Measuring Livelihoods and Environmental Dependence

Methods for Research and Fieldwork

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Chapter 8

Valuing the Priceless: What Are Non-Marketed Products Worth?

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The cynic knows the price of everything and the value of nothing.
Oscar Wilde (1893, *Lady Windermere's Fan, Act 3)*

Introduction

Households in developing countries collect and use a wide range of environmental products, from foods and construction materials to medicines and composted manure. In many remote rural areas, the bulk of goods collected by households, rather than being sold, is destined for direct consumption (for example, subsistence consumption of game or construction poles) or used as inputs into domestic production processes (for example, fodder for livestock). In these cases, there is no explicit transaction price that we can use for valuing the quantities of goods consumed.

Still, we may want to value these non-marketed activities for several reasons. First, we could be interested in a measure of the welfare contribution that different types of natural resources provide to households, that is, to estimate environmental income. Second, these values may help us understand how and why households allocate their labour, land and capital across different income-generating activities. Third, values of natural resources can also be important for policy-makers. For instance, if policies promote forest clearing for agricultural expansion, how much forest-derived non-marketed income is lost in the process? Fourth, in poverty analysis we need to get a value estimate of overall household income and consumption.

Values are thus the basis of any analysis of households' livelihoods. Counting physical quantities of products does not tell us much about their contribution to well-being. Instead, we seek to enumerate these resources in terms that provide

us with insights into the welfare implications and decisions, at household and policy-making levels, of how resources are used. But expanding enumeration from physical quantities to values is fraught with difficulties. In this chapter we provide an introduction to some key concepts and methods. In the following section, we take a closer look at the value concept. Next, we describe some of the structural obstacles found in peasant economies of developing countries, which frame the resource valuation problems that we want to address. Keeping these features in mind, we then outline and review six different practical methods for how to assign values to non-marketed goods. The last section gives some suggestions regarding how price data can be checked to see if they are reasonable.

What is value?

Values may be thought of as measures of how much people want or like various goods and services. The concept of values arises from the belief that there exists a common expression of benefits to people that can be expressed and aggregated across numerous types of resources and individuals. As such, we may use these aggregated values as expressions of well-being of people who hold diverse livelihood portfolios.

The concept of values can encompass broad concepts of what people like. One distinction is between 'held' and 'assigned' values (Adamowicz et al, 1998). When we observe a market price, we are seeing an assigned value that is thought to be transient, changing with market conditions. Assigned values may be conditioned by held values that are more basic, more qualitative and based on morals and preferences that are thought to change more slowly, if at all. In the following, our exclusive interest will be in assigned values. However, the diversity of people's underlying broader value systems should always be kept in mind. For instance, people may value certain forests, mountains or rivers for their cultural or religious purposes, and often (legitimately so) be unwilling to translate these values into monetary figures. The quantitative values we assign are thus bound to be incomplete measures of the multidimensional sources of human welfare.

The quantitative values we assign to resources depend on the alternative scenarios we imagine for them. For instance, my *utilitarian value* of an asset (say, a horse cart) represents the welfare loss I would experience without that asset, for example, having to carry things by hand instead. The *production value* reflects the inputs of labour and capital that were needed for making the cart. The *sales value* is the money I would receive by selling the cart in the market. The *replacement value* becomes relevant had I to substitute it for a similar asset, for example, a handcart instead of a horse cart.

Values are frequently exchanged in markets and expressed as prices that buyers pay to sellers. Sellers are thought to focus on costs of alternative forms of production, while buyers are thought to focus on benefits derived from alternative possible purchase combinations. The considerations of sellers and buyers come together in markets, which specify prices at which trades of goods and services occur. The higher the market price of a product, the more providers will be induced to sell it and the fewer buyers will demand it. Hence, prices change over time in response to changes in preferences of buyers and/or costs to sellers.

Although markets may frequently produce a single price for a given product, it is not reflective of the value of a good or service to all people. There is frequently great heterogeneity among individual sellers and buyers. Thus, many buyers 'find good deals' by buying products at prices that are less than the maximum that they would be willing to pay. The difference between the actual price paid and the maximum willingness to pay is referred to by economists as *consumer's surplus*, and expresses incremental values that buyers receive from market transactions. Similarly, normally many producers sell their products for more than the minimum amount that they would be willing to accept. Such differences are referred to as *producer's surplus,* and are taken as a measure of incremental benefits that sellers derive.

