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data collection instruments

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UNIVERSITY OF COPENHAGEN

IFRO Documentation

Short-term household responses to major natural disasters: data collection instruments

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1. Introduction

The Department of Food and Resource Economics (IFRO) at the University of Copenhagen in Denmark and the Institute of Forestry (IOF) at Tribhuvan University in Nepal have collaborated on environmental resource-related research since 2003. This includes a strong focus on the economic importance of environmental resources in local livelihoods and the sustainability of such income. The collaboration has produced environmental-augmented panel income accounts for 805 randomly selected households in four locations (High mountains, Remote middle hills, Peri-urban middle hills, Lowlands) and repeated measurements in 240 permanent sample plots randomly located in the forests used by the monitored households.

A major earthquake, subsequently known as the Gorkha Earthquake (in Nepal called the Great Earthquake), with a magnitude of 7.8M_w struck central Nepal on 25 April 2015, leaving almost 9000 people, injuring another 22,000, and destroying the productive assets and homes of hundreds of thousands of households. The epicentre was in Barpak Village Development Committee (VDC, the lowest administrative unit) in Gorkha District right next to the Remote middle hills research site monitored by IOF and IFRO (covering Simjung and Gyalchok VDCs). This coincidence made it possible to investigate household-level disaster response patterns, including paying particular attention to the importance of environmental products, using existing data as the before-event baseline. Unfortunately, the permanent sample plot network did not include plots in Simjung and Gyalchok VDCs; establishing such plots is of longer-term interest as it will allow biophysical monitoring of forest changes following the earthquake.

The Remote hill site case is arguably of wider international interest as it: (i) exemplifies a long-settled land-scarce environment where households are dependent on a range of income-generating activities, including agriculture, livestock, forestry, and remittances; (ii) provides insights into the importance of long-established and standardized community forestry where local communities have primarily been involved in forest regeneration, and subsistence forest uses, while (iii) the households are subjected to a range of market forces and state sanctions, also in regards to environmental product use. Following up on previous collaborations, IFRO and IOF decided to implement the Gorkha Earthquake project (GEQ).

1.1 Objectives

The GEQ aims to document short-term household and community responses (such as changes to asset portfolios and income) to the Gorkha earthquake. The project generates data to report on the quasi-natural experiment in the Remote hill site which constitutes a case study of before-and-after conditions allowing us to empirically investigate the impacts of the earthquake on rural households and their subsequent responses. The before-event detailed environmental-augmented household accounts, collected in 2008 and 2012 (details are available in Larsen et al. 2014), allow inclusion of understanding the role of environmental products in earthquake responses.

The research question is: how do households respond to major natural disasters?

The specific objectives for this study in the Remote hill site (in Gorkha District) are:

1. Document the household-level asset changes resulting from the Gorkha Earthquake.
2. Document formal and informal short-term response mechanisms to the Gorkha Earthquake including external (relief and assistance), internal (community) and own (household) responses.
3. Identify and quantify the short-term insurance function of environmental resources.
4. Establish a network of 100 permanent sample plots in the forests of Simjung and Gyalchok VDCs.

2. Overview of the research format

The GEQ used a range of quantitative and qualitative data collection techniques, applied in two work packages (WPs) with the following short names and aims:

> *WP 1: Short-term responses*. Identify, describe, quantify, and qualify household-level responses to the Gorkha earthquake. Data collection included quantitative (e.g. quantification of past quarter income and loss of assets) as well as qualitative (e.g. first and subsequent choices in dealing with loss of assets) elements.
>
> *WP 2: Biophysical.* Establish a network of plots in the two VDCs (ensuring that results can be integrated with findings from the already existing ComForM plots).

In order to successfully implement these work packages, the following factors were crucial:

- ***Completeness***. For statistical purposes, it was important to obtain an adequate number of observations. Hence all 303 households for which we have prior data in Gorkha District should be located and interviewed. Much effort should go into locating and finding all households.
- ***Thoroughness***. A lot of qualitative information will be collected; this information is key to understand people's responses to the earthquake. Hence it is imperative that high-quality data collection is undertaken, including having the ability to listen and probe.
- ***Timeliness***. Data collection for WP 1 must be undertaken and completed in September 2015; otherwise short-term responses are likely to be forgotten.
- ***Consistency***. Due to the large number of researchers involved, with different backgrounds, efforts need to be made to ensure the application of common definitions, methods, coding, data entry, and field procedures.

The present technical guidelines[1] aim to ensure application of agreed-upon methods, definitions, and interpretations of questionnaires. They also contain the data collection instruments.

2.1 Data collection instruments

This section gives an overview of the research format. To take full advantage of the detailed nature of before-event data, the short-term response investigation will include a detailed quantitative structured household survey. To ensure understanding of response behaviour, field work will also include a qualitative component. Data collection instruments were finalised in mid-August 2015 and tested in the second half of August.

The data collection instruments comprise:

1. A list of open questions to be asked at the household level. The purpose is to qualitatively assess the impact of the earthquake on people's assets, health, and food security. Moreover, it allows us to uncover earthquake impacts on livelihoods and coping strategy patterns which might be missed by the quantitative survey.

[1] The GEQ Technical Guidelines draw heavily upon: (i) the GEQ Project Document, (ii) the TGG-N Technical Guidelines (Smith-Hall et al 2018), and (iii) the PEN Technical Guidelines (PEN 2007).

2. A structured household-level quarterly income survey. This is essentially moulded on the PEN/ComForM quarterly income survey. To be implemented in the 303 panel households. The full sample size is maintained to allow for advanced statistical data analysis.

3. A structured household-level asset survey; moulded on the PEN asset survey (PEN 2008), the ØJN post-doc asset survey (designed for Nepal, unpublished), and the work by Kendra McSweeney in Honduras (used in connection to the hurricane Mitch disaster in 1998). To be implemented in the 303 panel households. The full sample size is maintained to allow for advanced statistical data analysis.

4. A qualitative short-term coping strategy survey. For practical purposes and to provide flow in data collection, this is integrated with the above mentioned income and asset surveys (and will hence be implemented in the 303 panel households). Assuming that households respond to their combined asset loss (instead of responding to each separate loss individually) the focus is to uncover the nature and sequence of responses.

5. A qualitative focus group discussion component to capture: (i) the impact of the earthquake on people's livelihoods (male, female, and children) and coping strategies, and (ii) the external relief history as well as any community-level responses. Focus group discussions will be conducted in each VDC (each to be recorded, transcribed, and translated). The same interview guideline is used for interviews with key actors, such as government representatives, NGOs, and others as relevant.

6. Establishment of 50 permanent sample plots in the forests of Simjung and Gyalchok VDCs, based on the approach developed by Meilby et al (2006).

Data recording comprises:

1. All structured survey data is recorded using pen and paper. Questionnaires are printed, used for testing, finalized, and then printed in a number adequate for the actual fieldwork. Data is entered in an Access database and data checking undertaken.

2. All household-level qualitative interviews (as well as the focus group discussions) are recorded using small portable Sony recorders, transcribed, translated, and then coded during analysis.

3. Plot data will be recorded based on the standard ComForM III approach (Larsen et al 2014) and as specified in the relevant Appendix in the present report.

2.2 Data collection activities

An overview of the work and time schedule is presented in Table 1. Due to the time required to prepare data collection instruments and test them, combined with the time required to conduct the field work and the timing of the major Nepal holiday season, fieldwork and data collection were concluded before Dashain, thereby making use of the opportunity to record short-term responses.

Table 1: Overview of work and time schedule, 2015-2016

Activity	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*
Draft asset instrument									
Draft response instrument									
Draft sample plot plan									
Pre-data collection site visit									
Training of interview team									
Income and asset data collection									
Response data collection									
Focus group discussions									
Transcription of interviews									
Translation of interviews									
Creating Access database									
Data entry									
Data quality control									
Training of plot team									
Establishment and measurement of plots									

3. Definitions

This section contains definitions of key terms. The purpose is to ensure a common understanding of these across components and research groups, and to ensure consistency in data collection, allowing for data to be aggregated, compared, and contrasted.

Household

Following PEN (2007: 21), a household is defined as "a group of people (normally family members) living under the same roof, and pooling resources (labour and income). Labour pooling means that household members exchange labour time without any payment, e.g., on the farm. Income pooling means that they "eat from the same pot", although some income may be kept by the household member who earns it. One should also note that it is possible to have household members who are non-blood relatives of the family, e.g., a household servant, an in-law, or someone invited to become part of the household because they have been orphaned or otherwise destitute."

Income

Income is particularly important in relation to calculating total household income. Based on PEN (2007: 17), income is generally defined as "the value added of labour and capital (including land). Income is therefore the return to labour and capital used in income-generating activities (self-employment or business) or sold in a market (e.g., wage labour). We also include transfers in the income definition, e.g., in the form of remittances or pensions."

The following is from PEN (2007: 17): "The basic income equation for income from self-employment or business (agriculture, forestry, and any other business) is:

$$I = \sum_{i=i}^{n} p_i y_i - \sum_{j=1}^{m} q_j v_j$$

Income (I) is gross value (price times quantities of all *n* products) minus the total costs (price times quantities) of all *m* purchased inputs (e.g., fertilizers, seeds, tools, hired labour). Maintenance of capital stock (or depreciation) should also be included, but this will have limited applicability for most households. Note that the costs of family labour should *not* be deducted to obtain household income.

Total household income is the sum of cash and subsistence incomes, the latter referring to the value of products being consumed directly by the household or given away, e.g. to friends and relatives. One should be aware that many respondents may consider income to mean *cash income only*. It is very important that our expanded definition of income (subsistence + cash) be clear to all data collectors."

Forest

We adopt the FAO definition of forest:

> *Forests are lands of more than 0.5 hectares, with a tree canopy cover of more than 10 percent, where the trees should be able to reach a minimum height of 5 meters in situ, and which are not primarily under agricultural land use.*

Forests thus includes: native and exotic; primary and secondary; closed and open forest (e.g., woodlands).

We follow PEN (2007: 11-12) and "use three forest categories, defined in the following way:

1. ***Natural forest*** *consists of indigenous (native) tree species. It is managed only to a very limited degree, i.e., one may practice "tolerant forest management in which the native vegetation is largely conserved or reconstructed through successional processes".*[2]

In natural forests, most beneficial trees occur spontaneously, although there may be some degree of management to stimulate the frequency and growth of these trees, e.g., by clearing competing vegetation.

2. ***Managed forest*** *consists predominantly of indigenous vegetation, and with active management to increase the frequency and productivity of beneficial species. The management will include felling (trimming, thinning in addition to regular harvesting) and planting of indigenous and/or exotic species.*

Managed forest will include both what is termed *production forest*, i.e., forests managed for timber production, and forests managed for various NTFPs. Forests and old forest fallows that have been enriched, e.g., by the planting of fruit trees, will therefore fall under this category. (See also discussion of *fallow* in the section below.)

3. ***Plantation*** *consists of forest stands established by planting and/or seeding in the process of afforestation or reforestation. They are composed either of (a) introduced species (all planted stands), or (b) intensively managed stands of indigenous species, which meet all the following criteria: one or two tree species planted, even age class, regular spacing.* (FAO definition)

Note the additional requirements above which restrict the definition of plantations with indigenous (native) species. If the land area is planted primarily with native species, but the trees are of uneven age and spacing, then this forest cannot be categorized as "plantation", but rather a "managed forest".

While these three categories exist along a continuum, some important distinctions are made. Moving from category 1. to 2. is marked by the active felling and planting in order to increase the production of beneficial trees. Moving from 2. to 3. is marked by the vegetation going from being predominantly spontaneous indigenous species to being predominantly planted species (either indigenous or exotic).

In other words, our primary criterion for the distinction between forest types is the *degree of human intervention*. Our secondary criterion is *the type of tree species* that the vegetation systems are composed of.

Open-closed forest

In the codes for forest categories (*code-forest*), a distinction is made between open and closed forests. This follows the FAO definitions with a 40 % canopy cover dividing line. Thus,

- **Closed forests** have a canopy cover above 40 %. Examples include tropical rainforest and mangrove forest.
- **Open forests** have a canopy cover between 10 and 40 %. Open forests generally have a continuous grass layer. Examples include the wooded savannahs and woodlands in Africa, and part of the *cerrado* and *chaco* in Latin America. "

[2] K.F. Wiersum. 1997. "Indigenous exploitation and management of tropical forest resources: an evolutionary continuum in forest-people interactions". *Agriculture, Ecosystems and Environment*, 63: 1-16.

Summary of forest definitions

We:

1. Adopt the FAO forest definition: Min. 0.5 ha, min. 10 % canopy cover, and min. (potential) height of 5 meters, and not agriculture as the primary use.
2. Use the three categories of forest: (1) Natural forest; (2) Managed forest; and (3) Plantation forest.
3. Agroforestry (in its various versions) is not considered forest.

Land tenure

Following PEN (2007: 12) "ownership or tenure of the forest and agricultural land is an important aspect for many key research and policy questions. The land tenure regime consists of many dimensions, and the three-digit coding system (*code-tenure*) is based on three aspects: (1) the formal or ***de jure*** **owners** of the forest (state, community, individuals); (2) the ***de facto*** **users** of the forest (state, community, individuals, or combinations); (3) the degree of rules **enforcement** (high, medium/low, none). This is elaborated further in the code list."

Non-forest land categories

In the codes for land categories (*code-land*), a number of other land categories are used in addition to the three forest categories. These are defined in this section. Following PEN (2007: 14), the main land categories used in GEQ is shown in Table 2 below.

Table 2: Description of main land categories (PEN 2007: 14)

Category	**Brief definitions & comments**
Forests:	
Natural forest	Indigenous species with only limited management.
Managed forests	Predominantly indigenous species, and management including felling and planting of indigenous and/or exotic species.
Plantations	Forest stands established by planting and/or seeding.
Agricultural land:	
Cropland	Land cultivated with crops. But, there is a fine distinction between cropland and fallow, agroforestry or plantation, see definition in text.
Pasture	Land used for herbaceous forage crops, established by humans and/or with active management.
Agroforestry	Land use established by humans combing trees and crops, either on a spatial or temporal scale.
Silvipasture	Land use established by humans combining trees and pasture.
Fallow	Agricultural land temporarily (up to 15 years) not being used for crops or pasture.

Other land categories:	
Shrubs	Woody perennial vegetation less than 5 m in height.
Grassland	Land with grass as the predominant natural vegetation; may have scattered trees (savannah) of less than 10% canopy cover.
Residential areas, infrastructure	Land used for buildings, roads, etc.
Wetland	Land where water saturates the soil, not classified as by forests or agricultural land.
Others	Land not fitting into any of the above categories.

Stock

Stock represents an amount of goods (e.g. agricultural, livestock, or business) owned by a household. Households gradually sell and replenish their stock to earn an income. For example, stock for a household who owns a shop would be the amount of goods in the shop (drinks, food, other items).

Capital

Capital is the amount of equipment (e.g. buildings, cages, machinery) a household owns as part of a business (e.g. shop or poultry farm). It does not include the stock (see above).

4. A detailed guide to the data collection activities

This section provides a guide to the GEQ data collection instruments.

4.1 Structured household survey

The household survey contains five sections (A, B, C, D, E). Here, rules and hints are given for each section separately.

4.1.1 Section A: Open questions to be asked at the household level

Asking open questions at the beginning of an interview is a good way to start as it (i) allows the researcher/enumerator to get an overall idea of the context in which the interview will take place and the issues which will be dealt with and (ii) is a smooth way to start a conversation (i.e. instead of starting straight out with more sensitive questions (e.g. about income or assets).

Remember that we are interested in people's *perceptions* of the facts. Therefore, enumerators should refrain from expressing their own opinion during interviews.

When conducting those qualitative interviews, make sure to follow advices given under section 5.2.

4.1.2 Section B: Quarterly household income survey

We refer to the excellent guidelines provided in PEN (20017), and in particular to the sections on "Getting the time frame right", "Cells that can be calculated", "Illegal activities and underreporting", "Recall periods", and "Valuation and pricing". The PEN guidelines also have very useful sections on question-specific hints and rules in relation to the income survey questions.

The codes are included in Appendix 5. Using uniform coding is important for data quality. Suggestions for new codes should be emailed to mapo@ifro.ku.dk.

You will have to use the Household Identification Number (HID) which has been used previously by the ComForM project.

4.1.3 Section C: Survey questions on earthquake-related asset loss

Question-specific rules and hints:

Question 1a.

- This question concerns the evolvement of household's economic condition between 2068 (2011-12, when last visited) until immediately before the earthquake. It is a good idea to mention an important event that happened in 2068 as a point of reference for the respondents.
- Make sure that the respondents do not get influenced by what happened after the earthquake when answering this question.

Question 1b.

- This question is only to be answered if the respondent answers that his/her household's economic condition has improved or worsen in question 1a.
- This question is the only question that in particular requires some enquiring and searching from your side because the respondent may not be precise in their formulation. **What we need to know are the direct causes affecting economic wealth.** For example, the respondent may say that land exhaustion/declining productivity (LLE-) is the principal reason for economic deterioration. Your job is

to find the underlying reasons for exhaustion/declining productivity. This could be due to weather (ACW-), crop inputs/equipment have become expensive (ACI-,ACIM-), or land division (LLD-) caused by death of a family member (HDI-). Another example is crop production increase. That is not a cause - the cause is what made crop production increase possible (land acquisition, LLAL+; inputs, ACI+, ACIM+; weather-related ACW+; irrigation LLW+; etc.).

