}^2 + \mathbf{a}^2$) – reflecting the increased diversification of activities. It strikes us as axiomatic that a good measure of diversification should change with adjustments to either absolute or relative shares, as the Herfindahl index does, not just to relative shares, as in the Gini.

[14] The Simpson index, originating in agronomy and geography, is equivalent to the Herfindahl index. The Simpson index is simply the sum of squared levels divided by the squared total. So it generates precisely the same result at the Herfindahl index.

For these three reasons, we favor the use of the Herfindahl measure to reflect highly disaggregated data on diversification behaviors. Computation of Herfindahl indices of asset holdings, activities to which different assets (e.g., labor, land, livestock) are applied, and incomes allow for multidimensional perspective on household diversification behavior. This index measure therefore provides a good supplement to simpler but coarser measures of income levels and shares.

## 6. Conclusion

This paper started from the premise that diversification of assets, activities, and incomes is important to African rural households, in that diversification into nonfarm income constitutes on average about 45 percent of incomes, and the push and pull factors driving that diversification are bound to persist. From that premise, we noted that the empirical study of diversification has been beset by practical problems and issues relating to (1) definitions and concepts, (2) data collection, and to (3) measurement of the nature and extent of diversification. The paper addressed each of those problems.

Two points are of special interest to the overall conceptualization of diversification research.

The first is that empirical studies have exhibited a wide variety – bordering on confusion – of systems of classification of assets, activities, and incomes as pertains to diversification behavior. We argued that the classification should conform to that used in standard practice of national accounts and macro input-output table construction, classifying activities into economic sectors that have standard definitions, and the classification of which does not depend on the location or functional type (wage- or self-employment) of the activity. We further argued that given a sectoral classification, it is useful to make a functional and locational categorization of the activity, and keep each of these three dimensions of the activity – sectoral, functional, and locational – separate and distinct so as to avoid confusion.

The second is that it is useful to have an image of a production function in mind when analyzing the components of diversification behavior: (1) assets are the factors of production, representing the capacity of the household to diversify; (2) activities are the ex ante production flows of asset services; (3) incomes are the ex post flows of incomes, and it is crucial to note that the goods and services produced by activities need to be valued by prices, formed by markets at meso and macro levels, in order to be the measured outcomes called incomes. “Livelihoods” is a term used frequently in recent diversification research, and while its meaning differs somewhat over studies, it generally means household and community behavior, with respect to holdings and use of assets and the productive activities to which the assets are applied. The link between livelihoods and incomes needs to be made by valuing the output of livelihood activities at market (and/or virtual) prices. That valuation permits an analytical link between household/community behavior (thus a micro view of diversification) and the aggregate functioning of markets (thus a link with the meso and macro levels and the policies pertaining thereto).

**References**


Abramovay, R. 1998. “Agriculture familiale et développement territorial au Brésil,” *Ruralia*, 3 (Revue de l’Association des ruralistes français): 91-111.

Adams, R.H. and H. Alderman (1992), “Sources of Income Inequality in Rural Pakistan: A Decomposition Analysis,” *Oxford Bulletin of Economics and Statistics* 54, 4: 591-608.

Alderman, H. (1993) “Obtaining useful data on household incomes from surveys,” in J. von Braun and D. Puetz (eds) *Data Needs for Food Policy in Developing Countries: new directions for household surveys,* Washington: IFPRI..

Alderman, H. and C.H. Paxson (1992), “Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries,” World Bank Policy Research Working Paper WPS 1008.

Anderson, D., and M.W. Leiserson. 1980. "Rural nonfarm employment in developing countries", *Economic Development and Cultural Change,* Vol. 28, No. 2.

Anderson-Schaffner, J. 2000. “The employment module and labor market analysis,” in M. Grosh and P. Glewwe (eds.), *Designing household survey questionnaires for developing countries: lessons from ten years of LSMS experience* (Washington: The World Bank).

André, C. and Platteau, J-P. (1998). Land Tenure under Unbearable Stress: Rwanda Caught in the Malthusian Trap, *Journal of Economic Behavior and Organization,* 34 (1).

Barrett, C.B. (1997), “Food Marketing Liberalization and Trader Entry: Evidence from Madagascar,” *World Development* 25, 5: 763-777.

Barrett, C.B. and P. Arcese (1998), “Wildlife Harvest in Integrated Conservation and Development Projects: Linking Harvest to Household Demand, Agricultural Production and Environmental Shocks in the Serengeti,” *Land Economics*, 74, 4: 449-465.