Prices arise in response to specific supply and demand conditions, which respond to their scarcity at the margin but will not necessarily mirror the innate usefulness of resources in absolute terms. For example, Box 8.1 indicates that low firewood prices do not mean that firewood is not valuable to households. Rather, low prices are a reflection of the abundance of firewood that reduces the costs of supply. If firewood was less abundant, we would expect to see higher prices.

Because the value of a product is so closely tied to its abundance, it is important to carefully consider the quantity of resources that are being valued. For example, if valuing the change in firewood consumption of an individual household, it may be reasonable to assume that the individual household is not largely affecting the abundance of firewood. Economists frequently take this 'marginalist' approach in that they value things based on the relative scarcity of goods and assets vis-à-vis small counterfactual changes. In such cases, economists may seem to 'take nature for granted', in other words, assign low values to natural resources that are abundantly available. In many cases, such as in Box 8.1, this approach may yield an accurate reflection of values. But if the true counterfactual is a large-scale, devastating deterioration of natural assets (such as climate change) then it becomes more difficult to estimate values marginally based on counterfactuals constructed from current conditions. For

example, Costanza et al (1997) attempted to put values on entire global ecosystem functions, assuming these would have to be fully lost or replaced. While these estimates might portray nature's worth in high-level policy arenas, the estimates are difficult to defend because counterfactuals are not clearly defined.

Box 8.1 *Bringing Adam Smith to the field*

When Adam Smith published his famous *The Wealth of Nations* in 1776, he used the so-called 'water-diamond paradox' to didactically illustrate the power of marginality in determining economic value. Water is essential for all life on Earth, yet since it is usually in abundant supply, it normally cannot be sold – at least, at the time of his writing. In turn, diamonds are a luxury commodity of limited direct use value – life could easily go on without them – yet they are highly priced for being scarce. Supply and demand thus determine exchange values, sometimes in contradiction to the logic of use values.

About 230 years later, Manyewe Mutamba conducted a village interview in Mufulira District in the Zambian Copper Belt, asking villagers which forest product was the most important to them. But, 'most important', for what: food, shelter or cash? Economists typically rank between 'apples and oranges' by assigning prices to different commodities, but in this case, most products were for subsistence use only. There was no intuitive reductionist yardstick. He thus asked people: 'Which one would be the product that it would be most difficult for you to lose?' Surely that clever hypothetical question would force them to prioritize! After some internal discussion, the group consensus was: 'Firewood.' Why? Because without firewood, it would be impossible to cook – and that would clearly be a major disaster.

For an economist, this was a surprising response: a forest walk revealed that wood resources remained extremely abundant. Since there was no shortage of firewood, it would also not have any mentionable exchange price and thus be of little economic value. Moreover, any intervention producing marginal changes in firewood availability would also have negligible influence on peoples' livelihoods. So, why bother about firewood?

The seemingly perplexing answer was fully explained by the nature of the question. We had not asked people about what commodity they would be most worried to lose *at the margin*, but in totality. We had asked them about which product had the highest use value, not exchange value. The scenario we implicitly had given to them – the prospect of losing all access to firewood – was a counterfactual completely outside of their local reality, without relevance in any foreseeable future. Firewood to them was what water was to Adam Smith.

Prices are not only employed as measures for individual households' welfare. We also frequently use prices as indicators to optimize welfare and resource allocation at higher aggregation levels, such as villages, districts or nations. For instance, if a district government was to decide whether to establish an agro-industrial project, it should evaluate the costs and benefits by also looking at local prices. This would refer to the prices of the incremental agricultural products that will be produced, but perhaps also of currently extracted forest products, which may partially be lost if the project implied conversion of forest to cropland. In this type of cases, prices generally most accurately reflect social values when:

- markets are competitive (in other words, there are sufficient buyers and sellers so that neither can individually influence prices);
- there are no 'market failures' with external side effects of production and consumption activities on third parties (or, alternatively, such failures are being corrected for in separate markets, for example, for environmental services); and
- markets create distributions of income that are in line with social desires to promote equity.

