# HOW DO FORESTS SUPPORT, INSURE AND IMPROVE THE LIVELIHOODS OF THE RURAL POOR? A RESEARCH NOTE

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## 1. Research Questions

Overall, forests have 3 possible roles in the livelihoods of the rural poor:

- by supporting the current consumption of the poor
- by providing valuable safety nets for the poor
- by providing a possible pathway out of poverty for the poor

Given the possibility of conducting a multi-country set of cross-sectional questionnaires on households and forest use, what questions could we answer, and what hypotheses might we have about these questions?

### 1.1: What is role of forest resources in supporting the livelihoods of the rural poor?

*Background* - Forests provide a wide variety of useful resources for rural households. These resources have a range of economic functions – sustaining consumption, generating cash income, providing agricultural inputs, providing input for small-scale enterprises, underpinning capital formation. Although we know rural households use forest resources extensively, not enough is known about their quantitative contribution to rural livelihoods in different forest areas, and how this relates to the different features of different poor households.

*Hypotheses*:

- overall, the poor depend more heavily on forest resources than the rich
- overall, the chronically poor depend more heavily on forest resources than the just-poor
- overall, the rich use more forest resources (in value terms) than the poor
- the relationship between rates of resource use and the household affluence differs according to the specific resource
- this differentiation holds with respect to other key sources of socio-economic stratification, such as gender, ethnicity, the life-cycle of the household, household composition

### 1.2: What is the role of forest resources in insuring rural households?

*Background* – Forest resources have 2 different insurance roles (see Angelson and Wunder 2003, Wunder 2001). They "fill gaps" as part of household responses to ex ante risks, like seasonal and other periodic fluctations in goods' availability and affordability. And they offer "safety nets" as part of household responses to larger ex post shocks, such as drought, unemployment and health shocks. But very little is known about the economic significance of these insurance functions, and how forest safety nets relate to the other safety nets rural households use to insure themselves against risk.

*Hypotheses:*

- overall, the insurance value of forest resources is small compared to the value of total household consumption
- but the insurance value of forest resources may be a significant part of their overall use value
- as a share of total household consumption, poorer households get a higher insurance value from forest resources than richer households
- forest safety nets are one of a set of safety nets for rural households
- the value of forest safety nets as a share of total safety net values declines as households get richer: forest safety nets are inferior insurance goods
- given that forest products are economically differentiated goods, so the use of forest products as insurance – and hence insurance values – varies by type of product, household, and shock

### 1.3: What is the role of forest resources in providing a pathway out of poverty?

*Background* – Rural households are often dependent on forest resources because they are poor, lacking the land, financial capital, other assets, and skills to undertake more profitable economic activities. And many forest resources have low value added, with low barriers to entry. So the existence of poverty traps (both asset and welfare poverty traps) is central to explaining differentiation in forest resource use. Understanding the link between poverty traps and the differing returns to forest resource activities is central to explaining the role forest resources have in providing pathways out of poverty.

*Hypotheses:*

- there are significant differences in value added per unit of resource use, for different forest resources. Lower and higher return resources can be distinguished.
- most forest resource uses have low value added.
- as the value added of forest resources rises, so tenure and other institutional features of resource use change to favour richer and more powerful households
- the key variables explaining these differences between households' ability to exploit higher vs lower return forest resources are the land availability, labour availability, skills, capital assets, and forest access characteristics of the household
- these variables underpin rural differentiation more widely
- compared to other accumulation strategies, few households become affluent by exploiting higher return forest products

## 2. Where Should the Research be Conducted?

We want to explore these research questions by analysing the variation between different kinds of forest systems and different kinds of socio-economic systems. This will improve the robustness of our conclusions, and allow application of the research findings to a wider set of countries.

However, the project is likely to involve only between 6 to 10 study sites in different countries. Given the wide variety of different forest types and production systems, it will not be possible to cover all the ways in which forests and the poor interact. Of course, some variation will come within country as well as across-country. All the same, it is

sensible to think through clearly what factors should vary and what factors should be held constant across countries, then select study sites carefully in the light of these choices.

We look at the chief sources of variation in turn.

*Type of forest*
The core research question is what contribution natural forests play in supporting, insuring and improving the livelihoods of the poor. So all study sites should focus on the role natural forests rather than forest systems that have been disturbed to such a degree that they are effectively plantations or small domestic plots. The upside of doing this is that this keeps the research focus on a key environmental issue – the conservation of natural forests. The downside is that it loses information on the potential contribution of agro-forestry (and other tree management regimes) to poverty alleviation.

Within the overall category of natural forests, there may be important differences between high-commercial potential and low-commercial potential forests; between near-natural and degraded forests; and between wet and dry tropical forests. These categories will of course overlap. For example, there are few high-commercial potential dry forests; many degraded forests will be so because the really valuable timber will have already been harvested. So the important natural forest types to research are: dry forests; wet, high potential forests; and wet low potential forests. These different forest types should be built into cross-country variation. This could be achieved by choosing carefully 2 to 3 study sites in each of Africa, Asian and LA.

*Forest tenure and management*
Natural forests are owned and managed in a variety of ways, including open access; communal with enforced access rules; private unmanaged; private managed. Economic theory would predict significant differences in resource use patterns between the same forest type held under different tenure conditions. And an important question in the current policy debate is whether changing tenure (eg from open access to local communal management) changes the potential role of forest products in the livelihoods of the poor. So it is desirable to build variation of forest tenure systems into the research.

In looking at actual forest tenure and management systems globally, two types stand out. Because collective forest access rules are so often enforced weakly, these are open access forests (whether owned by communities or the State); and private forests.

Forest tenure sometimes varies between these two types within a single study site. But while this local variation should be exploited wherever possible, this is uncommon. So study sites should be chosen to produce a comparison of forest tenure systems across countries. If possible, this variation of tenure should occur within each continent ie in Latin America, a study site with open access tenure and a study site with private tenure, and so on.

*Type of local agent*
Ignoring urban consumers, there are six main beneficiaries of forest products: (i) indigenous forest dwellers; (ii) swidden agriculturalists; (iii) smallholder farmers on the forest fringe; (iv) NTFP specialists; (v) timber-based SMEs; (vi) landless labourers. The first category – basically hunter-gatherers – are not interesting in terms of this research, in that we know that they are heavily dependent on forests and that they tend to be very poor, and there is no need to document this yet again.