Barrett, C.B. and S.M. Sherlund (2000), “Shadow Wages, Allocative Inefficiency, and Labor Supply in Smallholder Agriculture,” paper presented to the Econometric Society winter meetings, Boston.

Barrett, V., G. Lassiter, D. Wilcock, D. Baker, and E. Crawford. 1982. "Animal Traction in Eastern Upper Volta: A Technical, Economic, and Institutional Analysis," International Development Paper No. 4 (East Lansing: Michigan State University).

Bernstein, H., B. Crow and H. Johnson (1992), *Rural Livelihoods: Crises and Responses* (London: Oxford University Press).

Bigsten, A. (1996), "The Circular Migration of Smallholders in Kenya," *Journal of African Economies*, 5, 1: 1-20.

Boisvert, R.N. and C. Ranney (1990), "Accounting for the Importance of Nonfarm Income on Farm Family Income Inequality in New York," *Northeastern Journal of Agricultural and Resource Economics*, 19, 1: 1-11.

Bryceson, D.F. (1999), "African Rural Labour, Income Diversification & Livelihood Approaches: A Long-term Development Perspective," *Review of African Political Economy* 26, 80: 171-189.

Bryceson, D.F. and V. Jamal (1997), *Farewell to Farms: De-Agrarianisation and Employment in Africa* (Aldershot, UK: Ashgate).

Chambers, R. and R. Conway. 1992. "Sustainable rural livelihoods: practical concepts for the 21st century," *IDS Discussion Paper*, Sussex, no 296.

Chavas, J.-P. (1994), "On Production and Investment Decision Under Sunk Cost and Temporal Uncertainty," *American Journal of Agricultural Economics* 76, 1: 114-127.

Chavas, J.-P. and M. Aliber (1993), "An Analysis of Economic Efficiency in Agriculture: A Nonparametric Approach," *Journal of Agricultural and Resource Economics* 18, 1: 1-16.

Chopak, C.J., "Determinants of rural incomes in communal areas of Zimbabwe: household food security implications," Ph.D. Dissertation (East Lansing: Michigan State University, 1991).

Chuta, E. and C. Liedholm, "Rural small-scale industry: empirical evidence and policy issues," in C. Eicher and J. Staatz (Eds.), Agricultural Development in the Third World, (Baltimore: Johns Hopkins University Press, 1990).

Collier, P. and D. Lal, Labour and Poverty in Kenya 1900-1980 (Oxford: Clarendon Press, 1986).

Collier, P., S. Radwan, S. Wangwe, A. Wagner, Labour and Poverty in Rural Tanzania: Ujamaa and Rural Development in the United Republic of Tanzania, (Oxford: Clarendon Press, 1990).

Davies, S., Versatile Livelihoods: Strategic Adaptation to Food Insecurity in the Malian Sahel (Sussex: Institute of Development Studies, 1993).

DeJanvry, A., M. Fafchamps, and E. Sadoulet (1991), "Peasant household behaviour with missing markets: some paradoxes explained," *Economic Journal* 101 (409): 1400-1417.

Dercon, S. (1998), "Wealth, risk and activity choice: cattle in western Tanzania," *Journal of Development Economics* 55, 1: 1-42.

Dercon, S. and P. Krishnan (1996), "Income Portfolios in Rural Ethiopia and Tanzania: Choices

and Constraints," *Journal of Development Studies* 32, 6: 850-875.

Dixit, A. and R. Pindyck (1994), *Investment Under Uncertainty* (Princeton: Princeton University Press).

Ellis, F. (1998), "Household Strategies and Rural Livelihood Diversification," *Journal of Development Studies*, 35, 1: 1-38.

Ellis, F. (forthcoming), *Rural Livelihood Diversity in Developing Countries: Analysis, Policy, Methods*, draft monograph, University of East Anglia.

Francis, E. and J. Hoddinott, "Migration and differentiation in Western Kenya: a tale of two sub-locations," Journal of Development Studies, vol. 30, no. 1 (October 1993), pp. 115-145.

Glewwe, P. and J. van der Gaag (1988), "Confronting Poverty in Developing Countries: Definitions, Information and Policies," World Bank Living Standards Measurement Study Working Paper 48.

Haggblade, S., P. Hazell, and J. Brown, "Farm-nonfarm linkages in rural Sub-Saharan Africa," World Development, Vol. 17, no. 8, (1989), pp. 1173-1201.

Hill, P., Dry Grain Farming Families, (Cambridge: Cambridge University Press, 1982).