But markets may fail on any or all of these counts. For example, only a few dominating wholesale intermediaries might offer artificially low prices when buying in rural markets, and secure artificially high prices when reselling in urban centres. Production costs of gold panning may factor in costs of back-breaking labour necessary to find nuggets, but neglect environmental costs of streamside erosion from mining practices. In harvesting firewood at low prices, households may fail to leave woodlands for future generations. Despite concerns in this regard, they may fear that individual restraint would make no difference because other households would take over their share of an open-access resource (in other words, property rights matter).

Finally, markets may create inequities among village members that are unacceptable to people's concepts of justice. All of these scenarios create situations where prices fail to accurately reflect social values and where the analyst needs to make adjustments. The issue of how to do social valuation and cost – benefit analysis, however, goes beyond our purposes here; for a description of these issues with an environmental angle, see Hanley and Barbier (2009).

Rural livelihoods and prices

People living in developed economies typically produce products and services they sell for a living and for their monetary receipts (salaries, profits and transfer

incomes), they buy their necessities: production and consumption decisions are clearly separated. They can also normally buy and resell (or vice versa) the same product – for example, a used car – at a reasonable price margin: the loss from reverting most trades is manageable. Typically people have access to credit markets to generate some liquidity when needed, at reasonable costs. And through insurances they can safeguard themselves against major risks.

All of these circumstances can be quite different in rural areas in developing countries, where market imperfections tend to be much more pronounced. Often there are no insurance mechanisms, and credit is perhaps only available at usury interest rates. People typically produce some goods just for sale, some for subsistence use and many mixed for both purposes, such as selling in the market the surplus of staple food production, once basic household needs have been met. However, margins between buying and selling prices tend to be much larger: middleman profits can be high and risks of price fluctuations can be high if markets are thin (in other words, low trading volumes make prices jump frequently) or seasonal (for example, before and after peak harvests). Most of all, the transport costs of getting commodities to and from the market can be very high. This means that rural producers in developing countries may face relatively wide price bands between selling and buying prices of a product (Sadoulet and de Janvry, 1995).

What does that mean for our valuation and pricing problem? Let us have a look at an example. Let us say that, as a farmer at a tropical forest margin, I am producing maize. The market price in the nearest town is 20 shillings per sack, but the high transport costs on a dirt road, and the intermediary profits taken by a single transporter monopolizing the trade, sum up to 7 shillings, each transport way. Hence, in the village, the selling price I am being offered by the middleman is just 13 shillings. In case I occasionally needed to buy maize, the buying price of maize is 27 shillings. This leaves an external margin, or a price band, of $7 + 7 = 14$ shillings. In this price band, going from the price levels of 13 to 27 shillings, trading is not favourable to me – unless when I am occasionally trading maize with my neighbours within the village, with much less transaction costs and on more equal terms. The price I would be willing to sell maize for is 15 shillings, which is also called my 'shadow price' – in other words, an invisible price where economically things would break even for me, making neither losses nor gains. So, if hypothetically I could access the urban market at no transaction cost, I could sell maize at a competitive price of 20 shillings and make 5 shillings of profit per sack. But due to the elevated transport and commercialization costs, I can only sell at 13 shillings, and would thus actually lose 2 shillings.

Let us now say that I could make my maize production more efficient, and produce at 10 shillings instead of 15 shillings per bag. That would allow me to

make 3 shillings of profit by selling to the middleman (13 minus 10 shillings). However, there might still be reasons for me to hesitate with this deal. If my production is just a bit higher than my household consumption, the next harvest in the village could be a bad one, so that I would have to buy maize from outside to feed my family. If the buying price is a prohibitive 27 shillings, that implies a huge risk – especially if I cannot get access to credit or insurance. It might thus be better for me to hedge against future risks by saving the extra sacks of maize for a rainy day – unless they would likely perish during storage.