The other five categories are all useful from the point of view of this research. The likelihood is that each group has very different uses of forests; derives very different insurance values and functions from the forest; and may be constrained in very different ways in their use of the forest. In particular, both welfare and asset poverty constraints probably matter for smallholder farmers, landless labourers and swidden agriculturalists; asset constraints are likely to matter most for NTFP specialists and timber-based SMEs.

Given the importance of this source of variation, it would be useful to get as much information as these different groups as possible. So study sites should be picked so that there are as many of these 5 categories of agents as possible in each site.

*Source of risk*

To look at the role forests play in insuring against risk, it is vital that some risks exist. This should not be a problem for any of the agents we have selected. The types of major risks faced by smallholders, NTFP specialists or timber-SMEs include: climatic variation; human morbidity and mortality; animal morbidity and mortality; the loss of major income sources (eg through unemployment within the family); equipment failures; price shocks; and so on.

Some of these risks will vary naturally across countries – for example between unimodal rainfall areas and much more seasonal and erratic rainfall areas – and just due to the course of events – for example illness, price changes, equipment failures. These risks can be measured naturally as part of the data collection exercise.

To get really good research results, we would also want there to be as much household-specific risk as possible within study sites. This will allow real identification of the insurance functions of forests and derived forest option values. Again, this should be guaranteed as long as there is reasonable variation in agent and household types. This reinforces the desirability of including differences in agent type within each study site.

*Levels of income and poverty*

To look at all 3 research questions, it will be desirable to have variation in the levels of income and poverty being studied. Some of this variation will come naturally –from differences in income levels across countries. However, to get really good research answers it will be desirable to have a reasonably wide income range within each study site. This is partly to examine the differing role forests play at differing income levels; partly to look at how forest insurance functions change as income varies; and partly to provide case studies of richer rural households, and how they accumulated their relative wealth.

This implies that study sites should be chosen deliberately to include a reasonably wide variation of incomes. So all study sites should have mixtures of the chronically poor (<US$1 per day), the moderately poor (>US$1 per day and <US$2 per day) and the better off (>US$2 per day). (Note that these figures should be adjusted according to local perceptions and measures of poverty).

*Infrastructure and market distance*

The literatures on forest and poverty emphasises variations in infrastructure (or market distance) as a key driver of both incomes and deforestation. Reasonably cheap access to an urban centre or major formal market goes hand-in-hand with higher incomes, higher producer crop prices, higher NTFP prices, higher wage rates, better defined property

rights, and greater forest clearance. There are also stronger possibilities of rural-urban migration and remittances returning to the rural household. Remote areas, by contrast, generally have the opposite of all these things. (This is not always the case in parts of the Amazon).

Ideally, it would be desirable to choose 2 study sites in each country, whereby one is "close" to formal markets – such as a peri-urban area with remaining natural forests – while the other is "remote" – such as a much less well connected area of mixed agriculture and forest use. This would allow real exploitation of variation in this factor. However, this may be beyond the capacities of the project, in which case study sites should be chosen so there are different market distances between study sites across countries.

*Population density*
The density of population should also make a difference to the relationship between forest products and rural livelihoods. To a degree, population densities are correlated with market distance – closer areas having higher densities than remote areas. There will also be natural differences between sites in different continents. However, if variations in population densities due to these factors does not turn out to be significant, it would be sensible to select study sites in order to include areas with lower and higher population densities.

*Migration*
Another popular theme in the literature on forest degradation is that recent migrants into an area are much more likely to degrade forests than longer-term residents, whether due to differences in income levels, tenure security, rule adherence, capital assets, or culture. So it will be interesting to look in this study at whether there are systematic differences between migrants and longer-term residents in their use, insurance value and poverty alleviation characteristics of forests. Again, this is something that can be achieved by ensuring that there is a mixture of migrants and settled households in each of the study sites.

**Table 1: Criteria for country and site selection**

| | Variables chosen to: | | |
|---|---|---|---|
| | Be constant across countries | Vary across countries | Vary within study sites |
| Forest type | Natural forests | Dry forests; wet, high potential forests; wet low potential forests | None |
| Forest tenure | None | Open access; private | [*Open access; private where possible*] |
| Local agent | No hunter-gatherer forest dwellers | None | Swidden farmers; smallholder farmers; NTFP specialists; timber-based SMEs; landless labourers |
| Source of risk | None | Natural variation from different climates | Natural variation with different local agents |
| Levels of poverty | None | Natural variation from average income levels | Chronic poverty; moderate poverty; middle-income. |
| Market distance | None | Close; remote | *[Close; remote if more than one study site per country]* |
| Population density | None | Natural | Lower; higher |
| Migrants | None | None | Natural |

## 3. Research Methods

### 3.1: The role of forests resources in supporting the livelihoods of the rural poor

There are already two case studies of rural households' forest product use that have integrated economic and forest use data to create comprehensive, accurate and consistent household accounts of the type required. These are Cavendish (1997) for Shindi Ward, Zimbabwe, and Campbell et al (2002) *Household livelihoods in semi-arid regions* for two sites, also in Zimbabwe.

The methodology for collecting these data is described in detail by Cavendish in Campbell and Luckert (2000) *Hidden harvest* Ch.2, with valuable refinements of this core methodology suggested in Campbell et al (2002) *Household livelihoods in semi-arid regions* Ch.3. The methods described should be followed carefully in each of the project study areas.

There are some particular lessons that these studies have drawn from their experiences in the field. One is that almost all rural households studied are involved in a fluctuating mix of livelihood activities, ranging between formal and informal sectors. Also, these studies have found that forests usually offer rural households a wide range of resource uses. These uses are seasonally variable; are often "small" compared to major income and consumption sources; can be used sporadically; but also enter into household economic accounts in a number of different ways. This implies:

- The need for care and consistency in getting at a full set of household livelihood activities. Income and subsistence sources are varied and derived by different members of the household at different times of the year in different ways. It is important to establish in advance of formal data collection, the full range of livelihood activities undertaken by households in the study area, and the gender and age profile of these activities. Questionnaires can then be designed around this information.
- The need for care and consistency in getting at the whole range of forest product uses, including those that indirectly feed into other household economic activities (for example livestock grazing in the forest). Again, these need to be established in advance of formal data collection and questionnaires designed accordingly.
- Because of the episodic, shifting nature of rural household livelihood activities, it is useful to build in within- and across-questionnaire cross-checks, to draw out inconsistencies or new sources of information which can then be followed up by repeat visits while the survey team is still in the field. (See section 4 for more on this).
- Recall periods matter hugely. As Campbell et al (2002) show, using over-long recall periods leads to serious underestimation of the scale of household activity. They find, for example, that asking about wage remittances and cash expenditures on the basis of quarterly recall produces economic values just a third the size of the more accurate ones based on weekly recall. It is vital to match recall periods to the real capacity of respondents to recall accurately their economic activities. Again, this needs careful pre-testing before the formal data collection begins.