- Note that the ORDER OF EVENT allows you indicate the chronological sequence of events, without having to rearrange rows, i.e. 1= first event, 2=second event that followed event 1, 3=third event, and so on.
- Before inserting codes verify with the respondent that you have correctly interpreted their perception of casual relationships.
- Remember to include a (+) after the code if it is a positive factor and (-) if it is a negative factor. In case of other (OO) and other shocks (OS), a (+) and a (-) are also to be included.
- This question involves ranking. The ranking question should be asked in the following way:
  1. The enumerator asks the question as an open-ended question.
  2. The respondent gives one or more answers.
  3. Follow-up questions can be asked to clarify the response, or to ask about other reasons if they only give one reason.
  4. The enumerator asks the respondent to rank the reasons given: "Among the answers given, which one is the most important?" And then: "the second most important", and "third most important" (if applicable).

Note:

- You don't always have to fill in for all three alternatives, i.e., in some cases you only fill in a 1, or a 1 and 2. Don't force the respondents to give 3 alternatives.
- You should only fill in 1, 2 and 3 for the ranked alternatives, and leave the other cells blank.

Question 12.

- This question needs to be filled in for (i) gifts received, e.g. from family and friends, and (ii) formal loans and credits obtained by the household.

Question 13.

- Again, we are interested in the respondent's perceptions. As an enumerator/researcher, refrain from filling this question with your own opinion.
- Make sure that the respondent understands that we want to know about his/her household's *relative wealth compared to his/her neighbours* (in the settlement). We are not interested in having the respondent comparing his/her wealth to that of a household, e.g. in Kathmandu, Pokhara or Europe.

4.1.4 Section D: Survey questions on household-level coping strategies

- We are interested in capturing all coping strategies adopted by the household since the earthquake on April 25th 2015.
- In Column 3, we are interested in the sum of all money generated through this strategy since the earthquake.
- Please mention all coping strategies not stated in any of the categories under 9. Other. Be as specific and clear as possible here.

4.1.5 Section E: Enumerator/researcher assessment of the household

- This section is filled out by the enumerator and/or the researcher, and should not be asked or discussed with the respondent.
- The first question about smiling and laughter may appear strange, but there is evidence that smiles correlate with happiness and well-being.
- The information about survey quality can also be used to test potential biases, e.g. if there is systematic underreporting of forest income.

4.2 Focus group discussions

The qualitative focus group discussion component focuses on the earthquake's impact on households' livelihoods and the coping strategies adopted by adults and children. It also captures the external relief history after the earthquakes as well as community level responses. Data collection takes place alongside the implementation of the structured household questionnaire on shock coping and asset losses.

Focus group discussions are audio recorded, transcribed and translated. The discussions are facilitated by a researcher while an assistant makes extensive notes of the responses and the group dynamics to capture non-verbal interaction and to provide a backup in case of problems with the recording.

Number of focus group discussion locations:

Simjung: One FGD with men and one FGD with women in each of the 6 groups of settlements (Sirandada + Lame, Taple + Pable + Simjung+Sirubari, Gagonpani+ Haringhaderi+ Rittapani+Banje, Jhawa+ Sarkitol+Gorigoun+Inarpani, Pokharatar+Pokhari, Baluw+ Doreni) . Additionally, One FGD with children in each of the schools (5 schools in total). **Total number of FGD= 17.** Each FGD should involve 6-10 participants.

Gyachchok: One FGD with men and one FGD with women in each of the 5 groups of settlements (Mather, Milim+Milibeshi+Thuingoun, Dewalsungara+Bamsboat, Chimsang+Dhansira, Gyachchok). Additionally, 1 FGD with children in each of the schools (3 schools in total). **Total number of FGD= 13.** Each FGD should involve 6-10 participants.

Make sure to follow advice given in section 5.2.

4.3 Establishment of permanent sample plots

The forest resource survey is described in detail in Appendix 3, which also includes forms and tables needed in the field. The work is carried out in four phases. The preliminary stratification of the forest (first phase) is conducted during the monsoon, whereas the basic site survey (second phase), including participatory mapping and forest walk, and detailed survey planning work (third phase) are carried out after the monsoon. The plot establishment work (fourth phase) was planned for the end of 2015 but was in practice carried out in the spring of 2016.

The inventory design is similar to the design used at ComForM sites in Mustang, Kaski, and Chitwan districts (see also Larsen et al 2014), but in the present case the plot network mainly serves as a basis for assessing the extraction of wood products, and therefore tree stumps and standing trees are emphasized, whereas the work at other ComForM sites also includes recording of shrubs, herbs, seedlings, and in some cases even deadwood.

At the sites in Mustang, Kaski, and Chitwan the establishment of the plot network was based on a pilot survey and a thorough stratification but, due to time constraints and the fact that there are as many as 18 community forests in Gyalchok and Simjung VDCs, some of which are very small (<10 ha), it was decided to simplify the procedure and operate with a general sampling intensity of approximately 0.5%, and to allocate plots proportionally to forests. The target number of plots was 100, and the final number of plots established in Gyalchok VDC was 48, corresponding to 0.42% of the forest area (Table 3), while 50 plots were established in Simjung VDC, corresponding to 0.68% of the forest area.

Table 3 Plot allocation to community forests.

VDC	Community forest	Area (ha)	No. of plots	Sampling fraction
Ghyalchok	Baraikot	97.75	8	0.41%
Gyalchok	Bhahere	71.13	6	0.42%
Gyalchok	Chaurikharka	131.15	10	0.38%
Gyalchok	Kamadhenu	75.88	7	0.46%
Gyalchok	Nagepokhari	198.40	17	0.43%
Gyalchok		**574.31**	**48**	**0.42%**
Simjung	Amale Mandir	15.64	2	0.64%
Simjung	Arubote	7.40	2	1.35%
Simjung	Dalbote Kathe Danda	12.60	2	0.79%
Simjung	Dhoke Dhunga	37.60	4	0.53%
Simjung	Didibahini	3.50	1	1.43%
Simjung	Dovan Pakha	38.50	5	0.65%
Simjung	Himali Laligurans	53.20	6	0.56%
Simjung	Jhakre Pakha	10.60	3	1.42%
Simjung	Mausuli Pakha	44.20	4	0.45%
Simjung	Nimare Pakha	5.35	1	0.93%
Simjung	Paharepani	35.60	5	0.70%
Simjung	Salghari	68.20	9	0.66%
Simjung	Saune Chiuribote	36.20	6	0.83%
Simjung		**368.59**	**50**	**0.68%**

The permanent plots are established using a nested design with 20x25 = 500 m2 rectangular plots where trees and stumps ≥10 cm (diameter at breast height, dbh) are measured, and interior 10x15 = 150 m2 plots where trees and stumps ≥4 cm (dbh) are measured. All trees measured with regard to diameter are mapped using plot-specific coordinate systems. For stumps, the spatial location is recorded to 5x5 m2 quadrates. For common species, heights are measured for a subsample (n=30) in each forest. Like at other sites in Mustang, Kaski, and Chitwan districts, the permanent sample plots are distributed spatially within each forest using a so-called 'coffee-house design' which, for each additional plot established within the same forest patch, maximizes the minimum distance to already existing plots. Due to the complex and steep terrain, about half the plots were in practice moved from their planned location using a list of random compass directions and distances of 50 or 100 m. To make it easier to find the permanent plots again, plot sketches are prepared and actual geographical coordinates of all plots are recorded using a GPS device.

5. General guidelines on field work

This chapter contains advice on how to conduct the quantitative and qualitative fieldwork conducted. First, a general list of important points to consider when collecting data:

1. Before the training of field assistants, we should locate a number of IOF graduates that have both fieldwork experience as well as the people skills required to collect data and spend a considerable amount of time in an earthquake-hit area interviewing households. All trained and chosen field assistants should be familiar with the history of IOF-IFRO collaboration, including having a good understanding of the permanent nature of the ComForM Gorkha site.
2. All field assistants should introduce the GEQ project properly to all respondents, e.g. who you/we are, our ComForM history, the purpose of the project. It is also a good idea to inform the respondents about the structure/sequence of the interview and the approximate duration.
3. Remember to inform respondents that information collected will be anonymised in all reports and publications. We are only collecting name and address information to be able to contact the respondents in the future (e.g. for follow-up).
4. Remember to ask for respondents' consent to participate in the interview (and to be recorded).
5. It is crucial to achieve and maintain good rapport with the respondents. Start-off with some "small talk" on the monsoon, the times following the earthquake, etc.
6. Smile and be friendly.
7. Always choose a quiet and private location to perform interviews. Some of the questions can be sensitive (e.g. price information), and the only way to collect reliable data is to ensure that no one else is listening.

5.1 Quantitative data collection

When collecting quantitative data, remember to:

1. Bring a notebook and pen. Respondents do not always answer questions in the order which we have planned; record the relevant information when it is mentioned to avoid unnecessary repetitions which consume precious time and contribute to respondent fatigue.
2. Bring a calculator to assist respondents in estimating some of the volume or cost information.
3. As much as possible, help the respondents to give precise estimates. When the respondent does not know an answer, ask him/her to estimate it to the best of his/her ability. All questions need to be answered; write a comment at the end of the questionnaire if some of the data collected is considered unreliable.
4. Feel free to reformulate the questions in your own words (but make sure that you keep the same meaning).

5.2 Qualitative data collection

When collecting qualitative data, remember to:

1. Stimulate conversation: listen carefully to what is being said, probe, nudge, ask for clarifications, sum up what is being said to make sure that you understand the answers correctly.
2. Accept reflective silence. Sometimes, the respondents need some time to answer.
3. Be ready to re-state or elaborate questions if necessary. Make sure that the respondent understands the questions correctly.
4. Use non-verbal techniques (e.g. nodding) and make the respondent feel like the information he/she is giving is interesting and valuable.
5. Avoid sensitive issues in early phases of the interview and move on if necessary. You can always come back to the most difficult questions at the end of the interview.
6. Provide 'space' for questions from the respondent at the end of the interview.

Moreover, the following points are important to consider when conducting focus group discussions:

1. At the onset of the discussion, make sure that all participants are introduced to each other.
2. The key role of the interviewer (moderator) is to facilitate interactions between participants, to sum up what is being said and to ensure progress in the discussion.
3. Be aware of misinterpretation of consensus; make sure that all voices (and not only "powerful voices") are heard.
4. Provide small incentives (e.g. tea and snacks).

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Appendices

These appendices contain the latest version of all data collection instruments.

Appendix 1: Pre-data collection trip questions

A short visit to Simjung and Gyachchok is made by S Rayamajhi and BBK Chhetri in July 2015 August to express the Nepalese-Danish team's sympathies, gather overall information about impacts of the earthquakes, and assess the conditions for implementing the structured household questionnaire in September. Activities include interviews with key informants (5-7 independent interviews, including with the VDC secretary), transect walks with photographic documentation, and focus group discussions. Outcomes will be circulated to the team members immediately after the trip so that it can inform the finalization of preparations for the structured household questionnaire implementation.

In preparation of the trip, village maps and/or aerial photographs are prepared.

1. Key informant interview

Questions are meant to provide an understanding of the impacts of the earthquakes, community responses, and community level support received. Separate interviews with key informants from Simjung and Gyachchok VDCs would be best. Answers are noted down with indication of name of interviewee(s), location of interviewee's home, date and place of interview.

1. What kinds of damages did the earthquakes cause?
2. How many people died or were seriously injured? How many women, men, children, elderly?
3. Do you experience increased levels of diseases as a consequence of the earthquakes, maybe because of problems with the water supply, e.g. diarrhoea?
4. Has the earthquake affected the food security status of people in the VDC? – how?
5. What is the general spirit of the community – are people optimistic or depressed, maybe even traumatized? - e.g., emotional reactions of anger, irritability, panic attacks, increased anxiety.
6. How many houses in the VDC are damaged and destroyed?
7. Are people reconstructing their houses? – is it possible to reuse construction materials from destroyed houses and can material from specific houses be identified? Would that create any problems? [Question is inspired from Honduras where problems were experienced after a hurricane]
8. Are fields affected? – if yes, how and how seriously (can they be re-established)? are land titles upheld? [Question is inspired from Honduras where problems were experienced after a hurricane]
9. How much livestock died or was injured?
10. Is basic community infrastructure affected, for example roads, buildings, drainage, water supply?
11. Are forests and trees affected? – if yes, how?
12. What have the earthquakes meant for people's livelihoods? – are any specific groups more vulnerable, e.g. women, dalits, people living in specific geographical areas (wards), people with specific income strategies?
13. How do people cope with the damages? – do different specific groups cope (as in previous question) in different ways?
14. How many people stay and rebuild their houses and how many people leave the VDC?
15. Have you received any support to the community? – If yes, when, how much and from who?

In a separate session we would like to know how many of the households in our previous sample that are still living the VDCs.

2. Transect walk

To get a first-hand impression of the damages the visiting researchers request key informants to show them the damages to settlements and nearby fields – other transects may be deemed relevant too. During the walks, notes are taken of the information provided about specific damages, how they affect people and how people cope with them. Photographs of damages are made. The routes are drawn on maps/aerial photographs.

3. Focus group discussions

The purpose of the focus group discussion is to get a better impression of the different types of damages caused by the earthquake and what coping strategies people resort to. Groups of women and men of different ethnic groups and castes are invited to participate; approx. 6-8 individuals in one group covering as much of the two VDCs' area as possible. There are fewer questions for focus group discussions compared with key informant interviews because each question will require more time to be answered. The sessions are recorded to aid the preparation of the report; detailed answers are noted down with indications of interviewees' names, location of interviewees' homes, date and place of interview.

1. What kinds of damages have the earthquakes caused? – please indicate on map/aerial photograph where relevant
2. Are some wards more affected than others? – please explain how so and indicate on map/aerial photograph
3. Are different groups of people affected differently? – please explain how so and indicate on map/aerial photograph, if relevant
4. Are people staying in the VDC or are they relocating (entire households)? Why?
5. How do people cope with the damages?
6. Do different people cope differently? - e.g., people following different livelihood strategies, women, Dalits, other

Appendix 2: Structured household survey

GEQ data collection instruments

Version 20.08.2015

Identification

1. Household name and code	**(name)*	*(HID)*
2. Village name and code	**(name)*	*(VID)*
3. District name and code	**(name)*	*(DID)*
4. Name and PID of primary respondent	**(name)*	*(PID)*
5.		
6. Name and PID of secondary respondent	**(name)*	*(PID)*

Section A: Open questions to be asked at the household level

Answers to these questions will be recorded with a voice-recorder.

1. Tell us about the most severe consequences the earthquake has had on your livelihood.
2. Compared to other households in your VDC, has your household been severely, moderately or lightly affected by the earthquake? Tell us on what basis you make this judgment.
3. How did/do you cope with the earthquake-related damage done to your material assets (including home)?
4. How did/do you cope with the earthquake-related health damages in your family (e.g. injuries, disease, death, etc.)?
5. Has the earthquake affected the food security of your household? If so, how did/do you cope with this?

Section B: Quarterly household income survey

Technical notes:

- The numbers of the questions and lines and columns in the tables will be used to give each data cell a unique digital code, and should not be changed.
- A star (*) indicates that cell information may not be entered into the database, but is used for ease of recording.
- The following generic codes shall be used, although not being specified for each question:
  - **8 (minus eight)** is to be used to indicate that the question "does not apply" to the circumstances of the respondent(s).
  - **9 (minus nine)** is to be used for the alternative "I don't know" or '"The respondent doesn't know". Naturally, one should aim to minimize use of this response, but in some cases it's unavoidable.
- The GEQ Code List (Appendix 5) contains all the codes to be used, and must be used together with the questionnaire. The exception is the codes that apply only to single questions – these are included in the questionnaire itself.

Note: All incomes are asked for the past month (past 30 days), except for the last sections on crops, livestock and other income sources where the recall period is 3 months.

Note: The researcher should list the most common products in the various tables, based on RRAs and pre-testing of the questionnaire. After asking about these pre-listed products, the enumerator should ask if there are any other products not mentioned that the household has harvested/collected over the past 1 (3) month(s).

Control information

Task	Date(s)	By who?	Status OK? If not, give comments
Interview			
Checking questionnaire			
Coding questionnaire			
Entering data			
Checking & approving data entry			

A. Direct forest income (income from unprocessed forest products)

1. What are the quantities and values of raw-material forest products the members of your household collected for both own use and sale over **the past month**?

Note: Income from plantations is defined as forest income, while agroforestry income is categorized as agric. income (H).

Note: The quantities of unprocessed forest products used as inputs in making processed forest products should only be reported in section C, table 2, and not in the table below.

1. **Forest product** *(code-product)*	**2. Collected by whom?[1)]**	**Collected where?**		**5. Quantity collected** **(7+8)**	**6. Unit**	**7. Own use (incl. gifts given and received)**	**8. Sold (incl. barter)**	**9. Price per unit** **Rs.**	**10. Type of market** *(code-market)*	**11. Gross value** **(5*9), Rs.**	**12. Tran-sport/ marketing costs** **(total), Rs.**	**13. Purch. inputs & hired labour, Rs.**	**14. Net income, Rs. (11-12-13)**
		3. Land type *(code-land)*	**4. Ownership** *(code-tenure)*										

1) Codes: 1=only/mainly by wife and adult female household members; 2=both adult males and adult females participate about equally; 3=only/mainly by the husband and adult male household members; 4=only/mainly by girls (<15 years); 5=only/mainly by boys (<15 years); 6=only/mainly by children (<15 years), and boys and girls participate about equally; 7=all members of household participate equally; 8=none of the above alternatives.

Note: Answers in columns 3 and 4 should be consistent with land categories reported in village questionnaire (V1D01) and in the annual household questionnaire (A1C).

2. What are the quantities and values of raw-material forest products the members of your household collected for both own use and sale over **the past three months**?

Note: Income from significant sources of income that is likely to be missed using one month recall period. Use pre-defined product list from RRA and A1.

Note: Income from plantations is defined as forest income, while agroforestry income is categorized as agric. income (H).

Note: The quantities of unprocessed forest products used as inputs in making processed forest products should only be reported in section C, table 2, and not in the table below.

Note: a given product should be included in either B0 or B1 (not in both tables).