The large non-traded price band here makes it unattractive for me to participate in the maize market. If my neighbours are in a situation with similarly ranged shadow prices, the potentially tradable product, maize, would thus in our village become a de facto non-traded good, due to the high transaction costs involved in trading. Note that my price band problem could be even worse for more bulky products such as construction poles or firewood, because the transport costs here make up a higher portion of the final market value than for maize, or for perishable products such as fruits or vegetables, where a larger share of the products may become physically lost or damaged during the transport and commercialization process.

Along comes now to the village a young PhD student who wants to measure my household's welfare, and how much value different livelihood components contribute to it. We are discussing what price to value my maize production with: clearly both the intermediary's selling and buying prices would be inadequate, as would in this case also be the intermediate urban market price. The value we are looking for is my household's shadow price, which is jointly determined by my production costs and preferences for own consumption of the product in question. But that price is not stated anywhere, and my own gut feeling about its size might not be precise enough. What options exist for the young researcher to get a good price proxy? The next section outlines some hands-on ideas.

What valuation methods to use?

The choice of valuation method should generally be tailored to the specific characteristics, including the objectives of the study, the presumed importance of different types of goods and services, and the local information that is available. Our focus here is on the private benefits enjoyed by households, for subsistence and sale. Other environmental benefits include ecosystem services (for example, protection of watersheds, biodiversity, carbon stocks and recreational values) that can be valued through a series of methods (for example, hedonic pricing, travel costs, defensive expenditures and replacement costs,

production function approaches), which will not be treated here; see IIED (2003) for a general description of forest-benefit valuation techniques in developing countries. For quantifying household benefits in particular, we recommend the following six methods:

Local-level prices

Whenever available, using local prices is the first choice. These prices can come from within-village transactions or farm-gate/forest stumpage prices, and are extrapolated as general value indicators even to people who consumed but did not trade the product. Using the example from the previous section, if there is informal trade of maize between households within the village, the price used in these transactions might be a good proxy for valuing maize, in the absence of any external trades. It may be necessary to use focus groups and/or small market surveys to obtain the desired information.

Discussion: The big advantage here is that there exists a local price revealed by a real-world transaction. However, care is needed with this method when the underlying markets or transactions are extremely thin and unrepresentative. For instance, say maize is only being traded seasonally right before the harvest, when scarcity is at its peak and prices are thus very high. Or let us assume that bushmeat is consumed by everybody in the village, but it is only being bought by the wealthiest households, who engage in more rewarding activities that do not leave them enough time to go on long hunting trips and they thus likely have a larger willingness to pay for bushmeat than other people in the village. Both of these features would make reported prices too high for extrapolating to the desired value of common consumption over the entire year and population.

On the other hand, when I am buying maize from my neighbour, he might charge me a lower-than-normal amount, because he wants me to help him in the construction of his new stable: there is an expectation of a return favour embedded in the low price, which thus also constitutes an investment in social networks (Rao, 2001). Similarly, the farm-gate price that forest extractors of rubber or Brazil nuts receive from an intermediary trader is often low, because the trader has provided credit in advance to the extractors. In both of the latter cases, the local price would underestimate values, because it is invisibly bundled with other benefits.

Barter values

A non-traded commodity may locally be bartered for a marketed commodity. For instance, assume mushrooms are not traded, but occasionally exchanged between households for rice, which is usually a highly traded staple. Hence, rice

can serve as our *numeraire*: a common value measure that through triangulation implicitly sets a price for mushrooms: if 1kg of rice is commonly exchanged for one bag of mushrooms collected in the forest, and the former costs 20 shillings, then this price is also valid for the latter non-traded product.

Discussion: Barter values are as good as direct trade in reflecting de facto values, and as such an attractive measure – if one can find them. Barters may in many economic contexts have ceased to exist, giving way to cash transactions. Barters may perhaps even more than cash transactions be influenced by the aforementioned 'return favours' from social relations that are embedded into inter-household transactions, thus underestimating values. If variation between the implicit prices contained in different bartering deals is high, we should be suspicious (see also data checking in next section). We could also use *hypothetical* barters to elicit a proxy for a market price ('how much rice would you be willing to accept for your mushrooms?'). This is a contingent valuation approach (see next point), just with a non-cash *numeraire* being used.