### 3.2: The role of forest resources in providing insurance for rural households

It seems obvious from reading the literature on rural households' use of forest products that forests provide backstop resources for use in the event of misfortune (see Kaimowitz 2002 and references therein). As we outlined earlier, these are described in the parts of the forestry literature as:

- "Gap filling" – providing economic opportunities in response to predictable events such as seasonal food shortages, or the need to generate moderate levels of cash income for expenditures like school fees;
- Providing "safety nets" in the face of more major, unpredictable events and shocks.

As described in the forestry literature, "gap filling" functions may be of significant value to different types of rural households, but as a response to predictable events they do not have an independent insurance value. "Safety net" functions by contrast do have an insurance value. So at first blush, it might seem straightforward to calculate the value that these "safety net" forest roles offer to rural households and thereby calculate the total insurance value of forests.

However, this is not actually the way we should proceed. There has been a long and distinguished research programme in economics looking at the relationship between rural households, risk, and the strategies rural households follow for dealing with risk. This distinction between "gap filling" and "safety net" forest roles does not do justice to the insights of this literature. We need to work through more systematically the type of risks faced by rural households, and their different ways of dealing with these, before we can establish how we might get at forest insurance values.

*Risk and rural livelihoods*

Rural households repeatedly face a wide range of risks; and so they create livelihood portfolios precisely to deal with these risks. The major risks faced by rural households include: illness; injury; disability; death; drought; other major crop failures; large crop price fluctuations; livestock disease and death; unemployment; falling wages; theft; land expropriation; other serious crimes; political violence; civil war; and domestic unrest.

The economic literature on risk and rural households – which almost always ignores natural resource issues – describes a range of mechanisms, both formal and informal, for dealing with these risks. These include:

- Reducing the risks they face – through migration; developing more secure income sources; collective action to invest in risk-preventing goods (eg dams, dykes, fences, terraces, security); and securing the resource base through common management or other means;
- Mitigating risk through diversification – through crop and plot diversification, income diversification, such as combining farm and non-farm income; investment in physical and human capital; the returns from formal savings; the returns from collective, informal savings schemes;
- Mitigating risk through insurance – through marriage and the extended family; investing in livestock assets; investing in crop and other buffer stocks;

sharecropper tenancy and other contracts that share risk; investment in savings; investment in social networks to create reciprocal obligations;

- Dealing with shocks – through asset sales, including livestock; using up savings; taking loans; reducing food consumption; sending children to work; migrating seasonally or temporarily; relying on private transfers from networks of mutual support; increasing labour supply;

(Note that some economic activities provide a number of different ways for households to deal with risk. For example, households' formal savings bring an income return that diversifies risk; constitutes an asset that insures against risk; and provides a draw-down option that is part of coping with risk. In smallholder pastoralist systems, cattle are likewise a multi-product asset. Their milk is an income or consumption stream that diversifies risk; their asset value provides insurance against risk; they create social capital through bride-wealth, again insuring against risk; and they can be sold in the event of shocks. As we will see below, forests also offer rural households multiple ways of dealing with risk).

Despite this range of mechanisms, in practice rural households achieve nothing like "full insurance." A rural household is said to be fully insured if there is no relation between temporary income fluctuations and consumption; partially insured if there is some link between these two; completely; uninsured if there is a perfect correlation between temporary income fluctuations and household consumption. Analysis of rural households shows that consumption fluctuates quite dramatically, with loans and transfers in particular offsetting perhaps only 10 percent of the risks households face. Furthermore, the poorest households are usually the least insured against shocks. Ravallion and Jalan (1997) report that for the poorest wealth decile, 40 percent of an income shock is passed on to current consumption, whereas consumption for the richest third of households is protected from almost 90 percent of an income shock.

*Forest resources and risk strategies*

In this light, it would seem that forests can play a number of roles in dealing with risk:

- Reducing risks – by providing eco-system functions that mitigate natural risks (though in general it will not be possible to value such functions);
- Diversifying risks – by providing economic opportunities that are non-covariant with other livelihood activities eg with crop production, livestock production, labour income, household micro-enterprises and the like;
- Mitigating risks – by providing standing stocks of goods that can be exploited in difficult times (eg timber stocks, firewood stocks);
- Dealing with shocks – by providing economic activities with low entry barriers for those households that are afflicted by serious problems.

And given the finding that poorer households are less able to insure themselves than richer households, these forest insurance functions may be particularly important for the less well-off.

*What can we do with cross-section data?*

Can all these different insurance values be estimated from cross-sectional data sets? To answer this question, we need to make some more distinctions. The first is between

common versus idiosyncratic (or household-specific) risk. Common risk is something that happens to an area as a whole. Examples would be a severe, area-wide drought; a significant change in goods prices or interest rates; or other macro-events, such as regime change. By contrast, idiosyncratic risk happens only to the individual or households in question.

It is difficult to establish the full set of household responses to common risk from cross-sectional data. Because the shock happens to all households, it is not possible to identify fully how behavioural responses differ according to different risk types and levels. (It is the same reason why we cannot estimate price elasticities of demand from cross-sectional data). Of course, because households differ in advance of the shock in their asset and livelihoods portfolios, their responses to a common shock will accordingly differ. To take an example, after the drought shock in Zimbabwe in 1991/92, households in Chivi with sufficient adult labour were able to take up gold-panning. Those constrained in adult labour – for example female-headed households – were not able to do this.

Cross-sectional data would be able to establish these differential responses. But without a "normal" year against which to compare these post-shock livelihood strategies, we cannot compare how forest use in this case compares with "normal" levels. So this research programme will not in general be able to establish forest insurance values in the face of such common risks. (The exception is where there are data collected over time from the same survey area, what is called panel data. There is the potential to create a panel data set of rural livelihoods and forest resource use by re-sampling Shindi Ward, Zimbabwe, following the surveys there of Cavendish in 1993/94 and 1996/97).