Hopkins, J. and T. Reardon, "Agricultural price policy reform impacts and food aid targeting in Niger," Final report of the IFPRI/INRAN Project, Mimeo (Washington: IFPRI, 1993).

Hymer, S. and S. Resnick (1969). "Model of an Agrarian Economy," *American Economic Review*, vol. 59, no. 4, pp. 493-506.

Kelly, V., T. Reardon, A. A. Fall, B. Diagana, L. McNeilly, "Final report of IFPRI/ISRA project on consumption and supply impacts of agricultural price policies in Senegal," Mimeo (Washington: IFPRI, 1993).

Keyler, S., "Economics of the Namibian millet subsector," Ph.D. Dissertation (East Lansing: Michigan State University, 1996).

Lerman, R. and S. Yitzhaki (1985), "Income inequality effects by income sources: a new approach and applications to the United States" *Review of Economics and Statistics*, 67, 1: 151-156.

Little, P.D., B. Cellarius, C. Barrett, and D.L. Coppock (1999), "Economic Diversification and Risk Management Among East African Herders: A Preliminary Assessment and Literature Review," GL-CRSP Pastoral Risk Management Project Technical Report 02/99.

Livingstone, I., "A reassessment of Kenya's rural and urban informal sector," World Development, vol. 19, no. 6 (1991), pp. 651-670.

Loveridge, S., "Les sources de revenu des ménages agricoles rwandais, les exportations et leur impact sur la disponibilité alimentaire en milieu rural," Mimeo (Kigali: Division de Statistiques Agricoles, Ministry of Agriculture, 1992).

Low, A., Agricultural Development in Southern Africa: Farm-household Economics and the Food Crisis (London: James Curry, 1986).

Lucas, R.E.B. 2000. “Migration,” in M. Grosh and P. Glewwe (eds.), *Designing household survey questionnaires for developing countries: lessons from ten years of LSMS experience* (Washington: The World Bank).

Matlon, P., "Income distribution among farmers in Northern Nigeria: empirical results and policy implications," African Rural Economy Paper no. 18 (East Lansing: Michigan State University, 1979).

Maxwell, S. and M. Smith (1992), *Household Food Security: A Conceptual Overview* (New York: UNICEF).

Omamo, S.W. (1998), “Farm-to-Market Transaction Costs and Specialisation in Small-Scale Agriculture: Explorations with a Non-separable Household Model,” *Journal of Development Studies* 35, 2: 152-163.

Nattrass, N. and J. Nattrass, "The homelands and rural development," Development Southern Africa Vol 7 (October 1990), pp 517-534.

Norman, D., "Economic analysis of agricultural production and labour utilization among the Hausa in the North of Nigeria," African Rural Employment Paper No. 4 (East Lansing: Michigan State University, 1973).

Peters, P.E., "Monitoring the effects of grain market liberalization on the income, food security and nutrition of rural households in Zomba South, Malawi," Mimeo (Cambridge: Harvard Institute for International Development, 1992).

Reardon, T., E. Crawford, and V. Kelly. 1994. "Links between nonfarm income and farm investment in African Households: adding the capital market perspective," American Journal of Agricultural Economics, Volume 76, No. 5 (December): 1172-1176.

Reardon, T., C. Delgado, and P. Matlon, "Determinants and effects of income diversification amongst farm households in Burkina Faso," Journal of Development Studies, 28 (January 1992), pp. 264-296.

Reardon, T., P. Matlon, and C. Delgado. 1988. "Coping with household-level food insecurity in drought-affected areas of Burkina Faso", World Development, Vol 16, No.9: 1065-1074.
Reardon, T. 1997. "Using Evidence of Household Income Diversification to Inform Study of the Rural Nonfarm Labor Market in Africa," World Development, 25 (5), 735-748.

Reardon, T. and M. Mercado-Peters, "Self-financing of rural household cash expenditures in Burkina Faso: the case of net cereal buyers", in C. Cuevas and M. Benoit-Cattin (Eds.), Finance and Rural Development in West Africa, proceedings of seminar, Ouagadougou, October 21-25, 1991 (Montpellier: CIRAD, 1993).

Reardon, T. 2000. "Interactions Between the Agricultural System and Non-agricultural Activities of Farm Households in Developing Countries," in J-P Colin and E.W. Crawford (eds.) *Research on Agricultural Systems: Accomplishments, Perspectives, and Issues.*

Reardon, T., K. Stamoulis, A. Balisacan, ME Cruz, J. Berdegue, B. Banks. 1998. Rural Nonfarm Income in Developing Countries," Special Chapter in The State of Food and Agriculture 1998, Rome: Food and Agricultural Organization of the United Nations.