Contingent valuation

In the absence of any monetary or barter transactions whatsoever, one can ask respondents directly about their hypothetical maximum willingness to pay (WTP) or minimum willingness to accept (WTA) for a non-traded item. The choice between WTA and WTP should be determined by the most likely counterfactual – in other words, whether an item is locally most likely to be bought or sold – but normally WTP is more reliable. Contingent valuation is a common and consolidated stated preference method in environmental economics, which has enjoyed increasing popularity, especially for valuing public goods (Mitchell and Carson, 1989; Hanley and Barbier, 2009). One case study in Ethiopia used contingent valuation (WTP) to elicit the benefits perceived by villagers from a community forestry programme – both for public and for private non-marketed benefits (Mekonnen, 2000).

Discussion: While contingent methods have become fairly standard in developed countries, in developing-country settings, more so in rural areas, respondents may culturally have much greater difficulties answering contingent questions that attempt to put monetary values on non-traded items (Whittington, 1998). Alternatively, they may answer strategically, in other words, understating or overstating values they suspect might influence posterior interventions by donors or lawmakers (see also Chapters 10 and 11). A second critique of contingent methods is more fundamental: it measures preferences of the individual being questioned, which, unlike in a marketplace, includes not only a (hypothetical) market price, but also the individual's consumer surplus – in other words, what we called above the 'bargain hunting' of

obtaining goods cheaper than the utility derived from them. This means that large differences between individual WTPs may occur, which as a proxy of aggregate market values lead to an overestimation of values.

How can contingent methods be used in rural household surveys? If valuation of a single received benefit (for example, a public good) or, conversely, the opportunity cost of giving up one (for example, those from avoided deforestation) is the primary focus of the research, then great care is needed in formulating the hypothetical questions in accordance with the theory of, and accumulated experience with, contingent analysis. Even so, in remote rural regions, one should expect only mixed chances of success with this method. If the purpose is more pragmatic, such as to receive value range estimates for non-traded subsistence products, the task might be easier. In the Poverty Environment Network (PEN) project, several scholars used the hypothetical WTP in focus groups to collectively value certain subsistence products, thus obtaining a consensus estimate. This collective consolidation could also help in reducing the aforementioned consumer surplus bias in individual WTP estimates.

Substitute goods values

Marketable close substitute goods might help providing useful value approximations. These can be either similar goods (for example, using a marketable timber species for a non-marketed one) or an alternative good (for example, a pharmaceutical product instead of medicinal plants). As for the second type, locally non-traded firewood is often being valued by comparing its energy content with commercial local close substitutes, such as gas, kerosene or soft coke – the latter being used, for example, by Chopra (1993) in an effort to value Indian tropical deciduous forests. Similarly, Adger et al (1995) and Gunatilake et al (1993) use substitute pricing for obtaining non-timber forest product (NTFP) values for building materials, medicines, firewood and fruits in a national forest valuation for Mexico and valuation of local uses of a national park in Sri Lanka, respectively.

Discussion: The substitute method may adequately value quintessential use values by their substitutive counterfactual. But often products are less close substitutes than they appear at first sight. For instance, rural households in the Andes often use firewood as an inferior energy source, for example, for prolonged cooking, and more expensive kerosene or gas for light and quick heating needs, for example, boiling water (Wunder, 1996). Often local people have no economic means whatsoever to obtain the expensive industrial or urban substitutes that the valuation studies suggest. The alternatives that people de facto turn to in cases when natural resources run dry are often far from these

'luxury' suggestions. For instance, lacking local firewood supply may lead to the burning of dung, to steeply increasing firewood collection times from remoter sources and to an overall lowering of energy consumption – rather than a switch to gas, kerosene or soft coke. Another classical mistake is when locally non-marketed medicinal plants are being valued by the price of pharmaceutical substitutes, which are so expensive that poor rural households would never be able to buy it – thus applying an inadequate counterfactual for valuation. Care is thus necessary when using the commercial value of modern substitutes, because potentially gross over-valuations of natural values can occur, which lead to unrealistic results regarding the importance of extractive activities and about the economic values that forests and wildlands generate.