Though quantitative results will not be available here, it is possible to derive a qualitative understanding of responses to such shocks through the use of recall questions in the survey. For example, asking households in the survey area to list in rank order their most important livelihood strategies in response to a predefined common shock. These qualitative data can prove useful particularly when responses are compared across the different forest types being sampled in the overall research programme.

Fortunately, the general finding of the economics literature is that most of the risks faced by individual rural households are idiosyncratic rather than common. (See for example Deaton 1997, Dercon and Krishnan 1999b, Townsend 1995, and Morduch 1991 – references in Dercon 2000). As a rough guide, probably ¾ of total risk is individual rather than common. So even though cross-sectional data cannot identify forest insurance values in the event of common risks, in normal years this is only a minor portion of total forest insurance values.

With respect to idiosyncratic risk, we now need to distinguish between ex ante and ex post risk. The difference between these two risk types is explained in the box.

So in terms of our earlier discussion of the role forests play in dealing with risk, we can classify diversification and insurance as mechanisms to deal with ex ante risk, coping as a mechanism to deal with ex post risk.

The key difference is that of households taking action in advance of events in response to ex ante risk, and households taking action after events in response to ex post risk. This distinction matters because it makes a material difference to the way in which we can elicit forest insurance values.

**Rural household livelihoods and risk (from Dercon 2000)**

*Summary: Households in risky environments have developed sophisticated (ex-ante) risk-management and (ex-post) risk-coping strategies, including self-insurance via savings and informal insurance mechanisms.*

Households do not just undergo the consequences of high risk. Livelihood systems have developed that focus on long-term survival and well-being. There are different ways to characterise these systems. Alderman and Paxson (1994) distinguish risk-management from risk-coping strategies. The former attempt to affect *ex-ante* the riskiness of the income process ('income smoothing'). Examples are income diversification, through combining activities with low positive covariance and income-skewing, i.e. taking up low risk activities even at the cost of low return. In practice, this implies that households are usually involved in a variety of activities, including farm and off-farm activities, use seasonal migration to diversify, etc. (Rosenzweig and Binswanger 1993, Morduch 1990, Alderman and Paxson 1994 give more references). They are usually household or individually based but may also involve neighbours, relatives or kingroups (Fafchamps 1992).

Risk-coping strategies involve self-insurance (through precautionary savings) and informal group-based risk-sharing. They deal with the consequences *(ex-post)* of income risk ('consumption smoothing'). Households can insure themselves, by building up assets in 'good' years, to deplete these stocks in 'bad' years. Deaton (1991) has shown that precautionary savings can provide quite an effective, even though imperfect strategy for households in dealing with income risk. Rosenzweig and Wolpin (1993) report the use of bullocks in India to smooth consumption. Czukas et al. (1998), however, find little evidence of smoothing through sales of livestock.

Alternatively, informal arrangements can develop between members of a group or village to support each other in case of hardship. These mechanisms are often observed operating within extended families, ethnic groups, neighbourhood groups and professional networks. In recent years, these mechanisms have been studied theoretically and empirically in variety of settings (even though mainly in a few villages in India) (theoretically by Coate and Ravallion 1993, in ICRISAT-villages by Townsend 1994 and Ligon et al. 1997; empirically in the Philippines by Lund and Fafchamps 1997).

Risk-coping strategies may also involve attempting to earn extra income when hardship occurs. Kochar (1995) reports increased labour supply as the key response in the ICRISAT villages. The literature on coping strategies when famine strikes also regularly report attempts to earn additional income through a reallocation of labour, including temporary migration, earning income from collecting wild foods (also for own consumption), gathering activities (such as increased firewood collection), etc. Dessalegn Rahmato (1991) reports all these responses during the famine in Wollo in Ethiopia in 1984-85; similar responses were noticed in Sudan (De Waal 1987). Other examples are in Corbett (1988).

Group-based insurance mechanisms are geared towards insuring idiosyncratic shocks, affecting some members but not to all. They obviously cannot provide insurance to deal with shocks common to all members. Self-insurance can, in principle, deal with any type of shock, as long as ex-ante sufficiently large resources have been built up. Recent work has highlighted the links between informal insurance and self-insurance (e.g. Ligon et al. 1998) - and this has important implications for policy design.

*Establishing the role of forest products in dealing with shocks*

These values are easier to establish in the case of coping strategies for ex post risk. Because these involve definite actions in response to discrete events, the impact of ex post risk factors on forest product use can be clearly established through regression analysis. This can be done by running standard regression functions for different forest product uses, but including in the rhs of the regression, variables measuring the existence and size of various shocks. (This kind of analysis is found in McSweeney 2003).

To take a concrete example: suppose that in a given study area, households supply an NTFP such as carving wood to a market. In the absence of any shocks, there will be a supply function for carving wood (W) that can be estimated in the standard way:

$W_{ij}$ = f(income$_{ij}$, market prices$_j$, capital$_{ij}$, labour$_{ij}$, other hh characteristics$_i$, resource availability$_{ij}$, other variables$_{ij}$)

where: household i = (1,….,n)
season j = (1,…,m)

The lhs is our measure of forest resource use. It could be a simple discrete measure of whether the household sells wood for carvings or not; or it could be a budget share measure giving a better idea of the overall significance of this activity to the household. In the former case, probit regressions would be run; in the latter, tobit regressions or any more sophisticated form of truncated variable estimation technique. The rhs of the equation contains the usual variables explaining household supply.

After a household specific shock, though, the household may choose to supply more or less carving wood than it otherwise would. So the impact of the shock on carving use can be identified through the regression:

$W_{i,j+1..m}$ = f({set of supply variables}; death$_{ij}$, illness$_{ij}$, unemployment$_{ij}$, crop failure$_{ij}$, other major identified risks$_{ij}$)

(Note in this equation that supply, $W_{i,j+1}$, is next-period supply, or up to m period-after supply).

To look at forest use in the round in response to shocks, we would estimate demand and supply functions as appropriate for the range of goods identified by key informants to be candidate forest use activities for households in response to such shocks. For example, wild food consumption, firewood sales, carpentry, timber sales, and so on.

