



## **Environmental resource income is important for earthquake-hit rural households**

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Forest products are important sources of income and can play an important role in helping earthquake-hit rural households

# Environmental resource income is important for earthquake-hit rural households

## Introduction

In 2014, a total of 16,674 earthquakes were registered globally. Some of these led to international and national disasters, as last seen following the earthquakes in Nepal on 25 April and 12 May 2015 that killed more than 8,000 people, injured some 18,000, and destroyed the productive assets and homes of hundreds of thousands of households.

Based on our studies from Nepal on (i) combined livelihood and forest productivity, and (ii) trade in medicinal and aromatic plants, we identify environmental resource related low cost interventions that can create sustainable incomes for rural households in quake-hit districts in Nepal, thus enabling them to help themselves rather than relying solely on weak relief infrastructure already under pressure.

## Results

Our research shows that environmental income is especially important for the livelihoods of the rural poor, and that this income can be increased substantially with changes in legislation and governance. Environmental income is the sum of cash and subsistence income from non-agricultural areas, including forests, meadows and rivers. This type of income is not included in traditional poverty assessments.

### Environmental income reduces inequality and poverty

Environmental income decreases rural income inequalities and serves to reduce the prevalence, depth and severity of poverty. Inclusion of environmental income in poverty assessments in Gorkha, from a site located right at the epicentre of the first 2015 earthquake,

## Policy Recommendations – how to enable forest-based help for earthquake-hit rural families

- Remove legal restrictions, allowing local communities in earthquake-hit districts to commercially sell timber and fuelwood at market prices
- Allow households with destroyed houses free access to timber from community forests
- Remove legal restrictions on the harvest and transport of non-timber forest products, in particular medicinal and aromatic plants
- Set royalty rates for medicinal and aromatic plants to zero for a grace period of five years

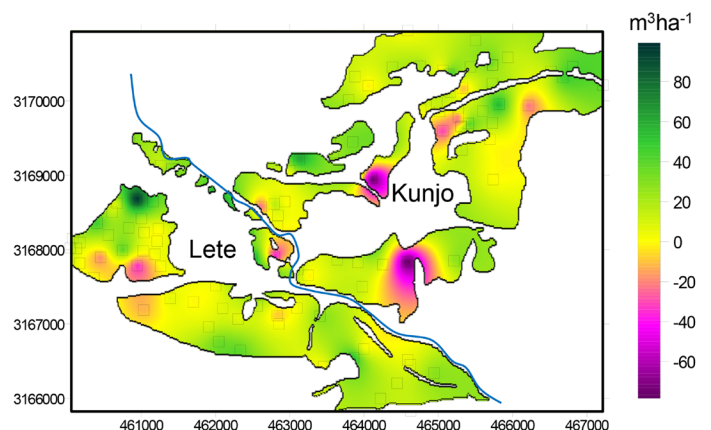
decreased the number of households living in extreme poverty (income of half a dollar per day per person) from 40 to 25% of the sample. Additionally, it reduced the income shortfall (the distance to the poverty line) by half and the poverty severity (the variation in poverty) by more than half (Chhetri et al. 2015). Environmental income keeps households from falling deeper into poverty.

The average annual share of household environmental income ranged from 9.1 – 15.7% of total net annual household income across four sites (High Mountains, remote Middle Hills, peri-urban Middle Hills and Lowlands). Incomes from firewood, grasses, tree fodder, wild fruits and medicinal plants were of particular importance and wealthier households displayed lower levels of reliance on these income sources (Chhetri et al 2015, Meilby et al 2014). This is illustrated in Table 1 providing an overview of total household incomes from the remote Middle Hills site in Gorkha District.

### There are high volumes of timber and firewood available in community forests

The current extraction of woody biomass for firewood and timber is within the limits of sustained production. At the High Mountains and Lowlands sites, the annual increment between 2005 and 2010 was more than twice the annual extraction; in the peri-urban Middle Hills, accumulation of timber and firewood as a result of forest protection over decades was realized in the observation period and annual extraction was hence three-fold that of the increment (Meilby et al. 2014). At all sites, changes in standing stocks varied across forest strata. This is illustrated for the High Mountain site (Fig. 1). Standing stock is generally being accumulated, in particular in younger forest areas

along the river in Lete and east and west of Kunjo village, while reduction in standing stock was only found close to some human settlements in Kunjo. This indicates scope in community forests for allotting free timber to households whose homes were destroyed by the earthquakes.



**Figure 1.** Overview of changes in standing forest stock ( $m^3ha^{-1}$ ), 2005 – 2010, in Kunjo and Lete areas in Mustang District.

### Considerable scope for increasing household incomes from community forests

Commercial timber harvest in forests managed by local communities is not encouraged by authorities, who favour forest conservation. The annual extraction of woody biomass is well below the 80% of the annual increment that can be accepted as sustainable in the High Mountains and Lowlands sites. Biomass increase in community forests has also been found in many other studies (e.g. Niraula et al. 2013). Further, the forest product trade from and within Nepal is beset with poor governance, including the local interpretation of official rules. Although local communities are



nominally authorized to trade forest products freely, these are sold to third parties at (low) prices set by the forest authorities.