Embedded time and other inputs

Imagine firewood in a forest-near village is highly abundant, and thus fetches a zero 'resource rent' (in other words, an open-access raw product in its natural setting). No development scenario would realistically alter its supply (see Box 8.1). However, the value of already collected firewood is never zero: the labour time used for collection sets a minimum value for its 'kitchen-gate' value. For instance, Chopra (1993) in his valuation of Indian deciduous forests used embedded labour collection time in part to value firewood and other NTFPs. If processing the firewood on a larger scale, for example, for making charcoal, required a chainsaw, then beyond the operator's labour time, more capital costs and the cost of gasoline would also be embedded in the output value.

Households typically distribute their labour and other inputs in ways that equals marginal returns from different activities – or at least does not fall under a certain minimum. Locally paid wages (in other words, not the national minimum wage!) could serve as 'shadow values of labour', which we can use to price the firewood collection time. Other inputs, typically of raw materials or capital, can also be computed and added to the minimum price. In fact, household economic models can, based on information about physical production inputs used and returns from other activities, help computing implicit output prices. This production function approach to output pricing can at least serve to double-check the validity of other pricing methods – see the Campbell et al (2002) case study for Chivi district in Zimbabwe.

Discussion: Labour time and embedded input valuation is key to understanding rural livelihoods, but labour is also challenging to measure robustly: rural people tend to multi task (for example, collect firewood when returning from agricultural field), shadow costs differ across labour types (for example, between skilled and unskilled men, women and children) and seasons (for example, harvesting versus between-harvest seasons). In the PEN project, a

strategic decision was made to not measure labour inputs, since it was thought that measurement efforts would be too resource-demanding. This generally precluded PEN researchers from using this valuation method. Finally, this conservative method with zero 'resource rents' assumes extreme abundance of natural products. As explained above, we are looking for the household's 'shadow price', which embeds both production costs and the utility of auto-consumption. What we implicitly assume with this method is that the shadow price is exclusively determined on the production side, so that the household demand side provides no value increment. In practice, this method thus often provides a lower value boundary, and is especially suited for inferior-type products.

Distant markets prices

Arguably the most common valuation error is to directly use urban-level market prices and multiply them by in-village production quantities to determine village-level subsistence values. This practice ignores that urban market prices include transport and marketing costs, whereas village-level value added may be only a fraction (see previous section). Moreover, distant market prices typically reflect purchasing power and levels of demand that are not present at local village levels. Even for a strictly speaking 'local' market, the valuation can become imprecise if it was to cover a variety of sub-sites with differences in resource availability and transport costs. Especially for bulky products such as firewood, charcoal, poles or fibres, errors in market location leads to glaring over-valuation errors.

Knowing the value chain, transport costs and margins of the product in other villages and close-by markets, one might possibly make corrections of the distant market price to arrive at a pseudo local price. These can also be estimated through surveys of value chain actors. In other words, if we find from 3–4 of these market studies that firewood tends to increase 0.10 shilling and charcoal 0.05 shilling per 50 km of transport distance to the market, then we can use these value increments in reverse: deducting market value added, what would have been the farm-gate value in our village?

Discussion: This method can make a useful complement only when product commercialization is a realistic counterfactual to direct use. It is also an applicable method of last resort when one has to validate uncorrected remote market information employed in an inadequate way; it is currently also being used for that purpose in the PEN project.

But distant market pricing would not be applicable when villages are extremely remote: transport costs would then come to exceed resource values, thus leading to negative imputed farm-gate prices. This would explain in

economic terms why non-traded price bands are wide, and why product commercialization from our village of interest was not realistic in the first place.

Although we have described several methods individually, none may fully do the trick of delivering the exact desired value. Conversely, it is also seldom that a product can be simultaneously valued by all six methods; often by default only some methods are feasible. Combining these feasible methods for cross-checks and balances can thus lead to much more consolidated estimates, using both economic theory and common sense. The analyst should also not hesitate to make corrections and computations, as long as the assumptions are presented to the public in a transparent way. Valuing subsistence uses thus also requires viewing resources from comparative angles, and using economic common sense in making adequate choices (see also Box 8.2).