The format chosen allows us to identify a number of things:

- The sign and significance of the coefficients on the shock variables allow us to assess to what degree forests products are being used as a coping strategy in response to shocks. Of course, it is possible that these coefficients are negative, in which case households would be substituting out of forest uses in the event of shocks – the opposite of insurance.
- With a number of seasonal lags in the supply function, it is possible to examine whether the use of forest products in responses to shocks is immediate, or whether it either amplifies or dies away over time.
- As usual, non-linear impacts can be identified through the use of squared variables

In order to explore the complete range of coping strategies used by rural households, these kinds of functions should be estimated for all the coping strategies identified by key informants as likely to be used in response to household shocks. For example, this might include livestock sales, migration, increased remittances, increased crop sales, use of savings, loans from friends and relatives, gifts, and so on. Again, the size and significance

of the shock coefficients would tell us much about which activities are used at all; how significant they are in total; and which are used in response to which shocks.

Finally, we are also interested in the question of whether richer households use a different portfolio of coping strategies than poorer households, and in particular whether forest products are used more by the poor than by the rich. We can analyse this question by additionally interacting, on the rhs of the regression, all the shock variables with household assets or household wealth status. The coefficient on these interacted variables will tell us (i) whether there is any significant difference between wealthy and less wealthy households; and (ii) how different coping strategies vary as households become better off. (If we wanted to examine whether the use of forest products as coping strategies varied according to gender, ethnicity, household structure and so on, then we can simply interact these variables in the same way).

So the final set of regressions would be as follows:

$$C_{i,j+1..m} = f(\{\text{set of demand or supply variables as appropriate}\}; \{\text{set of shock variables}\}; \text{household wealth} * \{\text{set of shock variables}\})$$

where C is any coping strategy used by the household.

*Establishing the role of forest products in dealing with ex ante risk*
Establishing the role of forest products in dealing with ex ante risk is more challenging, as by definition this involves actions that have been taken in advance of events, so that these are woven into the fabric of the households livelihood strategies. For example, it may be that in response to the various risks faced by rural households, they diversify their general livelihood portfolios in advance of any particular realisation of events to include forest product use and sales. So in a cross-section data set, the researcher may observe forest product use by different households. But in the absence of any measure of household-specific ex ante risk, it will not be possible to identify through regression analysis whether households are using these forest products just in response to their standard preferences, or whether they are using them to mitigate or diversify risk.

Two ways forward suggest themselves. The first is to concentrate on the relationship between forest use and agricultural risk. The idea here is that households involved in farming face repeated weather and other "draws", and so should have an idea of the likely variability of crop outcomes. Households will construct livelihood options that allow them to respond to this variability. They know that some years they will have a good harvest, and other years a bad harvest. So they will construct economic options that allow them to respond to these different outcomes.

This reasoning suggests that we can get at these insurance values by looking at the relationship between forest use and deviations of crop outcomes from household expectations. In other words, we can ask the household at some point during the crop cycle what they expect their harvest to be; we can observe actual harvest outcomes; and we can relate this difference to their subsequent use of forest products. We might expect, for example, that households with negative crop realisations use forest products more than those with positive crop realisations. (The counterexample here would be a high return forest activity that needs investment of some sort for a household to enter the activity: in this case, better crop returns may allow the household to make the required investment).

To look at this relationship, then, we can simply add terms for negative and positive crop deviations in the rhs of the regression equation above. (We would separate out negative and positive crop deviations because households may have very different responses according to whether they do better or worse than expected. In other words, there are discontinuities around the zero point). As before, we can look at the size and significance of coefficients; can examine non-linear effects; and can instrument crop deviations with wealth and other variables to see whether poorer and richer households differ in their responses.

While this approach would not by any means establish a comprehensive set of links between forest use and ex ante risk, it would do so for one of the most significant risks faced by rural households, crop risk. So it would provide a useful insight into the role of forest use in offering insurance in this case. (Note that this approach could be extended to other significant risks. For example, landless labourers and for households in receipt of remittances get a significant share of their income from wage employment. So at the start of the year, one could ask what their expectation is of their wage income, observe actuals, and construct deviations from expected wages accordingly).

This regression approach also allows us to analyse whether forest products are offering insurance functions at all. Remember that in the rhs of the regressions, we will have a set of variables measuring both major shocks (ex post risk), and the realisation of more predictable forms of variation (ex ante risk). If forest uses are not being used in response to risk, then none of these variables will turn out to have significant coefficients. Forest use will be completely identified by the standard variables determining demand and supply levels. In this case, forest products may turn out to play an important role in rural livelihoods (the hypothesis examined in question one), but these roles are simply not insurance roles (the question we are answering here).

A second approach is to establish groups of households within the sample frame whose economic position defines a "lower bound" on household welfare, and look at their forest resource use patterns. For example, a group of households constituting the poorest households in the community; or elderly households. Given these households' limited assets and therefore limited economic opportunities, the contribution that forest product use makes to their income or consumption represents part of the value of an activity portfolio that is open to every household in the area should it find itself reduced this position. In other words, in the event of a really bad shock – such as the death of an adult member of the household, or the collapse of a major livelihood component such as unemployment or mass cattle deaths – these are the kinds of values that any household can derive from the forest. To draw an analogy, forests are playing the role of income support in the welfare states of developed countries. Households may not be drawing welfare benefits – but they are available at any time if they need them. So this is in itself an insurance function of the forests.

*Establishing the value of the insurance functions of the forests*

So we now have three approaches to investigating the role that forest product uses play in helping rural households deal with risk. These are:

1. The use of forest products in response to shocks.
2. The use of forest products in response to more predictable realisations of ex ante risks, such as agricultural production.
3. The role of forest products in the livelihoods of the most constrained households.

Note that we cannot sum these three values to establish a total insurance value of forests. In part this is because there are some insurance values we cannot assess through cross-sectional data. But also because the insurance values elicited in the first two approaches overlap with that established in the third approach. It is best to think of these simply as three different but complementary approaches to forest insurance values.

In case, though, we now want to develop an area-wide insurance values derived from each approach, and compare these different values to household incomes, to see how significant they are in relation to economic activity as a whole. There are two steps here. First, we need to create household insurance values for each of these approaches. For approach (3), this is straightforward – the value of resource use by the household is the insurance value we are looking for. For approaches (1) and (2), it is less straightforward, involving converting the regression coefficients in our demand and supply functions into willingness-to-pay measures for the insurance offered by forests. This is a technical operation that will differ according to the type of regression technique used: such techniques will need to be established from the specialist literature.