1. **Forest product** *(code-product)*	**2. Collected by whom?**[1)]	**Collected where?**		**5. Quantity collected** **(7+8)**	**6. Unit**	**7. Own use (incl. gifts given and received)**	**8. Sold (incl. barter)**	**9. Price per unit**	**10. Type of market** *(code-market)*	**11. Gross value** **(5*9)**	**12. Tran-sport/ marketing costs** **(total)**	**13. Purch. inputs & hired labour**	**14. Net income (11-12-13)**
		3. Land type *(code-land)*	**4. Ownership** *(code-tenure)*										

1) Codes: 1=only/mainly by wife and adult female household members; 2=both adult males and adult females participate about equally; 3=only/mainly by the husband and adult male household members; 4=only/mainly by girls (<15 years); 5=only/mainly by boys (<15 years); 6=only/mainly by children (<15 years), and boys and girls participate about equally; 7=all members of household participate equally; 8=none of the above alternatives.

Note: Answers in columns 3 and 4 should be consistent with land categories reported in village questionnaire (V1D01) and in the annual household questionnaire (A1C).

B. Forest-derived income (income from processed forest products)

1. What are the quantities and values of processed forest products that the members of your household produced during **the past month?**

1. **Product** *(code-product)*	**2.** **Who in the house-hold did the work?**[1)]	**3.** **Quantity produced (5+6)**	**4.** **Unit**	**5.** **Own use (incl. gifts)**	**6.** **Sold (incl. barter)**	**7.** **Price per unit**	**8.** **Type of market** *(code-market*	**9.** **Gross value (3*7)**	**10.** **Purch-ased inputs & hired labour**	**11.** **Trans-port/ marke-ting costs**	**12.** **Net income excl. costs of forest inputs (9-10-11)**

1) Codes: 1=only/mainly by wife and adult female household members; 2=both adult males and adult females participate about equally; 3=only/mainly by the husband and adult male household members; 4=only/mainly by girls (<15 years); 5=only/mainly by boys (<15 years); 6=only/mainly by children (<15 years), and boys and girls participate about equally; 7=all members of household participate equally; 8=none of the above alternatives.

2. What are the quantities and values of *unprocessed* forest products used as inputs (raw material) to produce the *processed* forest products in the table above?

*Note: Avoid double counting with section B: only products used an inputs are recorded in the table below, and these quantities should **not** be included in what is recorded in section B.*

1. Processed (final) products *(code-product)*	**2. Unpro-cessed forest product used as input** *(code-product)*	**3. Quantity used (5+6)**	**4. Unit**	**5. Quantity purchased**	**6. Quantity collected by household**	**Collected where?**		**9. Who in the house-hold collected the forest product?[1)]**	**10. Price per unit**	**11. Value (3*10)**
						7. Land type *(code-land)*	**8. Owner-ship** *(code-tenure)*			

1) Codes as in the table above.

Note: The products in column 1 should be exactly the same as those in column 1 in the table above.

Note: Columns 7,8,9 should be left blank if no collection by household. Column 10 (price) should be asked even if only from collection, but if not available, see the Technical Guidelines on valuation.

Note: Answers in columns 7 and 8 should be consistent with land categories reported in village questionnaire (V1D01) and in the annual household questionnaire (A1C).

C. Fishing and aquaculture

1. How much fish did your household catch **exclusively from the wild** (rivers, lake, sea) during **the past month**?

1.Type of fish (list local names)*	**Collected where?**		**4. Total catch (kg) (5+6)**	**5. Own use (incl. gifts)**	**6. Sold (incl. barter)**	**7. Price per kg**	**8. Gross value (4*7)**	**9. Costs (inputs, hired labour, marketing)**	**10. Net income (8-9)**
	2. Land type *(code-land)*	**3. Owner-ship** *(code-tenure)*							

Note: Answers in columns 2 and 3 should be consistent with land categories reported in the village questionnaire (V1D01) and in the annual household questionnaire (A1C).

D. Non-forest environmental income

1. In addition to forest products and fish included in the previous tables, how much of **other wild products** (e.g., from grasslands, fallows, etc.) did your household collect **in the past month**?

1. **Type of product** *(code-product)*	**2. Collected by whom?**[1)]	**Collected where?**		**5. Quantity collected** **(7+8)**	**6. Unit**	**7. Own use (incl. gifts)**	**8. Sold (incl. barter)**	**9. Price per unit**	**10. Type of market** *(code-market)*	**11. Gross value** **(5*9)**	**12. Tran-sport/ marketing costs** **(total)**	**13. Purch. Inputs, hired laboour**	**14. Net income (11-12-13)**
		3. Land type *(code-land)*	**4. Ownership** *(code-tenure)*										

Note: Answers in columns 2 and 3 should be consistent with land categories reported in the village questionnaire (V1D01) and in the annual household questionnaire (A1C).

1) Codes: 1=only/mainly by wife and adult female household members; 2=both adult males and adult females participate about equally; 3=only/mainly by the husband and adult male household members; 4=only/mainly by girls (<15 years); 5=only/mainly by boys (<15 years); 6=only/mainly by children (<15 years), and boys and girls participate about equally; 7=all members of household participate equally; 8=none of the above alternatives.

2. In addition to forest products and fish included in the previous tables, how much of **other wild products** (i.e. non-cultivated products from grasslands, fallows, etc.) did your household collect **in the past three months**?

Note: Income from significant sources of income that are likely to be missed using one month recall period. Use pre-defined product list from RRA and A1.

Note: a given product should be recorded in either E0 or E1 (not in both tables)

1. **Type of product** *(code-product)*	**2. Collected by whom?**[1)]	**Collected where?**		**5. Quantity collected** **(7+8)**	**6. Unit**	**7. Own use (incl. gifts)**	**8. Sold (incl. barter)**	**9. Price per unit**	**10. Type of market** *(code-market)*	**11. Gross value** **(5*9)**	**12. Tran-sport/ marketing costs** **(total)**	**13. Purch. inputs & hired labour**	**14. Net income (11-12-13)**
		3. Land type *(code-land)*	**4. Ownership** *(code-tenure)*										

Note: Answers in columns 2 and 3 should be consistent with land categories reported in the village questionnaire (V1D01) and in the annual household questionnaire (A1C).

1) Codes: 1=only/mainly by wife and adult female household members; 2=both adult males and adult females participate about equally; 3=only/mainly by the husband and adult male household members; 4=only/mainly by girls (<15 years); 5=only/mainly by boys (<15 years); 6=only/mainly by children (<15 years), and boys and girls participate about equally; 7=all members of household participate equally; 8=none of the above alternatives.

E. Wage income

1. Has any member of the household had paid work over **the past three months**?

Note: One person can be listed more than once for different jobs.

*Note: If a person has worked but not yet received payment, the **expected** income is recorded in column 5 while the **actually received** income is recorded in column 6. In cases of pre-payment and/or late payment for work, the actual days worked, the negotiated daily wage rate and the actual amount received are recorded in columns 3, 4 and 6, respectively.*

1. Household member (PID)	**2. Type of work** *(code-work)*	**3. Days worked past 3 months**	**4. Daily wage rate**	**5. Total (expected) wage income (3*4)**	**6. Total wage income actually received**

F. Income from own business (not forest or agriculture)

1. Are you involved in any types of business, and if so, what are the gross income and costs related to that business over **the past 3 months?**

Note: If the household is involved in several different types of business, you should fill in one column for each business.

	1. Business 1	**2. Business 2**	**3. Business 3**
1. What is your type of business?[1)]			
2. Gross income (sales)			
Costs:			
3. Purchased inputs			
4. Own non-labour agricultural inputs (equivalent market value)			
5. Own non-labour forest inputs (equivalent market value)			
6. Own non-labour environmental inputs (equivalent market value)			
7. Hired labour			
8. Transport and marketing cost			
9. Other costs			
10. Net income (2 - items 3-7)			
11. Capital costs (investment, repair, maintenance, etc.)			
12. Current value of total capital stock			

1) Codes: 1=shop/trade; 2=agric. processing; 3=handicraft; 4=carpentry; 5=other forest based; 6=other skilled labour; 7=transport (car, boat,…); 8=lodging/restaurant; 9=brewing; 10=brick making; 11=landlord/real estate;

12=herbalist/traditional healer/witch doctor; 13=quarrying; 14= tailoring; 15= mason; 19=other, specify:

G. Income from agriculture – crops

1. What are the quantities, uses and values of crops that household **has harvested** during **the past 3 months**?

Note: only include crops that were harvested during the past three months. Use of stored crops is booked in table 1a.

Note: remember to probe for and include small quantities of crops that are continuously harvested for subsistence uses.

1. Crops *(code-product)* *(Pre-print crop types for site)*	**2a. Area unit**	**2. Area of production** *(no. of area units)*	**3. Total production (5+6+9)**	**4. Unit (for production)**	**5.Own use (incl. gifts received and given)**	**6. Sold (incl. barter)**	**7. Price per unit**	**8.Total value ((5+6)*7)**	**9. To stock**

2. What are the quantities and values of inputs used in crop production over **the past 3 months** (this refers to agricultural cash expenditures)?

Note: Take into account all the crops in the previous table.

Note: See codes-list (section 3.2) for additional codes.

1. Inputs	**2. Quantity**	**3. Unit (can be e.g. bottle, pack)**	**4. Price per unit**	**5. Total costs (2*4)**
1. Seeds				
2. Fertilizers				
3. Pesticides/herbicides				
4. Manure				
5. Draught power				
6. Hired labour				
7. Hired machinery				
8. Transport/marketing				
10.Payment for land rental_____				
9. Other, specify:_____				

H. Income from livestock

1. What is the number of ADULT larger animals your household has now, and how many have you sold, bought, slaughtered or lost during **the past 3 months**?

Note: Only include larger valuable animals; smaller animals are included in table 1a.

Note: See codes-list (section 3.3) for additional codes.

1. Livestock	**2. Beginning number (3 months ago)**	**3.Sold (incl. barter), live or slaught-ered**	**4.Slaught-ered for own use (or gift given)**	**5. Lost (theft, died,…)**	**6. Bought or gift received**	**7. New from own stock**	**8. End number (now) (2-3-4-5+6+7)** ***(bring this figure next quarter)***	**9. Total value of livestock type (all animals)**
1. Cow								
2. Ox								
3. She-Buffalo								
4. He-buffalo								
5. He-Goat								
6. She-Goat								
7. Sheep								
8. Pig								
9. Swine								
10. Donkey								
11. Mule								
17. Horse								
20. Wild bore								
21. Beehive								
19. Others, specfy								

1a. What is the number of ADULT smaller animals your household has **sold or consumed** during **the past month**?

Note: See codes-list (section 3.3) for additional codes.

1. Livestock	**2.Sold (incl. barter), live or slaughtered**	**3.Slaught-ered for own use (or gift given)**	**4. Total price of sold animals**	**5. Total value of consumed animals**
7. Ducks				
8. Chicken				
10. Guinea pigs				
11. Rabbit				
12. Turkey				
13. Guinea Fowl				
19. Other, specify:				

2. What are the quantities and values of animal products and services that you have produced during **the past 3 months**?

1. Product/service	**2. Production (4+5)**	**3. Unit**	**4. Own use (incl. gifts)**	**5. Sold (incl. barter)**	**6. Price per unit**	**7. Total value (2*6)**
1. Meat [1)]						
2. Milk [2)]						
3. Butter						
4. Cheese						
5. Ghee						
6. Eggs						
7. Hides and skin						
8. Wool						
9. Manure						
10. Draught power						
11. Bee hives						
12. Honey						
13. Curdled milk						
14. Soap						
15. Whole animal: _____						
16. Whole animal: _____						
17. Whole animal: _____						
19. Other, specify						

1) Make sure this corresponds with the above table on sale and consumption of animals.

2) Only milk consumed or sold should be included. If used for making, for example, cheese it should not be reported (only the amount and value of cheese).

3. What are the quantities and values of inputs used in livestock production during **the past 3 months** (cash expenditures)?

Note: The key is to get total costs, rather than input units.

1. Inputs	**2. Unit**	**3. Quantity**	**4. Price per unit**	**5. Total costs (3*4)**
1. Feed/fodder				
2. Rental of grazing land				
3. Medicines, vaccination and other veterinary services				
4. Costs of maintaining barns, enclosures, pens, etc.				
5. Hired labour				
6. Inputs from own farm				
9. Other, specify:				

4. Please indicate the approx. share of fodder from different land types, and the proportion grazed by your roaming animals compared to the proportion brought to the farm by household members **during the past 3 months**.

	Sources of fodder *(sums to 100%)*				**Type of feeding** (sums to 100%)	
1. Agriculture	2a. Community forest	2b. Other forest	3. Grass land	4. Other land	5. Browse and graze	6. Stall feeding
%	%		%	%	%	%

I. Other income sources

1. Please list any other income that the household has received during **the past 3 months**.

1. Type of income	**2. Total amount received past 3 months**
1. Remittances	
2. Support from government, NGO, organization or similar	
3. Gifts/support from friends and relatives (large quantities)	
4. Pension	
5. Payment for forest services	
6. Payment for renting out land (if in kind, state the equivalent in cash)	
7. Compensation from logging or mining company (or similar)	
8. Payments from FUG	
9. Monthly salary	
10. Other, specify:	

Section C: Survey questions on earthquake-related asset loss (household level)

1a. The first question is concerned with the economic situation of your household in the period from your household was interviewed by the ComForM project in 2068 until the earthquake hit Nepal in April 2072.

Between 2068 and 2072 (before the earthquake) did the economic condition of your household: Improve=1, Remain the same=2, Become worse=3	

Skip question 1b if the households economic situation remained the same (i.e. = 2).

1b. Please tell me about the things that occurred and things that your household members did that made the economic condition of your household improve (if answer above was 1) or worsen (if answer above was 3) in the period from 2068 until immediately before the earthquake. [Enumerator: After making the list, please have the respondent rank items in order of importance as well as chronologically].

Explanation (The sequence of events does not have to be chronological)	Code (table 1)	Importance (rank 1-3)	Month and year of start

2. Please describe your household composition before and after the earthquake including household members that have relocated due to the earthquake and now is living elsewhere.

	1. Name of members[1] who lived in the household the day before the earthquake (Make a complete list and then fill in the remaining information)	2. Gender (male=1, female=2)	3. Age (If less than one year write zero)	4. Relation with household head[2] 1=head[2] 2=husband/wife 3=son/daughter 4=grandchild 5=father/mother 6=brother/sister 7=nephew/niece 8=son/daughter in-law 9=brother/sister in-law 10=other family relatives 11=servant/servants relatives 13=tenant/tenants relatives 14=other persons not related	5. How many months did (NAME) live in the household the 12 months prior to the earthquake	6. Where has (NAME) been living most of the time since the earthquake 1=deceased 2=missing 3=hospitalized 4=relocated 5=still living in HH 6=other - explain (Ask for all household members including children and elders)	7. What was (NAME's) main occupation or activity providing (cash or subsistence) income for the HH **prior to** the earthquake (code table 3) (Ask for all household members including children and elders)	8. What is (NAME's) main occupation or activity providing (cash or subsistence) income for the HH **after the** earthquake (code table 3) (Skip if died or still hospitalized) (Ask for all household members including children and elders)
1.								
2.								
3.								
4.								
5.								
6.								
7.								

8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								
19.								
20.								

1. Household members live under the same roof and share food, money and labour at least 1 month per year.
2. Head of the household makes financial decisions and dispositions. It is not necessarily the eldest person or a male.

3. How many household members have been seriously ill or injured (i.e. confined to bed due to illness and unable to work) including permanently disabled after the earthquake?

Household member number (from Question 2)	1. No. of days ill (i.e. unable to work)	2. Symptoms/Illness	3. Expected permanent condition (1=yes, 2=no)	4. Total cost of all treatments received since the earthquake[1]	5. Do you perceive any direct or indirect relation to the earthquake? (1=yes, 2=no)

[1] Including costs of being hospitalized and transport costs

4. How many household members have been ill or injured but not seriously (i.e. not confined to bed due to illness or unable to work) after the earthquake (this could include cough, cold, headache, sprains, abrasions, cuts and minor injuries)?

Household member number (from Question 2)	1. No. of days	2. Symptoms/Illness	3. Total cost of all treatments received since the earthquake[1]	4. Do you perceive any direct or indirect relation to the earthquake? (1=yes, 2=no)

[1] Including costs of being hospitalized and transport costs

5. Please tell me about your house before the earthquake and where you are living now after the earthquake.

	3. PERIOD Immediately prior to the earthquake	4. PERIOD Current living quarters after the earthquake
5a. (PERIOD), was/is your living quarters owned by the HH? 1=no 2=partially/shared with owner (→6c) 3=yes (→6c)		
5b. (PERIOD), did/do the household pay rent 1=No, living with parents 2=No, lived with relatives/friends 3=Yes		
5c. Was/is the living quarters: 1=permanent housing 2=temporary housing 3=other temporary dwelling: explain		
5d. (PERIOD) what was/is the main construction material of the outside walls 1=concrete blocks 2=cement bonded bricks/stones 3=mud bonded bricks/stones 4=sundried bricks 5=wood/branches 6=no outside walls 7=other - specify		
5e. (PERIOD) what was/is the main construction material of the roof? 1=tiles/slate 2=galvanized iron 3=concrete/cement 4=wood/planks 5=straw/thatch 6=earth/mud 7=stone 8=other – specify		
5f. (PERIOD) how big was/is the inside of your house (square feet)		
5g. (PERIOD) what would be the sales value of your house/part of your house (This includes remaining building material if the house collapsed due to the earthquake) (Rupees)		
5h. (PERIOD) what was/is the walking distance in minutes from HH to nearest road accessible by car or truck all year round (except during monsoon)		

6. Please tell me about the assets that your household owned prior to the earthquake and which of these you have lost due to the earthquake or subsequently sold.