Potential increases in household incomes were calculated for two scenarios assuming that 80% of the annual woody biomass increment is sold at market prices: (i) all is sold as firewood, and (ii) where dimensions allow (diameter at breast height more than 10 cm) biomass is sold as timber and the remaining sold as firewood. If the latter scenario was realized, it would increase average household forest incomes ten-fold in the Lowlands and three-fold in the High Mountains. Allowing commercial timber sales at current harvest levels would increase average household wood-based forest income by 52 - 173%, depending on the site, i.e., on average from USD 60 (purchasing power parity adjusted) to USD 131 per person. The potential income increase in a particular location would vary with the size of the forest, species composition and age class distribution, as well as market access and the number of households. The effect on income would also be positive at over-harvested sites, in the sense that the additional income from timber sales would lessen the impact of changing to sustainable harvest levels. The scenario estimates are subject to the assumption that maintenance of present stocking levels (very low in the Lowlands site) is deemed acceptable.

### Medicinal and aromatic plants of economic importance to rural harvesters

The annual trade in medicinal and aromatic plants from Nepal ranges from 7,000 to 27,000 tonnes

with a value of USD 8-35 million (equivalent to USD 39-159 million when adjusted for purchasing power parity); almost half of this value is captured by around three hundred thousand harvesters who typically sell the air-dried plant material to middlemen who bulk and export it (Olsen & Helles 2009). The plant material is harvested across all physiographic zones and the harvest provides a vital income-generating opportunity for the rural population. The harvest and transport are, however, subject to bureaucratic restrictions that seem unwarranted from a resource-monitoring perspective (Larsen et al. 2000). Harvester income could be increased through removing the restrictions on harvest and by publicly removing royalty rates. This could increase harvester incomes by up to 10% or USD 14 million (purchasing power adjusted, Olsen & Helles 2009). The sustainability of medicinal and aromatic harvests remains unknown.

### Conclusions

Our findings indicate that introducing flexibility in local forest and environmental resource management, i.e., allowing commercial harvest and sale of timber and firewood at market prices, would improve rural livelihoods while also being ecologically sustainable. This proposed change would not require any legislative changes but necessitate a change in the governance culture (implementation of existing rules) towards emphasising income-generating opportunities rather than conservation. A further enhancement of rural livelihoods could be facilitated by the removal of restrictions on medicinal and aromatic plant harvest and transport. Combined, these two changes could

**Table 1** Total annual mean household (n=303) absolute (Nr<sup>1</sup>) and relative income per person by income source and quintile, remote Middle Hills site, Gorkha District, Nepal (Chhetri et al 2015).

Income source	Income quintiles				
	Lowest 20%	Second	Third	Fourth	Highest 20%
Environmental <sup>2</sup>	<sup>a</sup> 2662 (29.5) <sup>3</sup>	<sup>ab</sup> 4041 (24.7)	<sup>ab</sup> 4009 (17.8)	<sup>b</sup> 4838 (15.5)	<sup>c</sup> 7385 (11.0)
Forest	<sup>a</sup> 1792	<sup>a</sup> 2670	<sup>a</sup> 2527	<sup>a</sup> 2976	<sup>b</sup> 4775
Non-forest	<sup>a</sup> 870	<sup>ab</sup> 1371	<sup>ab</sup> 1482	<sup>bc</sup> 1862	<sup>c</sup> 2610
Farm	<sup>a</sup> 5190 (57.4)	<sup>ab</sup> 8403 (51.3)	<sup>bc</sup> 10781 (47.8)	<sup>c</sup> 14848 (47.6)	<sup>d</sup> 25477 (38.1)
Crop	<sup>a</sup> 2875	<sup>ab</sup> 5026	<sup>b</sup> 6289	<sup>c</sup> 8971	<sup>d</sup> 13801
Livestock	<sup>a</sup> 468	<sup>ab</sup> 1452	<sup>bc</sup> 3271	<sup>c</sup> 4600	<sup>d</sup> 9752
Wage	<sup>a</sup> 1847	<sup>a</sup> 1925	<sup>a</sup> 1221	<sup>a</sup> 1277	<sup>a</sup> 1923
Non-farm	<sup>a</sup> 1186 (13.1)	<sup>a</sup> 3943 (24.1)	<sup>ab</sup> 7774 (34.5)	<sup>b</sup> 11478 (36.8)	<sup>c</sup> 33990 (50.8)
Remittances	<sup>a</sup> 734	<sup>a</sup> 2062	<sup>a</sup> 3422	<sup>a</sup> 5611	<sup>b</sup> 21685
Pensions	<sup>a</sup> 194	<sup>a</sup> 1005	<sup>ab</sup> 3403	<sup>b</sup> 4842	<sup>c</sup> 10376
Services	<sup>a</sup> 82	<sup>a</sup> 69	<sup>a</sup> 246	<sup>a</sup> 240	<sup>a</sup> 439
Business	<sup>a</sup> 103	<sup>a</sup> 519	<sup>a</sup> 487	<sup>a</sup> 378	<sup>a</sup> 807
Gifts/rent/others	<sup>a</sup> 74	<sup>a</sup> 288	<sup>a</sup> 216	<sup>a</sup> 408	<sup>a</sup> 683
Total	<sup>a</sup> 9038	<sup>ab</sup> 16387	<sup>bc</sup> 22564	<sup>c</sup> 31164	<sup>d</sup> 66851

<sup>1</sup> 69 Nepali rupees/USD

<sup>2</sup> In the rows, a common superscript letter (a, b, or c) implies the means are not significantly different at the 5% level

<sup>3</sup> Figures in brackets are the shares of total household income

increase the income of a large number of rural households, with possible nationwide poverty reduction effects, while keeping wood product harvests within sustainable levels. Our results point to the need for

further research focusing on the assessment of the sustainability of medicinal and aromatic plant harvests.

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Firewood and other wooden products can contribute economically to help earthquake-hit rural households



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