Second, we need to go from household to area-wide insurance values. Here the key point is that in all the cases examined, these forest uses represent an option that is open to households if they choose to use it. It is what households can do if other things fail – equivalent to buying an insurance policy, but in this case, a free one. All households have this option, as long as two conditions are met: that (a) they have access to forests and (b) the forest is of sufficient quality to generate the forest uses described. So to go from household to area-wide values, we need to assess through the questionnaires the number of households for whom these two conditions hold, and weight the results accordingly.

Finally, as in any insurance value, in going from household insurance values to area-wide insurance values, we need to weight the results by the risk (or probability) of an event occurring. In approach (3), for example, it is not simply a case of multiplying the resource values used by the poorest households by the number of households in the study area, and expressing the resulting value as a proportion of total household incomes. Rather, we would need to weight this value by the probability that an individual household would find itself cast into the position of being one of the poorest households. How this might happen – and therefore the definition of the probability we are looking for – will depend on the study area. In some areas, it may be the probability that a household is thrown off its land; in another that remittances dry up completely; in another, that forest lands are expropriated. These probabilities can be taken from the cross-section data itself, and used to weight household insurance values accordingly.

*Key points, and a summary of methods*

We briefly summarise the key points and provide a short description of how to proceed. In terms of key points:

- Rural households face a variety of risks and engage in complex strategies to reduce, mitigate against, insure against, and cope with risks.
- Forest products offer a variety of complementary ways for households to do this.
- Cross-sectional data will not allow us to value all these mechanisms. We will not be able to assess the role of forest product use in dealing with common risks across an area, unless panel data sets are created.

- However, most risks are idiosyncratic and here we can use a variety of methods to assess the role that forest products play in household livelihood strategies.
- In particular, we can use regression analysis to identify the role of forest products in household responses to shocks (ex post risk); to bad and good ex ante risk outcomes; and to the most constrained households.
- From these regressions and valuations, we should be able to calculate a set of area-wide option values that represent the insurance value of forests. Though these cannot be summed, each can be compared with overall economic values to assess the significance of forest safety nets in rural livelihoods.
- The regression analyses also allow us to answer a host of other questions, including whether forests offer insurance at all; how the use of forest safety nets changes as households become more affluent; the significance of forest safety nets vis a vis other household insurance options; and how this relationship changes as households become more affluent.

And as to how to proceed:

1. Do a range of key informant interviews on risks and responses in the survey area. Be clear about ex ante and ex post risks, and consequent livelihood strategies. Make sure to cover all livelihood responses to risk, not just forest product use.
2. Construct the questionnaire accordingly. Because assets matter for insurance, pay attention to stocks and flows of major household physical, financial and natural assets – savings, cash, jewellery (e.g. in India), land, human capital, food stocks, cattle, other livestock, and so on. Also pay attention to gifts, changing remittance flows, and informal insurance, including collective insurance clubs (ROSCAs), as these can be part of responses to risk.
3. Early on in the survey, ask about expectations for those variables which key informants suggest are major sources of ex ante risk, such as harvests and wage income. Be careful about eliciting accurate expectations – make sure that respondents are clear that these questions are not linked in any way to the prospect of compensation in the event of failure.
4. Ask also about ownership of and access to forests, and the quality of those forests.
5. Include in the survey, recall questions on responses to major shocks in the past, with key livelihood responses identified.
6. Make sure good economic data is collected on core household activities (income, consumption, expenditure, agricultural activities, forest uses, assets and asset uses and so on) at least quarterly, so we can draw up standard household economic accounts, and can identify forest use and other responses that occur after shocks and the eventual "draw" from ex ante risks.
7. Likewise, in the quarterly surveys make sure that attention is paid to capturing any shocks that might have affected the household. It is also advisable to ask the households to describe qualitatively how they have responded to such shocks, and cross-check these answers with the quantitative data being collected.
8. After data entry and cleaning, conduct regression and valuation analysis as above.

### 3.3: The role of forest resources in providing pathways out of poverty

The research hypotheses in this area suggested that there are significant differences between value added per unit of resource use for different forest products; that these differences in value added are explained by differences in entry barriers to forest use activities; that these differences in entry barriers explain the reason why some households are able to be involved in higher return forest use activities, and others not; that such entry barriers exist not just for forest products but for a wide range of rural activities; and that forest products do not figure heavily in the accumulation strategies of affluent rural households.

If all these hypotheses turn out to be true, then it sheds some light on the question of whether NTFPs can be used to provide pathways out of poverty – the answer would be that they probably have a limited role. By contrast, if the hypotheses turn out to be false, then there may be a greater role for NTFPs in providing pathways out of poverty than the current international consensus suggests.

A variety of these hypotheses can be looked at by reasonably straightforward methods. To get an overall sense of the dynamics of poverty in a study area, it is useful to interview key informants about different livelihood strategies, and to conduct a series of case studies on the more affluent households in the area. This is invaluable to establish a qualitative sense of what is driving rural differentiation and rural accumulation strategies. These preliminary researches also often suggest natural activity clusters for the later statistical analysis.

The method of calculating value added for forest product activities is no different from the method used for any other economic activity. However, there is a complication in that the value of labour and capital inputs into forest product collection and processing activities is almost impossible to elicit from questionnaires. (There are problems in eliciting the quantity of labour inputs – the time spent – and the price of labour inputs – the rural wage – and the depreciation rate for capital equipment). Best practice here again is to do extended interviews with key informants (e.g. specialist timber or NTFP users) to establish the production technology in each case. These problems are explored in greater depth in Campbell (2000) *The hidden harvest*, Chapter 5.

Having established the range of value addeds in forest product use, simple statistical tests can be run to see whether the unit value addeds all come from the same distribution or not.

To explore whether forest products feature heavily in the accumulation strategies of affluent rural households, principal components analysis can be applied to the household livelihood portfolios established in the questionnaires. This sorts the household sample into different clusters according to commonalities in livelihood strategies. A direct analysis can then be made of whether the livelihood portfolios of more affluent households includes anywhere more intensive use of forest products.

A more sophisticated approach is needed to the question of whether it is barriers to entry or not that explains the fact that different rural households at different income levels are engaged in different patterns of forest resource use. This is because there are two possible explanations to the observation that rural households differ in the forest use portfolios: the first is that certain households have a comparative advantage in some activities compared to others; the second is that it is due to structural features of the rural economy.