Assets	1. How many pieces of (ASSET) did your HH own immediately prior to the earthquake (number)	2. What was the total expected sales price of (ASSET) owned prior to the earthquake (rupees)	3. How many pieces of (ASSET) was lost (i.e. destroyed) due to the earthquake (number)	4. How many pieces of (ASSET) have you sold after the earthquake (number)	5. What was the total sales price obtained from selling the (ASSET) (rupees)
1. Watch					
2. Radio tape/cd player					
3. Camera					
4. Bicycle					
5. Motorcycle					
6. Car					
7. Refrigerator					
8. Washing machine					
9. Fans					
10. Gas/electric stove					
11. Gas/electric oven					
12. Heaters gas/electric/kerosene					
13. Dish/cable TV					
14. Antenna TV					
15. DVD player					
16. Computer					
17. Sewing machine					
18. Iron					
19. Telephone					
20. Mobile phone					
21. Solar panel					
22. Car battery					
23. Indian toilet					
24. Improved stove					
25. Other – specify					
26. Other- specify					

7. Please tell me about the land and crops that your household cultivated before the earthquake and any crops and land lost or damaged due to the earthquake.

1. Make a list of the main landholdings that the HH owned or used immediately prior to the earthquake		2. Type of plot 1=regular irrigated 2=seasonal irrigated 3=rainfed 4=pasture 5=residential	3. What was the ownership of this land 1=owned 2=rented 3=shared	4. What area of land used by your HH has been damaged by the earthquake (incl. subsequent landslides) to an extent that will affect future cultivation or entirely lost (area)		5. What is the estimated value of standing crops lost and land damaged/lost due to the earthquake (rupees)	
Area	Unit			Damaged	Lost	Crops	Land

8. Please tell me about the agricultural equipment that your household owned before the earthquake and any equipment that you have lost due to the earthquake or subsequently sold.

Equipment	1. How many pieces of (EQUIPMENT) did your HH own immediately prior to the earthquake? (number)	2. What was the total expected sales value of (EQUIPMENT) immediately prior to the earthquake? (rupees)	3. How many pieces of (EQUIPMENT) was lost (i.e. destroyed) due to the earthquake (number)	4. How many pieces of (EQUIPMENT) have you sold after the earthquake (number)	5. What was the total sales price obtained from selling the (EQUIPMENT) (rupees)
1. Truck					
2. Tractor					
3. Power tiller					
4. Cart					
5. Thresher					
6. Hand trolley					
7. Water pump					
8. Water storage tank					
9. Tube well					
10. Water reservoir/dam (area)					
11. Generator/diesel engine					
12. Grass/hay cutter					
13. Plough wood					
14. Plough iron					
15.Green house plastic					
16. Green house glass					
17. Milling machine					
18. Seeds (kg)					
19. Chemical fertilizer (kg)					
20. Insecticide (kg)					
21. Biogas plant					
22. Other- specify					

9. Please tell me about the domestic animals that your household owned before the earthquake and any and animals that you have lost due to the earthquake or subsequently sold.

Animals	1. How many (ANIMALS) did you own immediately prior to the earthquake (number)	2. What was the total expected sales value of (ANIMALS) (rupees)	3. How many (ANIMALS) were lost due to the earthquake[1] (number)	4. How many (ANIMALS) have you sold after the earthquake (number)	5. What was the total sales price obtained from selling the (ANIMALS) (rupees)
1. Cow					
2. Ox					
3. She-Buffalo					
4. He-buffalo					
5. He-Goat					
6. She-Goat					
7. Sheep					
8. Pig					
9. Swine					
10. Donkey					
11. Mule					
17. Horse					
21. Beehive					
22. Calves (ox and buffalo)					
23. Chicken					
24. Ducks					
25. Rabbits					
26. Pheasants					
19. Others, Specify					

1. incl. due to subsequent disease or lack of fodder

10. Please tell me about any enterprises that your household owned/operated immediately before the earthquake and any damage or loss incurred to this enterprise due to the earthquake.

List enterprises (code table 6)	Stock value prior to earthquake (rupees)	Capital value prior to earthquake (rupees)	Stock value lost due to earthquake (rupees)	Capital value lost due to earthquake (rupees)	Enterprise operational now (1=yes, 2=no but planning to reopen, 3= no, definitely closed)

11. Please tell me about any debts and savings of the household before the earthquake and any loans taken and savings used after the earthquake.

	1. PERIOD Immediately prior to the earthquake (rupees)	2. PERIOD Now after the earthquake (rupees)	3. Has the amount 1= increased 2= stayed the same 3= decreased When comparing before and after the earthquake?
12a. In (PERIOD) did/do other households owe in money to your HH? (1=yes, 2=no)			
12b. In (PERIOD) did/do your HH owe in money to other households at the most? (1=yes, 2=no)			
12c. In (PERIOD) did/do your HH savings in cash? (1=yes, 2=no)			
12d. In (PERIOD), did your HH have savings in gold and silver (including jewellery and watches)? (1=yes, 2=no)			

12. Please tell me whether this household has directly received any post-earthquake relief aid from the Government, NGOs or private entities (including family and friends) [Enumerator please have the respondent rank the aid received in terms of its importance in coping with the earthquake]?

1. Aid received directly by the household (describe[1])	2. Value (rupees)	3. Received when (month)

1. Including formal loans and credit, materials and goods for coping with earthquake as well as for reconstruction. Importance for coping can be related with, e.g., amounts and timing

13. How would you regard you household's wealth status **relative to other households in your settlement** immediately before the earthquake and today?

Wealth status	Before the earthquake	Today
Poor =1		
Neither poor nor well off=2		
Well-off =3		

Section D: Survey questions on household-level coping strategies

Since April 25th, what are the strategies adopted by your household to cope with the impact of the earthquake? For each strategy, please mention the date (month) in which it was initiated as well as the amount realized with the strategy.

Coping strategies	Date (month) when strategy was initiated	Amount realized since EQ to today (Nr)
1. Buffer stock		
1.1 Consume food stocks		
1.2 Consume seeds		
2. Sale of real assets		
2.1 Sale of livestock		
2.2 Sale of land		
2.3 Sale of gold and jewelry		
2.3 Sale of watch, mobile phone, other liquid assets		
3. Borrowing or gifts		
3.1 Borrowing of money from friends or relatives living inside the VDC		
3.2 Borrowing of money from friends or relatives living outside the VDC		
3.3 Borrowing of food from friends or relatives living inside the VDC		
3.4 Borrowing of food from friends or relatives living outside the VDC		
3.5 Borrowing of money from informal moneylenders		
3.6 Borrowing of money from formal financial institutions		
4. Sending children to work		
4.1 Sending children below 15 years old to work inside the VDC		
4.2 Sending children below 15 years old to work outside the VCD		
4.3 Sending children above 15 years old to work inside the VDC		
4.4 Sending children above 15 years old to work outside the VCD		
5. Changed food consumption (quality and quantity)		
5.1 Eating food that you would normally not eat because you do not have the money to buy the preferred food		
5.2 Rely on wild foods (plants)		

Coping strategies	Date (month) when strategy was initiated	Amount realized since EQ to today (Nr)
5.3 Rely on wild meat		
5.4 Harvest immature agricultural products		
5.5 Ration portion size (eat less) of all family members		
5.6 Restrict adult consumption to make sure that children would get enough		
5.7 Restrict children consumption to make sure that adults would get enough		
5.8 Go whole days without eating		
6. Migration		
6.1 Temporary migration of one or more children members of household		
6.2 Temporary migration of one of more adult members of household		
6.3 Permanent migration of one or more children members of household		
6.4 Permanent migration of one of more adult members of household		
7. Sale of financial assets		
7.1 Use of money savings		
7.2 Use of pension savings		
8. Emergency income sources		
8.1 Extraordinary harvest and sale of timber		
8.2 Extraordinary harvest and sale of fuelwood		
8.3 Extraordinary harvest and sale of medicinal plants		
8.4 Extraordinary harvest and sale of wild foods		
8.5 Extraordinary harvest and sale of other non-cultivated products, specify		
8.6 Extraordinary labour work		
8.7 Extraordinary sale of handicraft		
9. Other, please specify		

Section E: Enumerator/researcher assessment of the household

Note: This is to be completed by the enumerator.

1.	During the last interview, did the respondent smile or laugh? *Codes: (1) neither laughed nor smiled (somber); (2) only smiled; (3) smiled and laughed; (4) laughed openly and frequently.*	
2.	Based on your impression and what you have seen (house, assets, etc.), how well-off do you consider this household to be compared with other households in the village? *Codes: 1=worse-off; 2=about average; 3=better-off*	
3.	How reliable is the information **generally** provided by this household? *Codes: 1=poor; 2=reasonably reliable; 3=very reliable*	

Appendix 3: Research manual for the post-earthquake Forest Resource Survey in Gorkha

Adapted from the research manual used in the ComForM Long-term study (LT-A), 2005-2013

Introduction

The forest resource survey described in this manual closely resembles the survey conducted at the other ComForM sites. However, the present survey is conducted mainly to detect extraction of wood following the earthquake that struck the area on the 25th of April 2015. It therefore emphasises trees and stumps and does not include measurements of shrubs, saplings and seedlings. First phase of the survey includes a preliminary stratification of the forest area which should be completed during the summer. It is followed by a site survey which is carried out in the field shortly after the monsoon. This work is done in connection with the asset loss and income survey. In the third phase the site map is completed, the required number of plots is estimated and the plots are allocated to the chosen strata. The fourth phase involves establishing the plots on site. This work is planned for November-December.

First phase: Preliminary stratification

The purpose of this phase is to collect available information about the research site, to use this information to prepare a preliminary forest map, and to help us obtain a common notion about the characteristics of the site and the associated demands made on data collection.

Examining topographical maps and forest maps

A first step is to gather all existing maps of the area, including topographical maps and sketch maps included in operational plans. If the topographical map shows information about forest types it may be possible to draw a preliminary, vegetation-based stratum map. Similarly, if the forest map included in the operational plan distinguishes different production areas, these may form a partial basis for the preliminary stratification.

Examining aerial photographs and satellite images

Most topographical maps are to a large extent based on interpretation of aerial photographs. However, the aerial photograph may contain much more information than what is actually included in the map so details can be added by consulting aerial photographs and high-resolution satellite images.

Second phase: Site survey

The site survey is carried out when the preliminary stratification has been completed and the asset and income survey is conducted. The site survey in Gorkha includes four activities: (1) obtaining additional information about the history, present state and use of particular parts of the forest from the user group, (2) agreeing with the user group regarding practical implementation of the survey and employment of user group members for various tasks, (3) completing the forest map in collaboration with members of the user group (a participatory mapping exercise), and (4) taking a walk in or around easily accessible parts of the forest to validate and correct the stratification of the forest (a forest walk). In previous surveys a pilot survey was conducted as a fifth activity but in Gorkha we will skip this activity to save time. Decisions regarding total number of plots and their distribution to forest strata will be based

on assessment of the nature of the strata and experience from surveys at the other ComForM sites.

The participatory mapping exercise

A participatory map is prepared with users of the forest. The people involved in the exercise should include users from different community strata, i.e. executive committee members, relatively wealthy, relatively poor, women, DAGs. If possible and relevant, de facto users who are not members of the CFUG should also be included.

The purpose of preparing the participatory map is (i) to collect information for stratification of the forest, (ii) to collect information on what types of environmental resources are available to people, as well as (iii) to collect information on the different products collected in different parts of the forest and from other environmental resources by different users.

The participatory map is prepared on the basis of an aerial photograph or high-resolution satellite image. The preparation of the map should be carried out as follows:

1. Explain to participants the purpose of the exercise.
2. Familiarise participants with the photo: look at the aerial photograph and identify features such as rivers and roads, and then the village, the forest, and the venue of the meeting (and places where the earthquake/monsoon has caused major landslides).
3. Ask the participants to list major types of resources with the help of the photo (different types of farm land, pastures, different forest types and qualities, other). Make notes of these to remember them.
4. Let the participants draw a map showing the different features on transparent plastic sheets overlaid on the photo.
5. Let the participants list products and services provided by each resource and who obtains them.

(Requisites: topographical maps, aerial photographs, transparent sheets, white paper + markers)

The forest walk

The participatory mapping exercise hopefully gives an idea about the management of different parts of the forest and what products are extracted where. It should also yield some idea about the relevance of the strata distinguished in the preliminary stages. However, to get a real notion of the structure and use of the forest it is necessary to conduct a forest walk with members of the user group. In part, the participatory mapping exercise serves as a basis of deciding what parts of the forest to visit. To limit the time consumption, it may be decided to visit only the more accessible or important parts of the forests and to get an overview of other forest patches by watching them from suitable vantage points.

Stratification – second iteration

After the forest walk the stratification of the forest should be refined by including the information obtained in the participatory mapping exercise and the observations done in and around the forest. It is important to make sure that all the resulting strata are relevant, that differences between them can actually be observed in the field, and that each of them are

sufficiently homogeneous with respect to vegetation, management, de facto use, and biophysical conditions.

All strata are assumed to be of interest, meaning that a set of permanent sample plots will be established within each stratum. To appreciate the consequences of this, consider the following. To avoid extremely poor estimates, the number of permanent sample plots within a stratum should never be less than 4-5. On the other hand, we will generally be working with sampling intensities of less than 2-4%, in some cases even less than 1%, and unless a stratum is considered extremely important compared to other strata, the sampling intensity normally should not exceed 6-8% for any stratum. Consequently, defining strata smaller than 5 hectares should be avoided whenever possible (5 plots with an area of 20×25 m = 0.05 ha each correspond to a sampling intensity of 100% × 5×0.05 ha / 5 ha = 5%). Given the fragmented nature of the forest in Gorkha, this may mean that some strata need to be defined such that they include forest area in more than one fragment.

Third phase: Survey planning

Based on the data gathered in the site survey the forest map is completed. The map includes the base map (a topographical map) and other available maps, the results of the preliminary stratification, and the land use observed in the field (forest walk) after having obtained additional information from the user group. Based on this map the final stratification, allocation of plots and planning of field work can be carried out.

Final stratification

The main idea of stratification is to distinguish significantly different parts of the area and allow us to sample each stratum separately. Stratification implies a number of advantages: (1) areas characterised by different land uses or management regimes can be examined separately, (2) it can be made sure that the state, growth and yield can be estimated with a reasonable (and predefined) precision for each land use category, and (3) for a given sampling effort forest-level estimates will reach a higher level of precision than without stratification. The last of these advantages increases with increasing difference between the applied strata.

The stratification process can be described as shown in Figure A3.1. Stage 0 shows the crude forest map with the village in the south-eastern corner and a river bordering the forest in the north-eastern corner. By considering the topography and perhaps information from the management plan (Stage 1) it emerges that certain parts of the forest area is located on steep slopes or near a creek and are considered protected although, most likely, they are to some extent used for collection of firewood, fodder and NTFPs. Therefore, two strata are formed. At Stage 3 information from aerial photographs, the management plan, the participatory mapping exercise and the forest walk is used to distinguish three vegetation types (Shrub and Forest type A and B). Finally, at Stage 3 three accessibility classes are defined, based on participatory mapping and forest walk. These accessibility classes indicate to what extent different parts of the forest are likely to be used for extraction of firewood, fodder and NTFPs. Overlaying the strata from previous stages with the accessibility classification yields a total of nine strata within which permanent sample plots must be established.

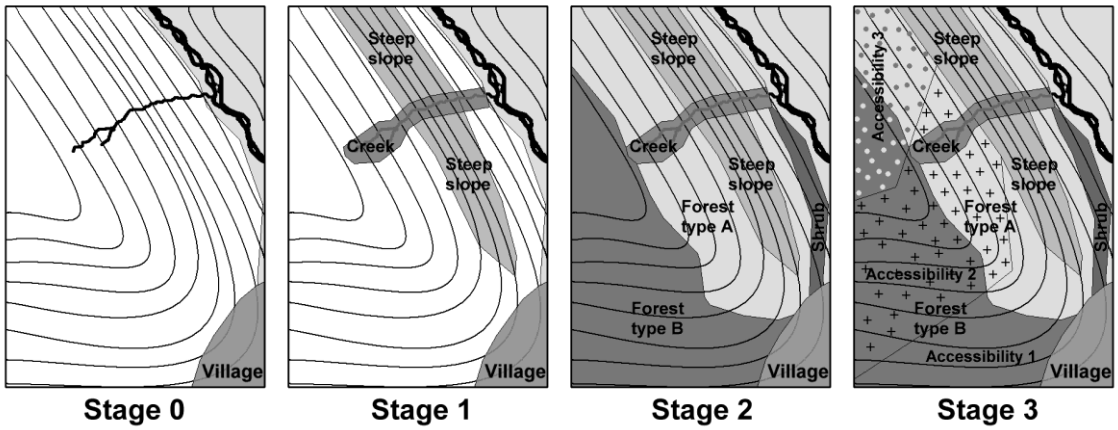

Figure A3.1 The stratification process. Stage 0: the forest map; Stage 1: including topographical information; Stage 2: including vegetation information; Stage 3: including observed management variation caused by differences with respect to accessibility.

Allocating and distributing plots

When allocating plots to strata it should be considered that each additional plot represents a considerable effort. Establishment of each plot may take several hours and follow-up measurements may also be quite time consuming. Moreover, it is expected that the plots will later be remeasured for many years. Therefore, each plot should be allocated to the stratum where it will be most useful, i.e. will lead to the greatest improvement of the statistical quality of estimates of forest state, productivity and yield. However, as plot allocation is carried out before the plots are established it is not realistic to base the allocation on dynamic properties of the forest. Consequently, the allocation will be based on the importance of each stratum as indicated by its area, the way it is used by the community and the assumed variation of stem density and basal area ('assumed' because a pilot study is not carried out). Practical considerations should also be taken into account. For example, it must be considered thoroughly how many plots can be established and maintained by the project without giving up important measurements within plots.