Box 8.2 *Can all non-marketed forest products be valued?*

Any comprehensive environmental income study in rural settings in developing countries is likely to come up with a long list of products used for a large number of purposes. Though it may be possible to accurately value many of these products, there may also be many pitfalls (for example, Adamowicz et al, 1998, Sheil and Wunder, 2002). Therefore, it may be necessary to try different techniques. As illustrated in this book, valuation may require careful planning, thorough data collection, continuous data quality control and opportunities to return to field sites to check suspicious data. And it may be necessary to pay particular attention to products that are of importance to most households' subsistence production, such as firewood, to ensure accurate value estimates for such products.

For some products, such as grasses and herbage consumed by grazing livestock, it may not be possible to directly obtain own-reported values. This is a challenge when one is working in an area where such products constitute an important component in household livelihoods, for example, in mixed agricultural systems reliant on grasslands for providing feeds to large livestock. For such products, one may be able to generate value estimates by combining own data with data from the literature.

There are also products that are impossible to value quantitatively. These may include sacred goods (Adamowicz et al, 1998), such as wooden religious artefacts, which people are unwilling to substitute, or in some settings the value of water consumption (Cavendish, 2002). Studies based on the PEN prototype questionnaire (PEN, 2007) generally do not record sacred goods or water consumption.

Checking data

The first three methods in the previous section rely directly on household's 'own-reported' values. The last three methods are estimates, in the sense that the outside analyst makes key assumptions regarding the applicability of imputed values. But there are many potential pitfalls, for example, when households feel obliged to provide answers to our contingent valuation questions even though they personally find it almost impossible. So, we need to check data quality: can we trust households' own-reported and our own analytically imputed values to provide valid and reliable measures? See also Chapter 12 for a general treatment of data checking.

A first step is to calculate basic distributional statistics (minimum, maximum, mode, median, mean, standard deviation) for unit values at product level (Cavendish, 2002). If households have provided us with valid data, we would generally expect:

- **Low dispersion in unit values**: For products with stable prices, we would expect standard deviation lower than the mean; and similar mean, mode and median values. The value band – in other words, the range within which values are estimated (determined by estimated minimum and maximum values) – should not be too wide, empirical evidence suggests that the value band for products with aggregated unit values with acceptable properties, is typically three to six times the standard deviation (Olsen, 2005; Rayamajhi and Olsen, 2008; Uberhuaga and Olsen, 2008). Products subject to fluctuating prices, for example, products with large seasonal price differences, such as pre- and post-harvest or heterogeneous products, will exhibit higher variation in unit values (see above for sources of price variation).
- **Homogenous standardized unit values**: Product values per SI unit (International System of Units, in other words, the modern metric system of measurement, including kilograms) should be similar across local units of measurement. Therefore it is useful to establish the relationship between local and SI units during fieldwork. Many conversion rates between local and SI units are product-specific (for example, how many kilograms of a particular fruit in a standard-sized basket?). Often many environmental products are used simultaneously, with various local measurement units. There may be much seasonal variation in product availability, and in some cases only few observations. Hence, conversion of local into SI units (which is needed if the physical quantities have to be compared across cases) is demanding, and should be explicitly planned for and continuously undertaken alongside value-data collection in the field.

- **Logical value ranking and correlations**: The value of processed products should be higher than for unprocessed materials (for example, charcoal will be more valuable than firewood), and similar products should have similar values (for example, different types of leaves used for the same purpose).

The few published studies using the above checking approach (Cavendish, 2002; Rayamajhi and Olsen, 2008; Uberhuaga and Olsen, 2008) showed unbiased own-reported values with satisfactory properties, which could hence serve for aggregation into product-level price estimates. Data checking can also include some aggregate common sense considerations. However, some valuation problems are commonly encountered:

- **Product size**: A particular product can exhibit variation for natural reasons, for example, species of mammals, fish or bamboo vary naturally in size. This can be dealt with through using more finely graded product categories – for example, registration of bamboo species – or by recording individual product details – for example, species and weight of hunted mammals.
- **Product quality**: Some product characteristics may not surface in interviews, for example, firewood may be wet or dry, or species composition may vary across loads. Again, this can be overcome by using more finely graded product categories.
- **Spatial and temporal variability**: In large study areas, own-reported values may vary due to differences in, for instance, transport costs and resource access. Some product values may also exhibit marked seasonality, for example, firewood may be valued higher in the winter, or fruits may be of low value in peak harvesting season. Keeping records at individual village level and collecting data across all main seasons should allow for analysis of such issues.
- **Few observations**: Many products may be encountered only once or a few times during a survey period. Data checking is hard for these products, but usually their share in total household income also remains low. In isolated hunter-gatherer communities where households collect a large number of products rarely, ignoring products with few observations may lead to underestimation of forest income. Additional information on such products can be collected through focus group discussions.