If the first, comparative advantage explanation were correct, we would observe household differentiation in forest product uses (and other rural activities) not because of entry barriers, but because some households are simply better at certain activities than others. One does not observe poorer households engaged in lower return activities because they are unable to do anything else, rather it is because they have a comparative advantage in lower return activities. As stated, these lower return activities are not just forest product uses, but might include selling labour locally, low-technology agriculture, keeping small livestock, and so on. The different livelihood portfolios we see are the result of efficient relative specialisation, rather than poverty traps.

By contrast, if the second, entry barriers explanation were correct, we observe household differentiation in forest product use (and livelihood portfolios more generally) because there are systematic barriers to poorer households entering higher return activities. They are poor not because they unfortunately just happen to be better at the kind of activities that have low returns, but rather because they are simply unable to do anything else. They lack the assets, the skills, the market access, or the connections to better themselves.

Why does this matter? Because it sheds some light on the reason <u>why</u> the high rates of forest dependence by the poor exist, and therefore says something about the dynamics of forest products, including NTFPs, and poverty alleviation. Imagine the research programme found indeed that many forest product uses had low returns, and that many rural households were using them because they were shut out from more profitable activities. This would suggest that these products can play little role in alleviating poverty, unless a new technology or market is discovered that raises dramatically the returns to these particular forest uses. By contrast, it may be that the research finds that many forest product uses are actually higher return activities, but that what stops more households from being involved in these is a series of entry barriers. Then there is a very different policy message: that forest uses may indeed have a greater role to play in alleviating poverty than currently suspected, and that what is stopping this from happening is a lack of capital, transport, market networks and so on.

The difference between the comparative advantage and entry barrier explanations of livelihood differentiation should appear in economic analyses of production functions. If the former were true, then production function analysis should show poorer households comparatively more productive in low return activities vs high return activities compared to more affluent households. However, if the entry barriers story is correct, then there should be no such differences found. Indeed, poor households may be more productive in more profitable activities than more affluent households – the problem is that they can't actually get a chance to do them.

Econometric methods for testing between comparative advantage and entry barriers for the livelihood portfolios of rural households have been developed in Dercon and Krishnan (1996) *J. Dev. Stud.* and Dercon (1998) *J. Dev. Econ.* Details of methods to be used can be derived from these papers, and adapted to the forest products case.

In doing this, it is important that accurate information is obtained about the nature of entry conditions for all the relevant forest product activities. As before, careful interviews with key informants are an invaluable source of this information.

### 3.4: The purpose of cross-country analysis

So far we have concentrated mostly on the research questions that can be answered by each individual country study, and the research methods that are required to get at these questions. A final question concerns what can be learned on top of this at the aggregate level, from cross-country analysis of all the data collected.

There are two major research programmes here:

*Exploring factors that vary across country sites*
In section 4 we established which factors should vary in selecting study sites in different countries at which level. At the country level, it was argued that study sites should be deliberately chosen to contrast forest type (dry; wet, high potential; wet, low potential); forest tenure (open access, private); and market distance (close, remote). And other variations will occur naturally, such as in income levels, risk, and population densities.

The individual country studies will not be able to look at how the role of natural forests in supporting, insuring and improving the livelihoods of the rural poor varies with regard to some of these critical variables. For example, are there systematic differences in these roles for different types of forests? Different forest tenures? Different infrastructure proximities? At different income levels? Levels of risk? Population densities? Only by pooling the cross-country data and then including these variables in statistical analysis or in the rhs of pooled regressions will these critical questions be able to be answered.

(To do this, it will be absolutely vital that the data from the different study sites are comparable. This reinforces the points we have made already about the need for the creation of comprehensive, accurate and consistent household accounts in each study site. Some recommendations for how to achieve this are contained below).

*Deepening the analysis of the within-country questions*
Equally, pooling the data to produce a cross-country data set will allow deeper analysis of the "within-country" questions that each of the individual studies will be seeking to answer. This is because the number of data points available in the pooled data set will be 10 to 12 times as great as any single country data set. This increase in data points brings an opportunity to use more sophisticated and accurate statistical and econometric methods; to improve the significance levels of results; and to identify parameters more accurately. Indeed, it is likely to be the case that explanatory variables that cannot be identified as significant at the level of single country data sets will be able to identified using pooled data.

To take an example: in Cavendish (1999) *The complexity of the commons* demand functions were estimated for a variety of natural resource uses, including wild fruits, wild vegetables, wild foods, firewood, and so on. A persistent problem in these estimations was the relatively small sample size (roughly 200 observations). This restricted econometric analysis to straightforward tobit estimation, not completely satisfactory. It also made parameter estimation statistically difficult – many parameters, even including some income elasticities of demand, remained unidentified.

By contrast, the pooled data set could have as many as 2,000 observations. This will allow much better analysis of the household behaviours we are trying to study. For example, analysis of the insurance function of forest product uses will rely heavily on regression

analysis, with standard demand and supply functions being augmented by shocks, ex ante risk realisations, and interacted variables. Both in terms of identifying a broader range of significant variables, and getting better parameter estimates, the pooled data will be vital.

## 4. Suggestions on Implementation

Throughout this paper, we have stressed the complexities of rural household livelihoods; and the multifaceted nature of household forest product uses. At various points, we have noted that real care is needed in undertaking data collection, and have suggested ways of collecting some of the specific data relevant to the questions touched on in this paper. In this section, however, we put forward some more general recommendations about how the research programme might be conducted, based on field experience of conducting this kind of research.

The structure and implementation of the research programme needs to have as its goals the highest quality and consistency of data:

- Quality - as this is vital to establishing credible and accurate research findings in a research area plagued by poor data and methodology
- Consistency - as without this the cross-country research will be deeply flawed, a problem that has afflicted a number of other cross-country research programmes.

This suggests the following programme features.

*Data collection periods*
High quality data will not be collected by one-off questionnaires designed only to answer a small number of specific research questionnaires. As already discussed in section 3.1, very careful attention needs to be paid to eliciting the full range of household livelihood activities, and to the full range of household forest product uses. Likewise, the recall lengths of each question need to be designed and pre-tested carefully.