When the plots have been allocated to strata their spatial positions within the areas making up the strata must be determined. To avoid bias the points where plots should be located must be chosen using a randomization technique. However, as pure randomization may sometimes lead to a situation where all plots are located within a small part of the stratum, implying that the precision of estimates based on the sample will be low, a small program (ComForM-PlotDistrib.exe) was developed in 2005 and should be used to distribute plots. The program uses these sampling rules: (i) with certain limitations (see ii-iv) plots have the same probability of ending up at any position within a stratum; (ii) no matter the orientation of a plot (depends on slope, cf. Figure A3.3) the whole area of a plot must be located within the stratum; (iii) no plots can be closer to another plot than 20 metres; (iv) the sample design must be space filling so the minimum distance between plots should be maximised. The procedure used to meet these requirements leads to a design that Müller (2001:76) termed a 'Coffee-house' design, as it resembles the way that tables in coffee houses and cafes are selected by costumers. In practice an optimisation procedure is used that, for each plot, maximises the minimum distance to other, already existing plots. The main input needed by the program is a colour bitmap (BMP format) showing a map of the stratified forest (without any text or lines). All GIS software packages are capable of exporting bitmaps. Different colours must be used for each

stratum (white and black are not allowed) and the UTM ranges (minimum and maximum Easting and Northing) must be keyed in. Finally, the number of plots that should be established within each stratum must be keyed in. The program outputs the spatial coordinates of the plot centres. These may be imported in the GIS program used to manage maps and rectified aerial photographs and special thematic maps for use in the field can be prepared (Figure A3.2). The coordinates can also be exported to a GPS instrument for direct use in the field.

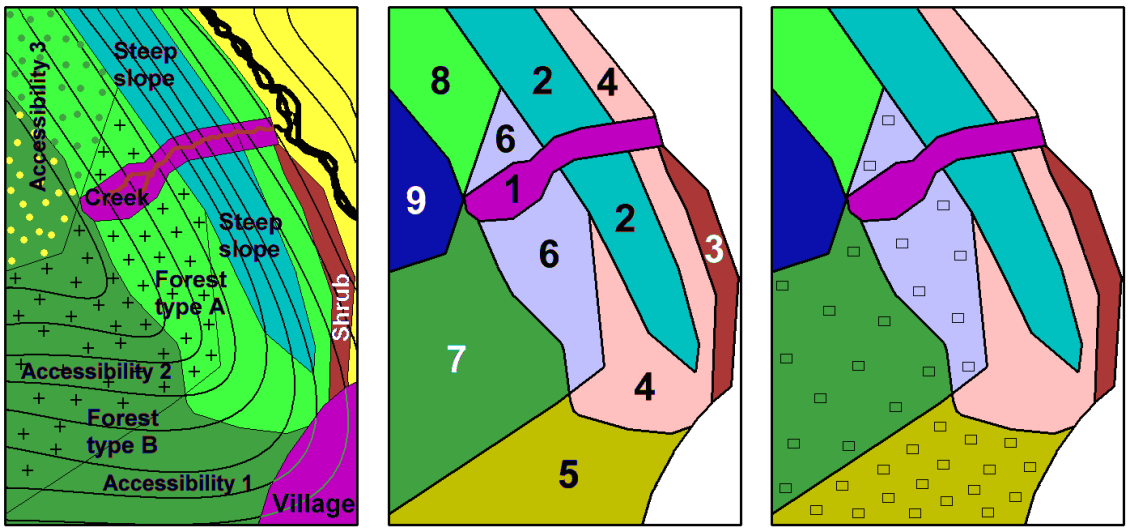

Figure A3.2 The plot distribution process: Left: The original map with the strata from Figure A3.1. Centre: The stratum layer with separate colours for each stratum. Right: Plots are distributed within three of the strata.

Preparing for field work

Before going to the field to establish plots, the work must be carefully planned. A sufficient number of field teams should be formed (faculty members, students and FUG members), instruments and materials should be procured, responsibilities should be delegated, field work should be scheduled, appointments should be made with the user group, forms for recording field data should be photocopied and maps should be printed.

Each field team should have 3-4 members, one of whom must be a person that ideally knows the details of the ComForM Long-term study, has read this research manual thoroughly and brings along a copy of the manual to the site. Preferably, this person has previously participated in the fieldwork at another ComForM site. Ideally the number of members of each team should be four, e.g. one IOF faculty member (team leader), one IOF student and two FUG members hired at the site. Alternatively, a team could include one IOF faculty member, two IOF students and one local FUG member. Finally, if it turns out that it is impossible for enough IOF faculty members to leave for a sufficient period of time, the team leader may be an IOF student that has previously participated in the work and satisfies the requirements stated above.

Fourth phase: Plot establishment

To establish a plot a number of tasks must be completed: (1) The location of the plot must be found in the field, (2) the boundaries of the plot must be measured and marked exactly, (3) plot characteristics must be measured and recorded, (4) the trees must be marked, mapped and measured, and (5) a range of different measurements must be done for individual trees

and stumps. In surveys at the other ComForM sites a range of additional measurements were done but in this case we will limit the work to the elements mentioned. In the sections below it is described in detail how to undertake the tasks. For a team of 4 persons the plot establishment work is expected to take 1-3 hours per plot.

Locating plots in the field

Before the field work starts the number of plots has been decided and the plots have been allocated to strata and distributed on the map (Third Phase). The result is a list of geographical coordinates where plots must be established. To find the points corresponding to these coordinates in the field a GPS instrument should be used. However, as this is often difficult in closed forest in mountainous terrain, a low level of precision can be expected. This should not be considered a major problem as the de facto points will, in a general sense, be random. After having established the plots, however, their spatial location must be estimated with a higher level of precision. If a GPS instrument is not available or the use of it proves difficult at the time of plot establishment, the plots may be located in two steps. First the coordinates of a well-defined landmark are found using a map or the GPS instrument; next the distance and direction to the position of the permanent sample plot is estimated and this point is found using a compass and a tape measure. In steep terrain the average slope should be estimated and the distance corrected using the correction factors listed in the attached table.

If it emerges that a plot is located in a place where it cannot be established, e.g. on an extremely steep slope or in a landslide area, the plot should be shifted as follows. A list of random numbers within the range [1…360] has been prepared and is attached. Choose a random number in the list and cross it out (it should only be used this once). Use a compass to find the direction in the field corresponding to the random number. If walking in the random direction is feasible, establish the plot 50 metres away in the chosen direction; if not, look up the random number to the right of the previous one, strike it out in the list and check if establishing the plot 50 metres away in this direction is possible. If walking in the chosen direction is possible but a plot cannot be established 50 metres away, try 100 metres away instead. The final location of the plot must be estimated afterwards using the GPS instrument.

Establishing and marking plots

Generally, the short side (20 m) of the plots should follow the terrain gradient, i.e. up/down the slope, and the long side (25 m) should lie across the slope, see Figure A3.3. However, in flat terrain the long side (25 m) should be oriented north-south.

When the location of the plot has been identified, mark the first corner with a rod painted with red/yellow paint, a stick with a flag or a colourful piece of cloth wrapped around it. Consider this corner as the lowermost left- or right-hand corner.

Establish the plot using the following procedure (cf. Figure A3.4). Estimate the direction of steepest slope and lay out a tape in this direction up the hill. Estimate the slope angle using a clinometer. This is done by sighting from the top of a pole at the first corner to the top of an equally long pole at the assumed location of the second corner. Look up the slope correction in the attached slope correction table and mark the second corner at a distance that corresponds to a horizontal distance of 20 metres. If there is no visible slope, lay out the tape in a westerly direction using a compass and mark the second corner 20 metres from the first corner.

Use a compass to measure the bearing between the second and the first corner and establish the second side of the plot in a direction perpendicular to the first side (use the compass). Mark the preliminary location of the third corner at a distance of 25 m. As the precision of bearings measured with an ordinary compass is low, the exact location of the third corner must be validated by measuring the diagonal. Look up the appropriate diagonal distance in the slope correction table. When the length of the second side is exactly 25 m and the length of the diagonal is correct, mark the third corner with a rod. Note that finding this point may require moving back and forth the tapes a few times. Use the compass to lay out the tape in a direction perpendicular to the second side (downhill). Mark the preliminary location of the fourth corner at the distance corresponding to a horizontal distance of 20 m according to the slope correction table. The exact location of the fourth corner must be validated by measuring the distance back to the first corner and, if necessary, by measuring the slope-corrected diagonal back to the second corner. When the distance back to the first corner is exactly 25 m and the distance back to the third corner is correct according to the slope correction table, mark the fourth corner with a rod.

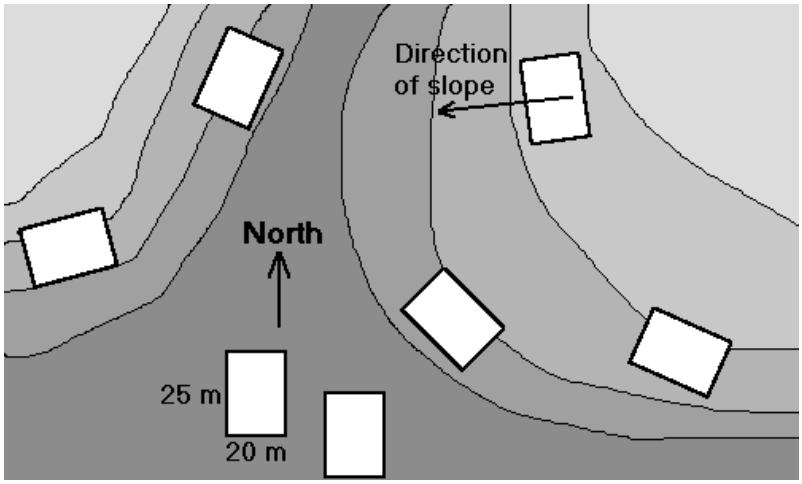

Figure A3.3 How to decide on plot orientation when establishing plots.

Now mark the points located 5, 10, 15 and 20 metres from the first and second corners along the long sides and the points located at horizontal distances of 5, 10 and 15 metres from the first and third/fourth corners along the short sides (slope-corrected distances in the attached slope correction table). The marks along the short sides will be needed when mapping the trees so use sticks or pegs with flags or paint, making them visible even at some distance.

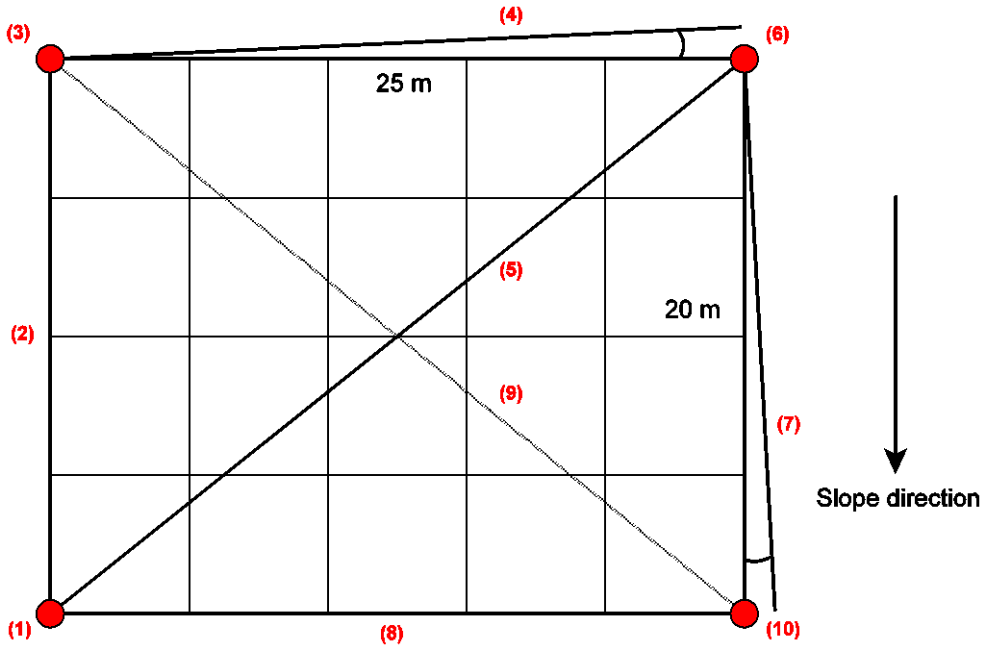

Figure A3.4 How to establish plots; numbers in parentheses indicate sequence.

To make the plots 'permanent' they must be marked permanently in the field, see Figure A3.5. However, as poles, metal rods, pipes or similar valuable objects may 'tend to disappear' it must considered carefully whether this is likely to happen at the particular site before any such objects are purchased and used. As a low-cost solution it may be considered whether it is feasible to put a 24 inches long L-shaped, 4×5 inches thick concrete pillar in the centre of each plot. Instead of poles, rods or pipes, ordinary football-sized stones may be used at the corners. In this case it is a good idea to dig a small hollow in the soil immediately outside the corner and place the stone there. Paint an arrow that points towards the point where the true corner is located and the corner pole should be put when the plot is visited the next time. However, no matter what object is used for marking a corner there is always a risk that it will be moved or removed. Therefore, from each corner the distances to at least 3-4 trees should be measured. The trees should be distributed around the corners. Trees inside the plot will be marked with numbers and trees outside the plot should be marked with letters to avoid confusion. In addition, trees outside the plot should be marked with a painted dot on the side of the tree facing towards the corner (see Fig. A3.5). To further improve the visibility of plot corners, even at some distance, little tags of shiny/colourful but worthless material (tinplate, sheet metal) may be attached to those trees that are closest to each of the plot corners, 3-4 metres above ground. These tags should be marked with plot number.

The diameter of the trees outside the corners and their distances to the nearest corner must be shown in a Plot Layout Sketch (attached) which should always be prepared when establishing a plot. Besides showing the location of such trees the Plot Layout Sketch must indicate the geographical orientation of the plot, the lengths of plot sides and diagonals and the slope direction. In addition, easily recognizable landmarks should be marked on the Plot Layout Sketch and distances and compass bearings indicated. Thus, when a field team visits a site, e.g. the following year, these sketches may help them to find their way to the plots.

Trees inside the plot that are so large that their breast height diameter is measured (cf. Table A3.2) are marked with their tree number and to increase the precision of measurements the

level where the diameter should be measured is marked by a painted horizontal line on the stem, see Figure A3.5.

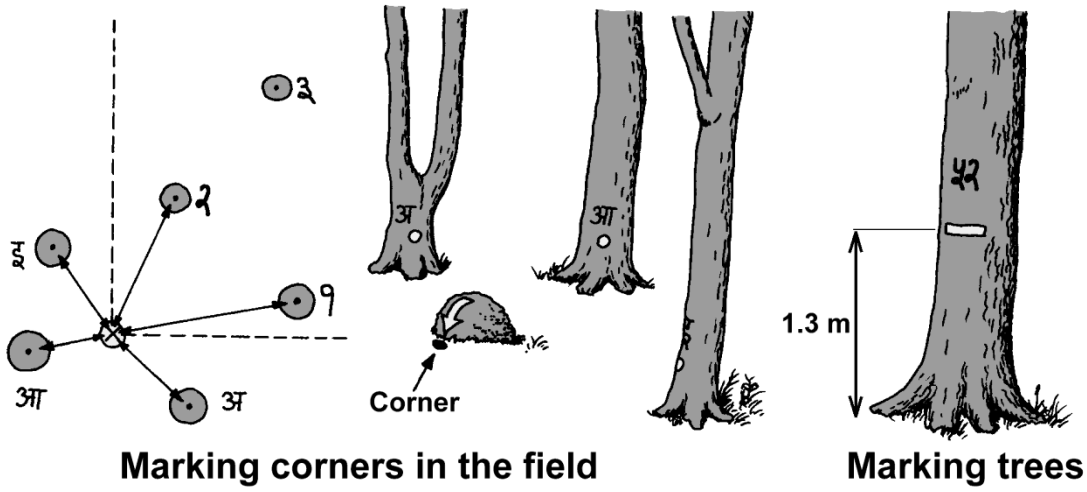

Figure A3.5 How to mark plot corners permanently (without valuable materials) and how to mark trees within plots.

Measuring plot characteristics

For each plot a set of information must be recorded that describes the basic conditions within the plot. This information is needed for a wide range of analyses, for example when analysing the distribution and growth of various species. Variables that should be measured for each plot are listed in Table A3.1. Note that assessment of soil colour should be done in the laboratory by comparing with standard colour classification tables, implying that a small, appropriately packed and labelled soil sample must be brought back from each plot. The rest of the variables can be assessed in the field. Apart from the variables mentioned in Table A3.1 additional information on parent rock type, climate and changes in land use should be obtained from secondary sources, either before or after plot establishment.

Table A3.1 Variables that should be recorded for each permanent plot. Decision about variables listed under the heading 'Optional variables' will be made in the field.