Reardon, T., C. Barrett, V. Kelly, and K. Savadogo. 1999. "Policy reforms and sustainable agricultural intensification in Africa," Development Policy Review 17 (4) December.

Reardon, T. and J. Berdegué. 1999. "Rural Nonfarm Employment and Incomes in Latin America," Paper presented at Seminar "Desarrollo del Empleo Rural No Agrícola" sponsored by the Inter-American Development Bank, the UN Economic Commission on Latin America, FAO, and the International Farming Systems Research Methodology Network (RIMISP), Santiago, Chile, 6-8 September.

Reardon, T. and P. Glewwe. 2000. "Agriculture," in M. Grosh and P. Glewwe (eds.), *Designing household survey questionnaires for developing countries: lessons from ten years of LSMS experience* (Washington: The World Bank).

Reardon, T. and P. Matlon. 1989. "Seasonal Food Insecurity and Vulnerability in Drought-Affected Regions of Burkina Faso" in D. Sahn (editor) Seasonal Variability in Third World Agriculture: The Consequences for Food Security, Johns Hopkins University Press.

Reardon, T. and J.E. Taylor (1996), "Agroclimatic Shock, Income Inequality, and Poverty: Evidence from Burkina Faso," *World Development* 24, 5: 901-914.

Reardon, T., J.E. Taylor, K. Stamoulis, P. Lanjouw, and A. Balisacan (2000), "Effects of Nonfarm Employment on Rural Income Inequality in Developing Countries: An Investment Perspective," *Journal of Agricultural Economics*, forthcoming.

Reardon, T. and S.A. Vosti. 1995. "Links between rural poverty and environment in developing countries: Asset categories and investment poverty," World Development, 23 (9), September:

1495-1506.

Rosenzweig, M. and H. Binswanger (1993), “Wealth, Weather Risk and the Composition and Profitability of Agricultural Investments,” *Economic Journal*.

Saith, A. (1992) *The Rural Non-Farm Economy: Processes and Policies* (Geneva: International Labour Office).

Savadogo, K., T. Reardon and K. Pietola (1998), “Adoption of Improved Land-Use Technologies to Increase Food Security in Burkina Faso: Relating Animal Traction, Productivity, and Nonfarm Income,” *Agricultural Systems* 598, 3.

Simler, K.R., "Rural poverty and income sources of smallholder farmers: a household economics analysis with panel data from northern Malawi," Ph.D. Dissertation (Ithaca: Cornell University, 1994).

Ranis, G. and F. Stewart (1993). “Rural Nonagricultural Activities in Development: Theory and Application,” *Journal of Development Economics*, vol. 40, no. 75-101.

Smith, K., C. B. Barrett, and P. W. Box (1999), "Not Necessarily In The Same Boat: Heterogeneous Risk Assessment Among East African Pastoralists," GL-CRSP Pastoral Risk Management Project Technical Report, September.

Sundberg, S., "OHV food consumption and expenditure survey: preliminary results on income sources in the OHV," Mimeo (East Lansing: Michigan State University, 1989).

Teklu, T., J. von Braun, and E. Zaki, Drought and famine relationships in Sudan: policy implications, Research Report 88 (Washington, D.C.: International Food Policy Research Institute, 1991).

Tschirley, D.L. and M.T. Weber, "Food security strategies under extremely adverse conditions: the determinants of household income and consumption in rural Mozambique," World Development vol. 22, no. 2 (1994) pp. 159-173.

Valentine, T.R., "Drought, transfer entitlements, and income distribution: the Botswana experience," World Development, Vol 21, no. 1 (January 1993), pp. 109-126.

Vijverberg, W. and D. Mead. 2000. “Household Enterprises,” in M. Grosh and P. Glewwe (eds.), *Designing household survey questionnaires for developing countries: lessons from ten years of LSMS experience* (Washington: The World Bank).

von Braun, J. and R. Pandya-Lorch, editors (1991), *Income Source of Malnourished People in Rural Areas: Microlevel Information and Policy Implications*, IFPRI Working Paper on Commercialization of Agriculture and Nutrition no. 5.

von Braun, J., D. Puetz, and P. Webb. 1989. "Irrigation technology and commercialization of rice in the Gambia: effects on income and nutrition," Research Report no. 75 (Washington, D.C.: IFPRI).