A systematic bias in the own-reported value data is problematic, as this would result in price data that do not reflect the true assigned value of products. The reason might be strategic responses on behalf of the surveyed population, such as wanting to appear poorer or underplaying the economic importance of illegally harvested products. Systematic bias should preferably be limited during

fieldwork, for example, through clearly stating purposes of research and establishing good relationships to respondents (see Chapters 10 and 11). In general, checking data should already be done in the field, not at data entry stages. This allows the immediate cross-checking of suspicious estimates with households and informants.

Conclusions

In developed economies, non-market valuation is basically limited to the field of externalities and public goods. However, in developing countries, especially in rural areas, many products consumed at the local level do not enter the marketplace, or only do so partially. This is due to a number of structural obstacles and imperfections in output, factor, credit and insurance markets.

Valuing non-marketed products in rural tropical livelihoods is thus important in order to get a holistic view of household welfare and understanding the day-to-day decisions households make. Economic values reflect local scarcity and scenarios for the alternative use of resources at the margin of currently observed patterns. These do not necessarily integrate all the broader welfare considerations we as human beings are concerned with. But they provide good guidelines for how to optimize resource use at the margin of larger societal trends.

As economic analysts, we will necessarily want to 'compare apples with oranges', in other words, obtain a reductionist common monetary yardstick for ranking physical quantities that viewed in isolation would say little about household welfare outcomes. Failing to do so may misguide policy and project interventions, by ignoring the hidden harvest from multiple subsistence-oriented resource-extractive activities (Campbell and Luckert, 2002).

Determining these economic values, however, is not always easy; people's preferences, production functions and decision-making parameters cannot be read in an open book. Valuation normally requires some economic reasoning, an eclectic approach, a good portion of common sense and also some pragmatism. In the above sections, we described six different specific methods with their respective pros and cons, and how they could be creatively combined so as to cross-check value estimates from different angles and perspectives. Some of these rely on self-reported household values; others are analytical estimates. Under scenarios of imperfect information, setting upper and lower boundaries by triangulating different subsistence valuation methods may be the most promising approach. The relevance of methods may vary substantially across the subsistence products in question. There are often also strong spatial dimensions to natural resource values: implicit prices for one product may differ substantially between the forest, farm-gate and urban marketing levels.

Moreover, checking the value data's statistical and other properties can also provide important insights into the validity of findings. A careful product-level empirical analysis can reveal errors. But data checking should also include some aggregate common sense considerations. If we visibly perceive that villagers spend two thirds of their time on an activity we have valued at 10 per cent of all household income, we know that we have probably come to make an undervaluation somewhere. Or if half of the resulting household incomes in a village, for instance, proves to be concentrated in the subsistence use of wood fuels, we know that an error must have occurred, since the nature of human needs and composition of household spending elsewhere in the world would not justify such a concentration in household consumption. We have probably then chosen a wrong valuation method for firewood and should go back to have a second look. In other words, valuation is probably best conceived as an iterative procedure, where a process of trial and error will lead the analyst to reasonable estimates.

Key messages

- In rural areas of developing countries, especially remote settings with limited market access, the extent of non-marketed production can be substantial. Assigning inadequate values to these products can lead to major misunderstandings about local welfare and resource-use dynamics.
- We presented a prioritized list of six different methods to value subsistence goods, drawing on either household self-reported data or externally derived economic estimations. This list should be used eclectically, according to the specific case in question.
- For arriving at adequate value estimates, we recommend a thorough empirical check on household-reported value data, and the use of different subsistence methods and economic common sense to cross-check the results.

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