Really adequate data to answer the research questions will only be elicited by following rural households over a long enough period to observe different strategies at different times of the year. This suggests that there should be at least a one-year data collection period for each study site. However, one year is far too long to ask households to recall their livelihood and forest product activities – this needs to be done over a much shorter time-span. So there should be in each study area a number of questionnaire rounds, with each questionnaire round being implemented every two or three months according to local conditions (ie 4 to 6 questionnaires to make up a year's worth of data).

Two years of data collection in each study site would be better than just one. It would provide more information on the variability of forest resources uses and rural livelihoods; it would also therefore expand considerably our knowledge of the insurance value of forests. The decision to undertake one or two years' data collection in each study site (or a subset of study sites) is really a matter of pragmatics. It is harder to maintain the research effort over this period; it would involve the doctoral students changing their status after one year of the programme, from being resident data supervisors (see below) to off-site co-ordinators; it risks longer delays from inception of the project to delivery of results. However, if the project proposers and funding agencies are committed, then these problems are all surmountable.

*Local structure of data collection*
The project envisages the data from each study area being collected by a Ph.D. student, with doctoral supervision by a local academic (backed by an international academic where desirable). This both builds capacity and is cost-effective.

To ensure really good quality data, though, there is absolutely no substitute for the student living in the research area continuously for at least one year's duration of the data collection. This should part of the funding conditions attached to each student's participation in the research programme. The advantages of living in the field during the data collection are numerous. It means the student can really get under the skin of the rural area s/he is studying – the livelihood systems, the local power structures, how recent history is affecting current events, the different types of resources being used, what local people's hopes and frustrations are, and so on. These qualitative data make a real difference to the design of specialist modules of the questionnaire, such as on risk or entry barriers. They allow much better interpretation of the data results.

The student living permanently in the field also has a much greater ability to ensure the highest quality of the data being collected by enumerator teams. The key here is for questionnaire scrutiny to be intelligent, careful and immediate, exactly what a resident supervisor is able to do. Questionnaires should be checked on a daily basis; questionnaire cross-checks can be examined immediately and discrepancies questioned; repeat visits to households be organised the next day or the day after, so the information is still fresh in the respondent's mind; and responses from one round of a questionnaire can be checked rapidly with those of a previous round.

As an example, questionnaires can ask every three months about food sales, purchases, own consumption and stock levels: these variables are all inter-related. So answers given in one period should tally with those given three months later. Likewise, information given in one questionnaire round on things like wages, remittances, household enterprises, livestock holdings, agricultural activities and forest uses can be checked against that given from previous questionnaire rounds. I found this an invaluable way of unearthing discrepancies and omissions by respondents – when these were uncovered, it was a simple job to send out an enumerator to conduct a repeat interview the next day. These types of questionnaire checks really improve the quality of data, but they can only be done by a data supervisor living *in situ*, not in a remote research institute or national capital.

*Data entry and data cleaning*
One of the biggest time lags that comes into these kind of research programmes is that between the end of data collection and the onset of data analysis. This is because of the time and energy it takes to enter data into a usable format (ie a computer data analysis programme such as SAS, SPSS or Stata) and to clean the data (ie examine missing variables, check for mis-coded or mis-entered data, probe extreme values and so on). The time taken to enter and clean data is always underestimated, and the frustrations involved often lead to errors in the final data sets and delays in the production of research results. The recommendation here would be to plan for all data entry and cleaning to be done under contract by a commercial company under the supervision of one of the members of the international project board (see below). The costs of this need to be factored into project budgets from the start.

*International structure*

The research programme is both multi-country and multi-disciplinary. So it would be neither feasible nor desirable for it to be run by a single individual. Rather, it will be necessary to have small project board comprised of a team of international experts whose research specialisms cover the different topics covered in the research. This could comprise one of each of the following:

- Forest economist, who has worked on a range of forest types and on household forest product uses.
- Micro-econometrician, who has collected and worked with survey data on rural households in developing countries.
- Botanist or forest ecologist, who has experience of working in multi-disciplinary teams and has wide knowledge of forest ecology
- Tenure and institutions expert, who has worked on natural resource issues and is skilled at non-quantitative research methods.

It should be stressed, though, that the members of the project board would have to make a serious and on-going commitment to the research programme in terms of their time. So each must be firmly committed to the goals of the programme, and their time commitment properly established and funded.

*Ensuring cross-country data comparability*

A critical, and challenging, task will be to ensure that the data from each of the study areas are comparable, so that the cross-country analysis can be valid. Data comparability will only be achieved by ensuring that each of the individual sites sticks to a core data collection methodology; that data definitions are clearly established and agreed on, and that any changes made to local research methodologies are submitted to and cleared by the international project board. So the key task will be to ensure:

- All parties engaged in the research are fully aware and agree on research questions and methods.
- There is close monitoring and support of the field research programme at critical points.

Some steps for how this might be achieved are as follows:

1. After study sites are selected and agreed on, with local supervisors and students established, there should be an international meeting of all parties at beginning of project to develop joint commitment to: project terms of reference; research questions and hypotheses; research methods; timings and processes. Such a meeting would encourage team-building; allow all participants in the research to question and have input into the final research hypotheses and methods; and build lines of communication.
2. At the beginning of their time in the field, each student to do a preliminary RRA or PRA assessment of key issues, such as resources and resource uses, household types, household activity analysis and livelihood strategies, sources of socio-economic stratification, local tenure & institutions, local history.
3. Specifically, each student should assess the nature of variability of key factors in study site, namely: range of local agents (swidden farmers, smallholders, NTFP

specialists, timber-based SMEs, landless labourers); range of household-based risks; range of income levels (chronic poverty, moderate poverty, low and middle income); existence of migrants.

4. Additionally, each student should develop a clear logistical plan over how the research wil be conducted – where they will be based, how they will recruit and train local enumerators, when the data collection should start, how many questionnaire rounds they might undertake, and when and why they might go ahead with these.
5. On the back of these assessments, each student to submit a report to their supervisor and the project board on what they have discovered and how they propose to incorporate these findings in their questionnaires and other research methods. The supervisor and project board will give rapid, extensive feedback before the detailed design of questionnaires.
6. The student will then move on to design a set of detailed questionnaires; again, these should be submitted to his or her supervisor and the project board, with similar rapid and extensive feedback.
7. The student finalises questionnaires and then commences formal data collection.
8. One member of the project board to visit each study site early on in the data collection process, to supervise the team and data collection processes early on.

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