Webb, P. and J. von Braun, Famine and Food Security in Ethiopia: Lessons for Africa, (Chichester: John Wiley and Sons, 1994).

Weersink, A., C. Nicholson, and J. Weerhewa (1998), “Multiple job holdings among dairy farm families in New York and Ontario,” *Agricultural Economics* 18, 2: 127-143.

World Bank, "Poverty profile for Zimbabwe," Mimeo (Washington: World Bank, 1996).

**Table 1:Nonfarm income of rural households in Africa: Case study evidence**

| Country | Year(s) | Percentage nonfarm in income | Rich/poor nonfarm share (ratio x:1) | Local nonfarm/ migratory (ratio x:1) | Nonfarm/ farm labor (ratio x:1) | Nonfarm wage/self (ratio x:1) |
|---|---|---|---|---|---|---|
| Botswana[a] | 1974-75 | 54 | na | .35 | na | 1.2 |
| Botswana[a] | 1985-86 | 77 | 2.5 | .50 | na | 2.6 |
| Burkina Faso[b] (favorable) | 1978-79 | 22 | na | na | na | na |
| Burkina Faso[c] (unfavorable) | 1981-84 | 37 | 2.5 | 11 | 33 | na |
| Burkina Faso[c] (favorable) | 1981-84 | 40 | 5 | 39 | 20 | na |
| Ethiopia overall | 1989/90 | 36 | 1.2 | na | na | .25 |
| Ethiopia highland (unfavorable)[d] | 1989-90 | 38 | na | na | na | .65 |
| Ethiopia lowland (favorable)[d] | 1989-90 | 44 | na | na | na | .03 |
| Ethiopia pastoral[d] | 1989-90 | 38 | na | na | na | 1.0 |
| Gambia[e] | 1985-86 | 23 | 1.3 | na | na | na |
| Kenya[f] (central) | 1974-75 | 42 | 0.5 | 2.5 | na | na |
| Kenya[g] (western) | 1987-89 | 80 | na | 2 | na | na |
| Kenya[h] | 1984 | 52 | na | 2.7 | na | 1.25 |
| Lesotho[i] | 1976 | 78 | 2.8 | na | na | |
| Malawi[j] | 1990-91 | 34 | 1 | 3 | 2 | 0.9 |
| Mali[k] | 1988-89 | 59 | na | na | na | na |
| Mozambique[l] | 1991 | 15 | 2.5 | 25 | na | na |

**Table 1:Nonfarm income of rural households in Africa: Case study evidence**

| Country | Year(s) | Percentage nonfarm in income | Rich/poor nonfarm share (ratio x:1) | Local nonfarm/ migratory (ratio x:1) | Nonfarm/ farm labor (ratio x:1) | Nonfarm wage/self (ratio x:1) |
|---|---|---|---|---|---|---|
| Namibia[m] (favorable) | 1992-93 | 56 | na | 2 | na | na |
| Namibia[m] (unfavorable) | 1992-93 | 93 | na | 0.2 | na | na |
| Niger[n] (unfavorable) | 1989-90 | 52 | 2 | 1.7 | 24 | na |
| Niger[n] (favorable) | 1989-90 | 43 | 1.3 | 7.8 | 5.8 | na |
| Nigeria[o] (northern) | 1974-75 | 30 | na | na | na | na |
| Nigeria[p] (northern) | 1966-67 | 23 | na | na | na | na |
| Rwanda[q] | 1990 | 30 | 5 | na | na | .20 |
| Senegal[r] (northern/ unfavorable) | 1988-89 | 60 | 2.0 | 9 | 60 | na |
| Senegal[r] (central) | 1988-90 | 24 | 1 | 5 | 24 | na |
| Senegal[r] (southern) | 1988-90 | 41 | 2.6 | 19 | 20 | na |
| South Africa[s] (homelands) | 1982-86 | 75 | na | 0.5 | na | na |
| Sudan[t] | 1988 | 38 | 1.0 | 3.5 | 5.8 | .15 |
| Tanzania[u] | 1980 | 25 | na | 5 | na | na |
| Zimbabwe[v] | 1988-89 | 35 | 1 | na | na | 2 |
| Zimbabwe[w] overall | 1990-91 | 38 | na | 2.2 | na | na |
| Zimbabwe[w] poor | 1990/91 | 31 | na | 1.01.5 | na | na |

**Notes to Table 1** (excerpted from Reardon 1997)

All figures are based on local currency income, and ratios are of shares, not levels.
Nonfarm income is local nonfarm wages, plus nonfarm self-employment, plus migration remittances.
"Local nonfarm income" is only local nonfarm wages plus local nonfarm self-employment.