Variable	Explanation
Vegetation type	Categories. We use the forest types defined by TISC (2002). Examples: Hill Sal Forest, Chir Pine Forest.
Altitude	Height above sea level. Measured using: Topographical map, GPS instrument or altimeter.
Aspect	Direction of slope. Measured using a compass
Slope	Average slope of the terrain within the plot (in that direction where it is steepest). Measured with a clinometer or a level and two tapes

Forest stratum	A short but descriptive name of the stratum within which the plot is located
Key words on forest structure	<u>Descriptive key words on forest and terrain within and around the plot:</u> These may include: *Present state*: Categories such as regeneration, pole stage, mature, uneven-aged. Based on visual assessment. *Forest structure*: Describe the number of canopy storeys that can be distinguished within the plot (1, 2, 3, many) and their character. Based on visual assessment *Forest density*: Use categories such as temporary clearing, landslide area, open canopy, closed canopy, dense canopy. Based on visual assessment. *Forest management and disturbance*: Use key words such as: recently thinned, heavily lopped, heavily grazed, no traces of use, untouched, casually managed, degraded, heavily degraded, etc. Based on visual assessment. *History*: Use categories such as: primary forest, secondary forest, forest plantation, afforestation on former agricultural land
Optional variables	
Litter layer	Categories: none, 0-2 cm, 2-5 cm, 5-10 cm, 10-15 cm, >15 cm. Visual assessment
Soil texture	Categories: coarse sand or gravel, sandy, intermediate, clayey, very clayey. Use a scoop, a spade or a knife to take a small sample of soil immediately below the top soil. Take it in your hands and assess the texture by rubbing it between your fingers.
Soil colour	A sample of soil is brought back to the laboratory and compared to a standard soil colour classification table.
Key words on soil properties	<u>Descriptive key words on characteristics of the soil:</u> *Depth of soil*: Use categories such as solid rock, stony, very shallow, shallow, medium, deep. Based on visual assessment. *Water supply*: Use categories such as very wet, wet, intermediate, dry, very dry. Based on visual assessment

Mapping the trees

The spatial position of trees is measured as illustrated in Figure A3.6 and the work proceeds as follows. Each 20×25 m plot can be thought of as four parallel 25 m long and 5 m wide strip transects (for slope corrections, see the attached table). Tapes are laid out along both sides of the first transect. Note that although the slope may vary from one side of the 20×25 m plot to the other, we generally use the estimated average slope for correction of the distance measurements (table attached). Thereby, the two dimensions of the coordinate system are treated in the same way (we also assume that the x axis (long side of the plot) is horizontal everywhere within the plot). Note that no attempt should be made to correct the distance measurements in the field! As long as the transect number and the distance measurements are taken down consistently, the coordinates of the trees can always be calculated once the data have been entered in the database.

The measurements start in the lowermost, left-hand corner (0,0 in the local coordinate system). One team member is positioned at the tape, another measures the distance from the tape to the centre of each tree (see Fig. A3.6). The former team member makes sure that all measurements are at right angles to the long side of the transect. A third team member records the distances measured along the side of the transect and from the side of the transect to the centre of the tree. Note that if the terrain slope is significant, the distances to some of the trees may be considerably more than 5 metres. Again, to avoid miscalculations the distances to the trees must be recorded as measured, i.e. without slope correction; slope correction is done once the measurements have been entered in the database.

When all trees within the first transect have been measured, the tape at the long side of the transect is moved to the next 5 m wide transect and the measurements proceed as above. Note that when working in Transects 1 and 4 only trees with dbh≥10 cm should be mapped. The same applies to the first and last 5×5 m subplot in Transects 2 and 3 whereas in subplots B2, C2, D2 and B3, C3 and D3, all trees with dbh≥4 cm should be mapped (see Fig. A3.7 and Table A3.2).

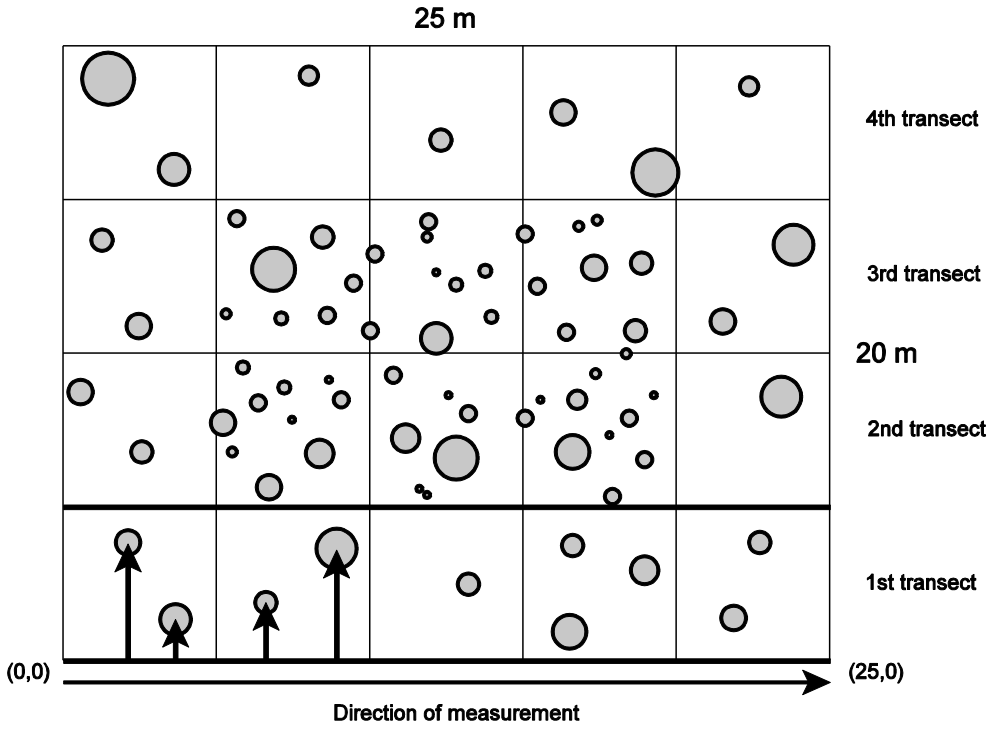

Figure A3.6 Mapping the trees using a local coordinate system and four 5 m wide strip transects.

Mapping the trees within each plot is expected to increase the range of different analyses that the data can be used for. In addition, it reduces the risk of not being able to associate future measurements with the right trees (painted number may not be visible after a few years). Using the stem coordinates, stem maps are prepared, printed out and brought along on later field visits. A small program has been developed for preparation of such maps (ComForM-PlotMaps.exe). An example is shown in Figure A3.7.

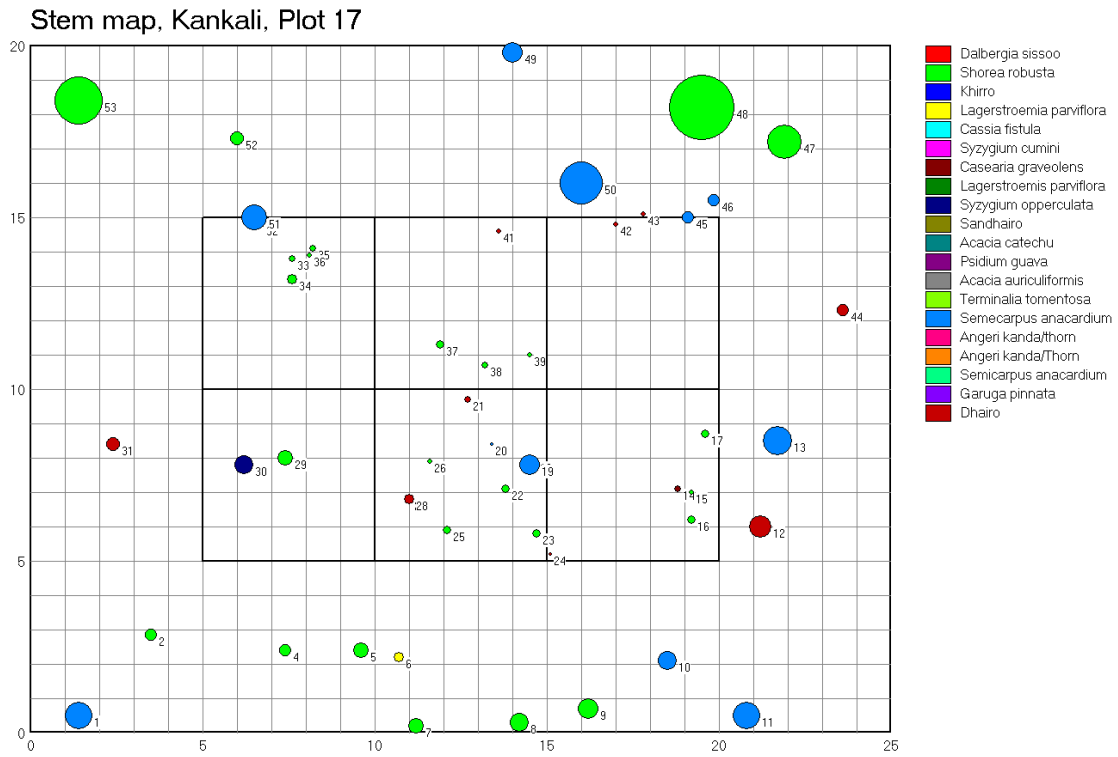

Figure A3.7 Stem map. Example from Kankali CF, Plot 17, at a stage when species identification was not yet completed. The diameter of the bubbles is proportional to stem diameter.

Species identification

Ideally all tree species should be identified at the time of plot establishment so that the correct scientific species name of each tree can be recorded and entered in the database. However, as this is not always possible in practice, preliminary names may be recorded at plot establishment. These may be local names or just species numbers (Sp.1, Sp.2, etc.). Later, a follow-up visit can be made to identify all unidentified species and check that the species recorded during the first visit are correct. In the ComForM programme it turned out to be necessary to carry out species identification as a separate activity. In this post-earthquake survey a different approach will be used to avoid the need of revisiting the plots within the coming year. Trees that cannot be identified reliably while in the field will be identified by their local name. In addition, as much as five-six photographs should be taken, showing the whole tree, the branching pattern, both sides of the leaves, inflorescences and fruit (if present). In addition it should be considered to collect samples for herbarium identification.

Measurements within plots

Trees and other plants of different size occur with different densities. For example if the basal area of a forest is 20 m2ha-1 and all trees have a diameter of 30 cm at breast height, then the stem number is 282.9 ha-1, but if the diameter of the trees is only 10 cm, the stem number is 2546.5 ha-1. Consequently, if the same plot size is used for all types of trees/plants, the effort involved when measuring small individuals becomes tremendous. However, the precision of the estimates obtained at the stand level does not increase at the same rate so using plots of the same size for trees of all sizes is not efficient. Therefore, in the ComForM forest surveys trees of different sizes, shrubs and herbs were measured within nested plots (see Figure A3.8).

For an overview of the required recordings in the survey in Gorkha, refer to Table A3.2. The chosen plot sizes are based on the principles used in MFSC (2000) and numerical considerations as exemplified above.

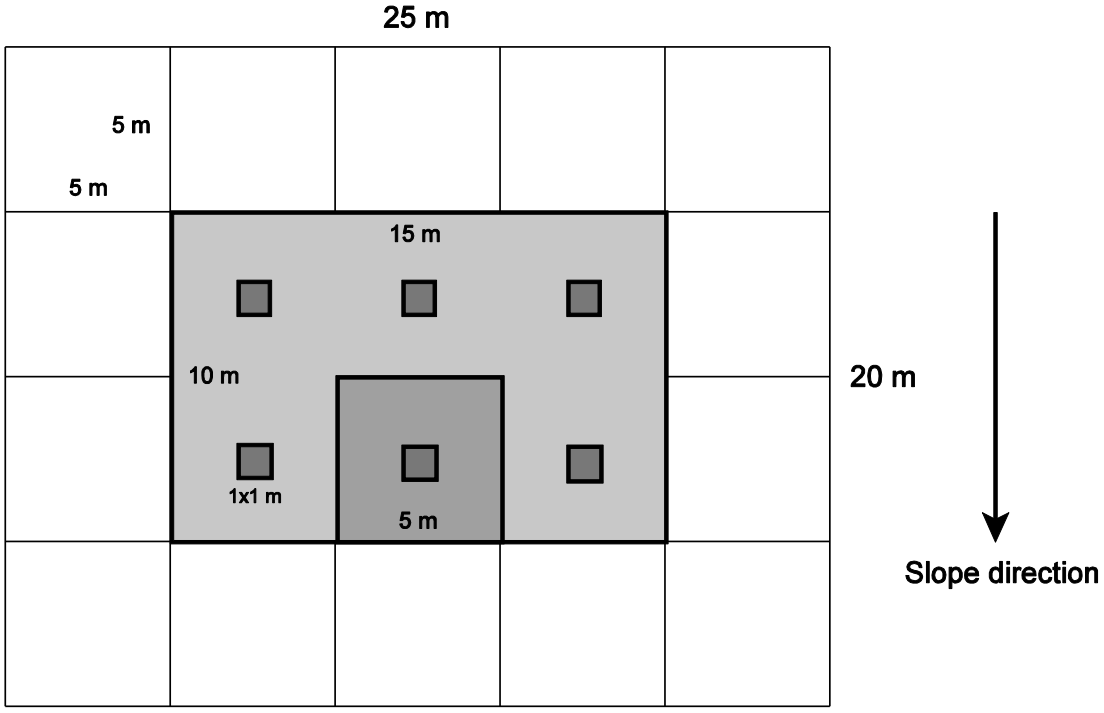

Figure A3.8 Plot structure used in the ComForM long-term study. NB: 5×5 and 1×1 m squares are not used in the post-earthquake survey.

Table A3.2 Where to measure, count and record presence for different tree sizes.

		Plot size			
	DBH	20 × 25 m	10 × 15 m	5 × 5 m	1 × 1 m
Trees	≥ 10 cm	Measure†			
Trees	4.0 – 9.9 cm		Measure†		
Stumps	≥ 10 cm	Measure‡			
Stumps	4.0 – 9.9 cm		Measure‡		

† These trees are numbered and marked with yellow enamel paint

‡ Stumps are mapped but not marked in the field

Measuring trees

Within the 20×25 m plot trees with diameter ≥10 cm are measured. Within the interior 10×15 m plot trees with diameter ≥4 cm are measured. Measurements include the spatial position (x,y coordinates) and breast height diameter of all trees and the total height for a sample of trees, see below. In addition, bole length is measured on all those trees for which total tree height is also measured. This should not require much additional effort. Finally crown class, tree quality and health state are assessed. These assessments are done visually for all numbered trees within the plots. In the ComForM forest surveys tree heights, bole length, crown class, tree quality and health state were not measured at the time of plot establishment but almost a year later. This allowed us to select the trees using stratification across species and diameter classes. In the Gorkha survey we will need to carry out the measurements at the same time and the selection of sample trees will therefore be based on a simpler procedure.

The basic measure of tree size is breast height diameter. This measure is recorded for all trees according to the rules described above. Note that for stems with irregularities measurements are done according to the principles illustrated in Figure A3.9. For stems that fork from the ground each individual stem is measured separately but to indicate that they share a common root they are numbered by adding a letter suffix, e.g. stems 12a and 12b are both part of tree number 12. In data sheets and databases a field is reserved for this suffix. As indicated in Figure A3.5 tree numbers are painted on the trees. In addition, to minimise measurement errors the point of measurement 1.3 m above ground is marked with a painted horizontal line. For large trees the point of measurement should be marked on both sides of the tree. Care should be taken to make sure that the diameter is measured exactly at the indicated measurement point.

Based on the enumeration of trees within plots of different sizes stem numbers can be estimated for all tree categories. Similarly, the diameter measurements form the basis of stand basal area estimates for all species and size classes. To estimate volume or biomass measurements of total height are needed. However, as height measurements are time consuming they will only be carried out for a smaller sample of trees. The applied stratification of the forest is assumed to reflect management as well as growth conditions. Therefore, for each species and stratum we will need a separate sample of height measurements. However, for species of little significance it may be decided not to measure height. To allow us to prepare a decent regression of height on diameter for each species we will need a sample of at least 30 trees per (common) species and stratum. This sample should be distributed evenly across the permanent sample plots. When the species and diameter has been recorded for all trees within the plots allocated to a certain stratum, the number of trees per species and plot is examined and the number of sample trees for height measurement is decided for each plot and species. Note that the sample should be distributed in such a way that for each species roughly the same sampling fraction is used in all permanent plots. To illustrate the procedure an example is given in Table A3.3. The planned sampling fraction is the ratio of the planned number of sample trees to the total number of trees, e.g. for Castanopsis indica the planned sampling fraction is 30/143 = 0.2098.

Within each plot and species the sample trees must be selected randomly. This is easily done on the computer as soon as tree diameters and species have been entered in the database but if this has not been done yet, the attached table of random numbers can be used. For example, if the observed number of Shorea robusta trees within a plot is 27 and it has been decided to select 5 trees for height measurement, one may select a random tree number for

the first height measurement; the rest of the sample trees can be selected systematically as every fifth tree, e.g. if the random tree number is 9, the remaining four trees will be tree number 14, 19, 24, and 2 (as 29 does not exist). As far as possible the same trees should be measured in the future and when one of them is removed in a thinning a new random tree of the same species should be selected. By collecting repeated height measurements the best possible basis of height growth modelling is provided.

Measuring stumps

Stumps may be dead or alive. In Mustang deadwood measurements were conducted in 2006, 2010 and 2013, but in Gorkha the purpose of measuring and classifying stumps is to make up for the fact that plots were not established before the earthquake, implying that measuring stumps is the only possible way to measure recent extraction.

If a stump is taller than 1.3 m it is measured in the same way as dead standing trees (Table A3.2). If it is less than 1.3 m tall the diameter is measured as close as possible to the top. In addition the height is measured. The state of the stump (dead, alive, with sprouts, etc.) is recorded and an assessment of its approximate age is made. In this assessment the following categories are used: 'less than one year old', '1-2 years old', '3-5 years old', 'at least 6 years old'.

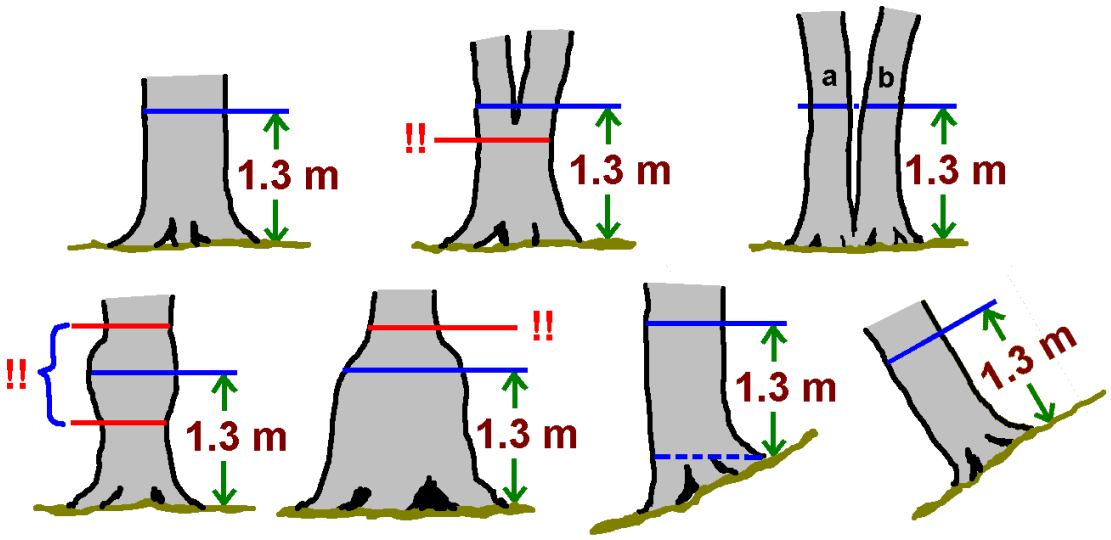

Figure A3.9 Measuring the breast height diameter of irregular tree stems.

Table A3.3 Example illustrating how to distribute height measurements to species and plots within a stratum.

Number of trees observed within each plot							
Species \ Plot	1	2	3	4	5	6	Total
Castanopsis indica	27	23	35	12	20	26	143
Schima wallichii	22	29	13	41	18	22	145
Syzygium venosum	4	9	12	3	4	11	43
Number of trees selected for height measurements							
Species \ Plot	1	2	3	4	5	6	Total
Castanopsis indica	6	5	7	3	4	5	30
Schima wallichii	5	6	3	7	4	5	30
Syzygium venosum	3	6	8	2	3	8	30
Sampling fraction for each of the plots and species							
Species \ Plot	1	2	3	4	5	6	Planned
Castanopsis indica	0.22	0.22	0.20	0.25	0.20	0.19	0.2098
Schima wallichii	0.23	0.21	0.23	0.17	0.22	0.23	0.2069
Syzygium venosum	0.75	0.67	0.67	0.67	0.75	0.73	0.6977

Height estimation in sloping terrain

Depending on the height of trees, tree heights (and bole lengths) are measured in two different ways. For trees with a height of less than 5 metres we measure the total height directly using a 3 m long bamboo stick (or similar) with 10 cm graduation. For trees that are taller than 5 metres a point is sought from which both the true top and the foot of the tree can be seen. Observations taken at very steep angles are likely to lead to large estimation errors so this point must be at least as far from the tree as the height of it. Leaning trees should be measured from a direction perpendicular to the direction of inclination. The distance from the observation point to the point above which the tree top is found (in practice, usually the centre of the stem) is measured and the angles between horizontal and the top of the tree (angle t) and between horizontal and the foot of the tree (angle f) are measured with a clinometer. Depending on the type of clinometer, readings may be either in degrees or in per cent of distance. Clinometer readings, including their sign, are recorded and, provided that the measured distance (S) is the horizontal distance, tree height (H) can be estimated as:

$$\mathrm{H} = \mathrm{S} \times (\tan(\mathrm{t}) - \tan(\mathrm{f}))$$

If clinometer readings are in per cent, they are actually equal to 100% × tan() so in this case height is calculated as:

$$\mathrm{H} = \mathrm{S} \times (\text{reading top} - \text{reading foot})/100\%$$

However, although it is in principle possible to measure every tree from a point that is located roughly at the same elevation as the foot of the tree, this may prove very difficult in steeply sloping terrain. Consequently, on steep slopes the distance measured between the tree and the observation point will rarely be the horizontal distance and the above formulas no longer apply. The problem is illustrated in Figure A3.10 and as will appear from the sketch, steep slopes may lead to a considerable difference between horizontal distance D and measured distance S. In sloping terrain the horizontal distance is:

$$\mathrm{D} = \mathrm{S} \times \sqrt{1/\left(1 + \tan^2(\mathrm{a})\right)}$$

where a is the slope angle of the terrain. Consequently, tree height can generally be estimated as:

$$\mathrm{H} = \mathrm{S} \times (\tan(\mathrm{t}) - \tan(\mathrm{f})) \times \sqrt{1/\left(1 + \tan^2(\mathrm{a})\right)}$$

As will appear from Figure A3.11 the error arising from using the simple formulas above is negligible for slope angles less than 10-20 degrees but in steeper terrain the overestimation becomes considerable.

In practice, the slope angle of the terrain is not measured and therefore has to be estimated using the measured angles to the top (t) and foot (f) of the tree, the measured distance (S) and the height (above ground) at which the clinometer readings were taken (h), i.e. a bit less than the height of the operator. The slope angle (a) can be found by solving:

$$\tan(\mathrm{a}) = \frac{-2\mathrm{S}^2 \tan(\mathrm{f}) - \sqrt{(2\mathrm{S}^2\tan(\mathrm{f}))^2 - 4(\mathrm{h}^2 - \mathrm{S}^2)(\mathrm{h}^2 - \mathrm{S}^2\tan^2(\mathrm{f}))}}{2(\mathrm{h}^2 - \mathrm{S}^2)}$$

It should be noted that observation height (h) is not crucial, inasmuch as the height of people (i.e. the location of their eyes) usually varies within a relatively narrow range (1.4-1.9 metres), so a value of, e.g., h = 1.5-1.6 m may be used if the height of the operator is unknown.

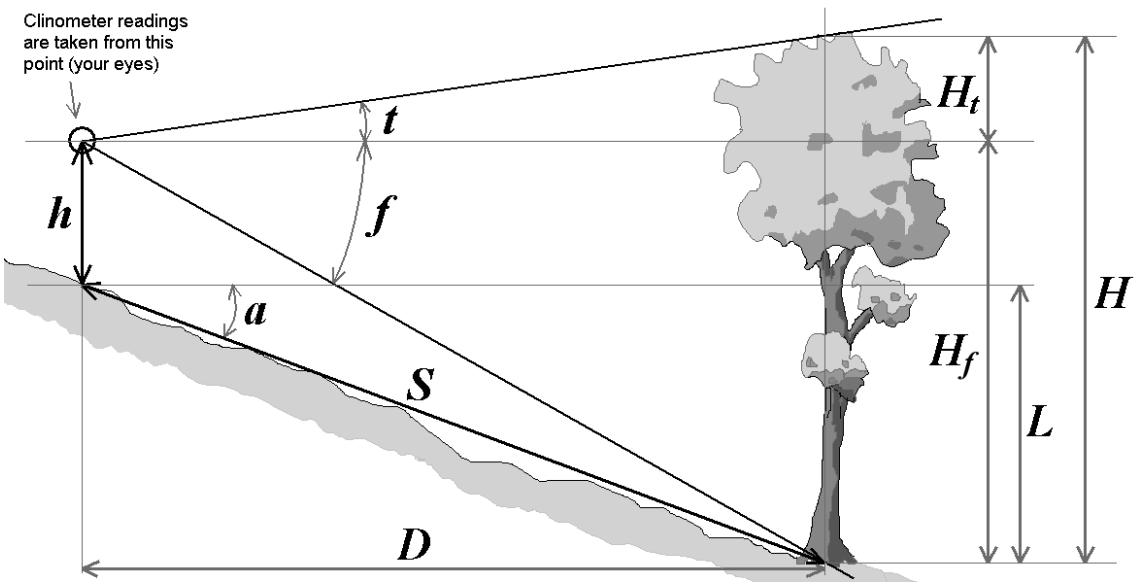

Figure A3.10 Symbols used in the text for estimation of tree height in sloping terrain.

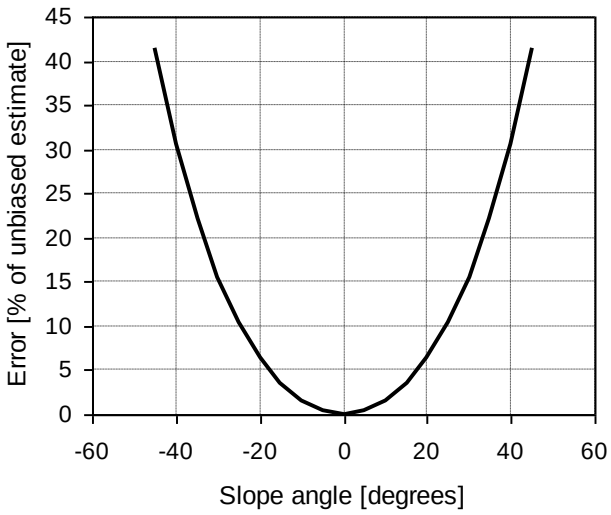

Figure A3.11 Estimation error (per cent) arising when using the formula H = S × (tan(t) – tan(f)) for estimating height (H) in sloping terrain (see Figure A3.10).

Form PI: Plot Information (terrain, soil, vegetation)

Form PI - Plot Information

Checked: Keyed: Proofread:

Date / /20

Site **Plot no.**

Measurements conducted by:

Team leader:

IOF faculty members

Students:

FUG members:

Easting [m] (UTM x coordinate)

Northing [m] (UTM y coordinate)

Altitude [m] (metres above sea level)

Terrain slope [degrees] ° (in the short-side direction)

Length of short side [0.01 m] . **Length of long side [0.01 m]** .

Length of diagonal [0.01 m] . (between first and third corner)

Aspect (compass direction) ° **Terrain aspect (code)**

Forest stratum

Forest type

Key words describing the forest and terrain within and around the plot:

Examples: Dense, open, scattered trees, poorly stocked, plantation, multi-storey, newly thinned, heavily lopped

Soil type

Soil description (key words):

Checklist:

- As far as possible the plot is established at the prescribed location (if not, specify in comments below)
- The true geographical location of the plot has been measured carefully, either by means of GPS or by thorough measurements of directions and distances to fixed landmarks (altimeter readings should also be included)
- The horizontal size of the plot is 20x25 m and the appropriate slope correction has been applied
- The plot has been marked permanently, distances from corners to trees outside the plot have been measured, these trees have been marked with paint and a sketch showing the plot and the surrounding trees has been prepared
- The forest structure is described above, by specifying stratum and forest type and by descriptive key words

Comments:

Examples: How to find the plot (if this is difficult), special corner marks used, various irregularities

Form PE: Plot establishment (tree mapping and DBH)

Form PE - Plot Establishment

Page no. of

Date / / 20

Checked: Keyed: Proofread:

Site **Plot no.**

Measurements conducted by:

Team leader:

IOF faculty members

Students:

FUG members:

Tree numbers, species, breast height diameters and spatial coordinates

Note that diameter must be measured in centimetres with one decimal (accuracy: millimetres)

Tree no.	Letter (a,b,...)	Species (Scientific name)	DBH [0.1 cm]	Transect [1...4]	Sub-plot [e.g. A1]	Along transect [0.1 m]	Across transect [0.1 m]
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Checklist:

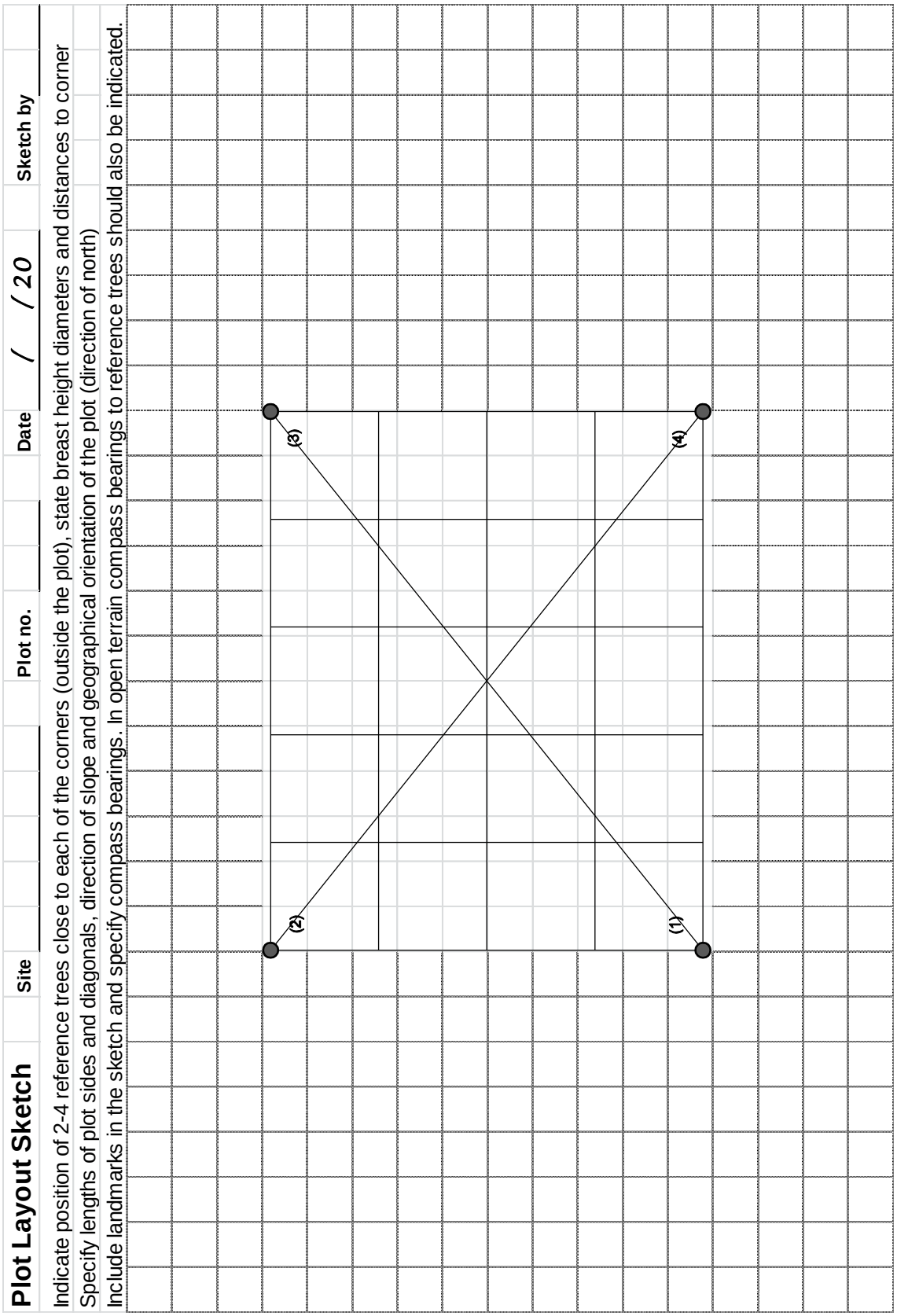
- As far as possible the plot is established at the prescribed location (if not, specify in comments below)
- The horizontal size of the plot is 20x25 m and the appropriate slope correction has been applied
- All trees with DBH ≥ 4.0 cm have been measured within the prescribed subplots
- The species of all measured trees with DBH ≥ 4.0 cm has been recorded (if not identified, specify 'Other')
- Scientific species names or abbreviations are used (except if only the local name is known)
- Tree numbers and points of measurement (1.3 m above ground) have been painted on all trees with DBH ≥ 4.0 cm
- When a tree has several stems (forks below 1.3 m) these are numbered individually using a letter suffix (e.g. 12a, 12b)

Species abbreviations:

Comments:

Examples: Remarks regarding specific trees, irregularities with respect to measurements, etc

Plot Layout Sketch (location of trees and landmarks)



Form TM: Tree Measurements (DBH 4.0-9.9 cm and ≥10 cm)

Form TM - Tree Measurements

Page no. _____ of _____

Date / /20 | Checked: | Keyed: | Proofread:

Site _____ **Plot no.** _____

Measurements conducted by:

Team leader:

IOF faculty members

Students:

FUG members:

Tree numbers, height measurements, stem and crown characteristics

Note that distances must be measured in metres with one decimal (accuracy of measurement: decimetres)

Tree no.	Distance [0.1 m]	Angle foot [per cent]	Angle bole end [per cent]	Angle tree top [per cent]	Crown class (code)	Tree quality (code)	Health state (code)
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Checklist:

- All distances are measured from the central part of the stem to a point vertically below the clinometer
- Clinometer readings are taken in per cent (if a clinometer without percentage scale is used and readings are in degrees this should be clearly indicated in the comments below
- As far as possible height measurements are done at a distance that is similar to or greater than the height of the tree, i.e. angles measured are less than 100% (45 degrees). Care has been taken to identify the top of each tree correctly
- The prescribed codes for crown class, bole quality and health state are used

Comments:

Form TR: Tree Remeasurements (DBH 4.0-9.9 and ≥10 cm)

Form TR - Tree Remeasurements

Page no. _____ of _____

Date / / 20 | Checked: | Keyed: | Proofread:

Site | **Visit no.** | **Plot no.**

Measurements conducted by:

Team leader:

IOF faculty members

Students:

FUG members:

Tree numbers, DBH and height measurements, stem and crown characteristics

Note that (1) distances must be measured in metres with one decimal (accuracy of measurement: decimetres)
(2) Breast height diameters must be measured in centimetres with one decimal (accuracy: millimetres)

Tree no.	DBH [0.1 cm]	Distance [0.1 m]	Angle foot [per cent]	Angle bole end [per cent]	Angle tree top [per cent]	Crown class (code)	Tree qual. (code)	Health (code)
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Checklist:

- All distances are measured from the central part of the stem to a point vertically below the clinometer
- Clinometer readings are taken in per cent (if a clinometer without percentage scale is used and readings are in degrees this should be clearly indicated in the comments below
- As far as possible height measurements are done at a distance that is similar to or greater than the height of the tree, i.e. angles measured are less than 100% (45 degrees). Care has been taken to identify the top of each tree correctly
- The prescribed codes for crown class, bole quality and health state are used