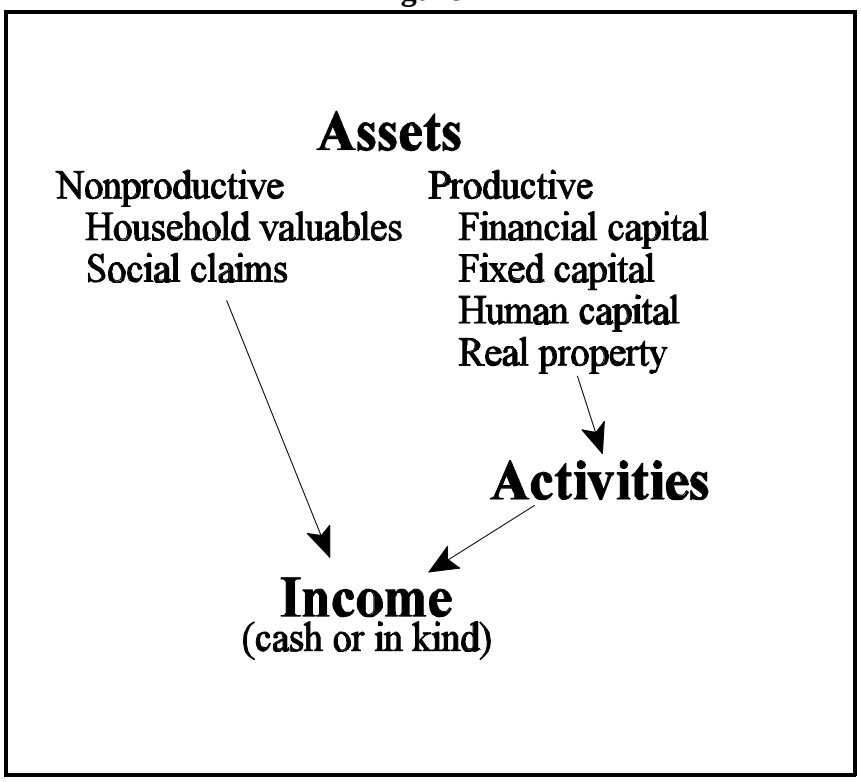
a. Botswana: Valentine (1993)
b. Burkina Faso: Barrett et al. (1982)
c. Burkina Faso: Reardon et al. (1992)
d. Ethiopia: Webb and von Braun (1994)
e. The Gambia: von Braun et al. (1989)
f. central Kenya: Collier and Lal (1986)
g. western Kenya: Francis and Hoddinot (1993)
h. Kenya: Livingstone (1991)
i. Lesotho: Low (1986)
j. Malawi: Peters (1992)
k. Mali: Sundberg (1989)
l. Mozambique: Tschirley and Weber (1994)
m. Namibia: Keyler (1996)
n. Niger: Hopkins and Reardon (1993)
o. Nigeria: Matlon (1979)
p. Nigeria: Norman (1973)
q. Rwanda: Loveridge (1992)
r. Senegal: Kelly et al. (1993)
s. South Africa: Nattrass and Nattrass (1990), average over 7 case studies
t. Sudan: Teklu et al. (1991)
u. Tanzania: Collier et al. (1990)
v. Zimbabwe: Chopak (1991)
w. Zimbabwe: World Bank (1996)

**Table 2: Three-way classication of activities: sectoral, functional, spatial**

| | Primary | | | | Secondary | | Tertiary | |
|---|---|---|---|---|---|---|---|---|
| | Agriculture | | Mining/Other Extractive | | Manufacture | | Services | |
| Wage-employment | local | migratory | local | migratory | local | migratory | local | migratory |
| Self-employment | local | migratory | local | migratory | local | migratory | local | migratory |

Non-farm = all activities outside the agricultural sector, regardless of location (on- or off-farm, that is, at -home or away-from-home) (shaded columns).
On-farm or at-home = all activities on one's own property, regardless of sectoral or functional classification.
Off-farm or away-from-home = all activities away from one's own property, regardless of sectoral or functional classification.

**Figure 1**


Assets
Nonproductive
Household valuables
Social claims
Productive
Financial capital
Fixed capital
Human capital
Real property
Activities
Income
(cash or in kind)