Comments:

Supplementary materials

Conversion: girth ↔ diameter, inches ↔ centimetres

Girth		Diameter		Girth		Diameter		Girth		Diameter	
[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]
0.2	0.5	0.1	0.2	10.2	25.9	3.2	8.2	20.2	51.3	6.4	16.3
0.4	1.0	0.1	0.3	10.4	26.4	3.3	8.4	20.4	51.8	6.5	16.5
0.6	1.5	0.2	0.5	10.6	26.9	3.4	8.6	20.6	52.3	6.6	16.7
0.8	2.0	0.3	0.6	10.8	27.4	3.4	8.7	20.8	52.8	6.6	16.8
1.0	2.5	0.3	0.8	11.0	27.9	3.5	8.9	21.0	53.3	6.7	17.0
1.2	3.0	0.4	1.0	11.2	28.4	3.6	9.1	21.2	53.8	6.7	17.1
1.4	3.6	0.4	1.1	11.4	29.0	3.6	9.2	21.4	54.4	6.8	17.3
1.6	4.1	0.5	1.3	11.6	29.5	3.7	9.4	21.6	54.9	6.9	17.5
1.8	4.6	0.6	1.5	11.8	30.0	3.8	9.5	21.8	55.4	6.9	17.6
2.0	5.1	0.6	1.6	12.0	30.5	3.8	9.7	22.0	55.9	7.0	17.8
2.2	5.6	0.7	1.8	12.2	31.0	3.9	9.9	22.2	56.4	7.1	17.9
2.4	6.1	0.8	1.9	12.4	31.5	3.9	10.0	22.4	56.9	7.1	18.1
2.6	6.6	0.8	2.1	12.6	32.0	4.0	10.2	22.6	57.4	7.2	18.3
2.8	7.1	0.9	2.3	12.8	32.5	4.1	10.3	22.8	57.9	7.3	18.4
3.0	7.6	1.0	2.4	13.0	33.0	4.1	10.5	23.0	58.4	7.3	18.6
3.2	8.1	1.0	2.6	13.2	33.5	4.2	10.7	23.2	58.9	7.4	18.8
3.4	8.6	1.1	2.7	13.4	34.0	4.3	10.8	23.4	59.4	7.4	18.9
3.6	9.1	1.1	2.9	13.6	34.5	4.3	11.0	23.6	59.9	7.5	19.1
3.8	9.7	1.2	3.1	13.8	35.1	4.4	11.2	23.8	60.5	7.6	19.2
4.0	10.2	1.3	3.2	14.0	35.6	4.5	11.3	24.0	61.0	7.6	19.4
4.2	10.7	1.3	3.4	14.2	36.1	4.5	11.5	24.2	61.5	7.7	19.6
4.4	11.2	1.4	3.6	14.4	36.6	4.6	11.6	24.4	62.0	7.8	19.7
4.6	11.7	1.5	3.7	14.6	37.1	4.6	11.8	24.6	62.5	7.8	19.9
4.8	12.2	1.5	3.9	14.8	37.6	4.7	12.0	24.8	63.0	7.9	20.1
5.0	12.7	1.6	4.0	15.0	38.1	4.8	12.1	25.0	63.5	8.0	20.2
5.2	13.2	1.7	4.2	15.2	38.6	4.8	12.3	25.2	64.0	8.0	20.4
5.4	13.7	1.7	4.4	15.4	39.1	4.9	12.5	25.4	64.5	8.1	20.5
5.6	14.2	1.8	4.5	15.6	39.6	5.0	12.6	25.6	65.0	8.1	20.7
5.8	14.7	1.8	4.7	15.8	40.1	5.0	12.8	25.8	65.5	8.2	20.9
6.0	15.2	1.9	4.9	16.0	40.6	5.1	12.9	26.0	66.0	8.3	21.0
6.2	15.7	2.0	5.0	16.2	41.1	5.2	13.1	26.2	66.5	8.3	21.2
6.4	16.3	2.0	5.2	16.4	41.7	5.2	13.3	26.4	67.1	8.4	21.3
6.6	16.8	2.1	5.3	16.6	42.2	5.3	13.4	26.6	67.6	8.5	21.5
6.8	17.3	2.2	5.5	16.8	42.7	5.3	13.6	26.8	68.1	8.5	21.7
7.0	17.8	2.2	5.7	17.0	43.2	5.4	13.7	27.0	68.6	8.6	21.8
7.2	18.3	2.3	5.8	17.2	43.7	5.5	13.9	27.2	69.1	8.7	22.0
7.4	18.8	2.4	6.0	17.4	44.2	5.5	14.1	27.4	69.6	8.7	22.2
7.6	19.3	2.4	6.1	17.6	44.7	5.6	14.2	27.6	70.1	8.8	22.3
7.8	19.8	2.5	6.3	17.8	45.2	5.7	14.4	27.8	70.6	8.8	22.5
8.0	20.3	2.5	6.5	18.0	45.7	5.7	14.6	28.0	71.1	8.9	22.6
8.2	20.8	2.6	6.6	18.2	46.2	5.8	14.7	28.2	71.6	9.0	22.8
8.4	21.3	2.7	6.8	18.4	46.7	5.9	14.9	28.4	72.1	9.0	23.0
8.6	21.8	2.7	7.0	18.6	47.2	5.9	15.0	28.6	72.6	9.1	23.1
8.8	22.4	2.8	7.1	18.8	47.8	6.0	15.2	28.8	73.2	9.2	23.3
9.0	22.9	2.9	7.3	19.0	48.3	6.0	15.4	29.0	73.7	9.2	23.4
9.2	23.4	2.9	7.4	19.2	48.8	6.1	15.5	29.2	74.2	9.3	23.6
9.4	23.9	3.0	7.6	19.4	49.3	6.2	15.7	29.4	74.7	9.4	23.8
9.6	24.4	3.1	7.8	19.6	49.8	6.2	15.8	29.6	75.2	9.4	23.9
9.8	24.9	3.1	7.9	19.8	50.3	6.3	16.0	29.8	75.7	9.5	24.1
10.0	25.4	3.2	8.1	20.0	50.8	6.4	16.2	30.0	76.2	9.5	24.3

Conversion: girth ↔ diameter, inches ↔ centimetres, page 2

Girth		Diameter		Girth		Diameter		Girth		Diameter	
[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]
30.2	76.7	9.6	24.4	40.2	102.1	12.8	32.5	50.2	127.5	16.0	40.6
30.4	77.2	9.7	24.6	40.4	102.6	12.9	32.7	50.4	128.0	16.0	40.7
30.6	77.7	9.7	24.7	40.6	103.1	12.9	32.8	50.6	128.5	16.1	40.9
30.8	78.2	9.8	24.9	40.8	103.6	13.0	33.0	50.8	129.0	16.2	41.1
31.0	78.7	9.9	25.1	41.0	104.1	13.1	33.1	51.0	129.5	16.2	41.2
31.2	79.2	9.9	25.2	41.2	104.6	13.1	33.3	51.2	130.0	16.3	41.4
31.4	79.8	10.0	25.4	41.4	105.2	13.2	33.5	51.4	130.6	16.4	41.6
31.6	80.3	10.1	25.5	41.6	105.7	13.2	33.6	51.6	131.1	16.4	41.7
31.8	80.8	10.1	25.7	41.8	106.2	13.3	33.8	51.8	131.6	16.5	41.9
32.0	81.3	10.2	25.9	42.0	106.7	13.4	34.0	52.0	132.1	16.6	42.0
32.2	81.8	10.2	26.0	42.2	107.2	13.4	34.1	52.2	132.6	16.6	42.2
32.4	82.3	10.3	26.2	42.4	107.7	13.5	34.3	52.4	133.1	16.7	42.4
32.6	82.8	10.4	26.4	42.6	108.2	13.6	34.4	52.6	133.6	16.7	42.5
32.8	83.3	10.4	26.5	42.8	108.7	13.6	34.6	52.8	134.1	16.8	42.7
33.0	83.8	10.5	26.7	43.0	109.2	13.7	34.8	53.0	134.6	16.9	42.9
33.2	84.3	10.6	26.8	43.2	109.7	13.8	34.9	53.2	135.1	16.9	43.0
33.4	84.8	10.6	27.0	43.4	110.2	13.8	35.1	53.4	135.6	17.0	43.2
33.6	85.3	10.7	27.2	43.6	110.7	13.9	35.3	53.6	136.1	17.1	43.3
33.8	85.9	10.8	27.3	43.8	111.3	13.9	35.4	53.8	136.7	17.1	43.5
34.0	86.4	10.8	27.5	44.0	111.8	14.0	35.6	54.0	137.2	17.2	43.7
34.2	86.9	10.9	27.7	44.2	112.3	14.1	35.7	54.2	137.7	17.3	43.8
34.4	87.4	10.9	27.8	44.4	112.8	14.1	35.9	54.4	138.2	17.3	44.0
34.6	87.9	11.0	28.0	44.6	113.3	14.2	36.1	54.6	138.7	17.4	44.1
34.8	88.4	11.1	28.1	44.8	113.8	14.3	36.2	54.8	139.2	17.4	44.3
35.0	88.9	11.1	28.3	45.0	114.3	14.3	36.4	55.0	139.7	17.5	44.5
35.2	89.4	11.2	28.5	45.2	114.8	14.4	36.5	55.2	140.2	17.6	44.6
35.4	89.9	11.3	28.6	45.4	115.3	14.5	36.7	55.4	140.7	17.6	44.8
35.6	90.4	11.3	28.8	45.6	115.8	14.5	36.9	55.6	141.2	17.7	45.0
35.8	90.9	11.4	28.9	45.8	116.3	14.6	37.0	55.8	141.7	17.8	45.1
36.0	91.4	11.5	29.1	46.0	116.8	14.6	37.2	56.0	142.2	17.8	45.3
36.2	91.9	11.5	29.3	46.2	117.3	14.7	37.4	56.2	142.7	17.9	45.4
36.4	92.5	11.6	29.4	46.4	117.9	14.8	37.5	56.4	143.3	18.0	45.6
36.6	93.0	11.7	29.6	46.6	118.4	14.8	37.7	56.6	143.8	18.0	45.8
36.8	93.5	11.7	29.8	46.8	118.9	14.9	37.8	56.8	144.3	18.1	45.9
37.0	94.0	11.8	29.9	47.0	119.4	15.0	38.0	57.0	144.8	18.1	46.1
37.2	94.5	11.8	30.1	47.2	119.9	15.0	38.2	57.2	145.3	18.2	46.2
37.4	95.0	11.9	30.2	47.4	120.4	15.1	38.3	57.4	145.8	18.3	46.4
37.6	95.5	12.0	30.4	47.6	120.9	15.2	38.5	57.6	146.3	18.3	46.6
37.8	96.0	12.0	30.6	47.8	121.4	15.2	38.6	57.8	146.8	18.4	46.7
38.0	96.5	12.1	30.7	48.0	121.9	15.3	38.8	58.0	147.3	18.5	46.9
38.2	97.0	12.2	30.9	48.2	122.4	15.3	39.0	58.2	147.8	18.5	47.1
38.4	97.5	12.2	31.0	48.4	122.9	15.4	39.1	58.4	148.3	18.6	47.2
38.6	98.0	12.3	31.2	48.6	123.4	15.5	39.3	58.6	148.8	18.7	47.4
38.8	98.6	12.4	31.4	48.8	124.0	15.5	39.5	58.8	149.4	18.7	47.5
39.0	99.1	12.4	31.5	49.0	124.5	15.6	39.6	59.0	149.9	18.8	47.7
39.2	99.6	12.5	31.7	49.2	125.0	15.7	39.8	59.2	150.4	18.8	47.9
39.4	100.1	12.5	31.9	49.4	125.5	15.7	39.9	59.4	150.9	18.9	48.0
39.6	100.6	12.6	32.0	49.6	126.0	15.8	40.1	59.6	151.4	19.0	48.2
39.8	101.1	12.7	32.2	49.8	126.5	15.9	40.3	59.8	151.9	19.0	48.3
40.0	101.6	12.7	32.3	50.0	127.0	15.9	40.4	60.0	152.4	19.1	48.5

Conversion: girth ↔ diameter, inches ↔ centimetres, page 3

Girth		Diameter		Girth		Diameter		Girth		Diameter	
[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]
60.2	152.9	19.2	48.7	70.2	178.3	22.3	56.8	80.2	203.7	25.5	64.8
60.4	153.4	19.2	48.8	70.4	178.8	22.4	56.9	80.4	204.2	25.6	65.0
60.6	153.9	19.3	49.0	70.6	179.3	22.5	57.1	80.6	204.7	25.7	65.2
60.8	154.4	19.4	49.2	70.8	179.8	22.5	57.2	80.8	205.2	25.7	65.3
61.0	154.9	19.4	49.3	71.0	180.3	22.6	57.4	81.0	205.7	25.8	65.5
61.2	155.4	19.5	49.5	71.2	180.8	22.7	57.6	81.2	206.2	25.8	65.7
61.4	156.0	19.5	49.6	71.4	181.4	22.7	57.7	81.4	206.8	25.9	65.8
61.6	156.5	19.6	49.8	71.6	181.9	22.8	57.9	81.6	207.3	26.0	66.0
61.8	157.0	19.7	50.0	71.8	182.4	22.9	58.1	81.8	207.8	26.0	66.1
62.0	157.5	19.7	50.1	72.0	182.9	22.9	58.2	82.0	208.3	26.1	66.3
62.2	158.0	19.8	50.3	72.2	183.4	23.0	58.4	82.2	208.8	26.2	66.5
62.4	158.5	19.9	50.5	72.4	183.9	23.0	58.5	82.4	209.3	26.2	66.6
62.6	159.0	19.9	50.6	72.6	184.4	23.1	58.7	82.6	209.8	26.3	66.8
62.8	159.5	20.0	50.8	72.8	184.9	23.2	58.9	82.8	210.3	26.4	66.9
63.0	160.0	20.1	50.9	73.0	185.4	23.2	59.0	83.0	210.8	26.4	67.1
63.2	160.5	20.1	51.1	73.2	185.9	23.3	59.2	83.2	211.3	26.5	67.3
63.4	161.0	20.2	51.3	73.4	186.4	23.4	59.3	83.4	211.8	26.5	67.4
63.6	161.5	20.2	51.4	73.6	186.9	23.4	59.5	83.6	212.3	26.6	67.6
63.8	162.1	20.3	51.6	73.8	187.5	23.5	59.7	83.8	212.9	26.7	67.8
64.0	162.6	20.4	51.7	74.0	188.0	23.6	59.8	84.0	213.4	26.7	67.9
64.2	163.1	20.4	51.9	74.2	188.5	23.6	60.0	84.2	213.9	26.8	68.1
64.4	163.6	20.5	52.1	74.4	189.0	23.7	60.2	84.4	214.4	26.9	68.2
64.6	164.1	20.6	52.2	74.6	189.5	23.7	60.3	84.6	214.9	26.9	68.4
64.8	164.6	20.6	52.4	74.8	190.0	23.8	60.5	84.8	215.4	27.0	68.6
65.0	165.1	20.7	52.6	75.0	190.5	23.9	60.6	85.0	215.9	27.1	68.7
65.2	165.6	20.8	52.7	75.2	191.0	23.9	60.8	85.2	216.4	27.1	68.9
65.4	166.1	20.8	52.9	75.4	191.5	24.0	61.0	85.4	216.9	27.2	69.0
65.6	166.6	20.9	53.0	75.6	192.0	24.1	61.1	85.6	217.4	27.2	69.2
65.8	167.1	20.9	53.2	75.8	192.5	24.1	61.3	85.8	217.9	27.3	69.4
66.0	167.6	21.0	53.4	76.0	193.0	24.2	61.4	86.0	218.4	27.4	69.5
66.2	168.1	21.1	53.5	76.2	193.5	24.3	61.6	86.2	218.9	27.4	69.7
66.4	168.7	21.1	53.7	76.4	194.1	24.3	61.8	86.4	219.5	27.5	69.9
66.6	169.2	21.2	53.8	76.6	194.6	24.4	61.9	86.6	220.0	27.6	70.0
66.8	169.7	21.3	54.0	76.8	195.1	24.4	62.1	86.8	220.5	27.6	70.2
67.0	170.2	21.3	54.2	77.0	195.6	24.5	62.3	87.0	221.0	27.7	70.3
67.2	170.7	21.4	54.3	77.2	196.1	24.6	62.4	87.2	221.5	27.8	70.5
67.4	171.2	21.5	54.5	77.4	196.6	24.6	62.6	87.4	222.0	27.8	70.7
67.6	171.7	21.5	54.7	77.6	197.1	24.7	62.7	87.6	222.5	27.9	70.8
67.8	172.2	21.6	54.8	77.8	197.6	24.8	62.9	87.8	223.0	27.9	71.0
68.0	172.7	21.6	55.0	78.0	198.1	24.8	63.1	88.0	223.5	28.0	71.1
68.2	173.2	21.7	55.1	78.2	198.6	24.9	63.2	88.2	224.0	28.1	71.3
68.4	173.7	21.8	55.3	78.4	199.1	25.0	63.4	88.4	224.5	28.1	71.5
68.6	174.2	21.8	55.5	78.6	199.6	25.0	63.5	88.6	225.0	28.2	71.6
68.8	174.8	21.9	55.6	78.8	200.2	25.1	63.7	88.8	225.6	28.3	71.8
69.0	175.3	22.0	55.8	79.0	200.7	25.1	63.9	89.0	226.1	28.3	72.0
69.2	175.8	22.0	55.9	79.2	201.2	25.2	64.0	89.2	226.6	28.4	72.1
69.4	176.3	22.1	56.1	79.4	201.7	25.3	64.2	89.4	227.1	28.5	72.3
69.6	176.8	22.2	56.3	79.6	202.2	25.3	64.4	89.6	227.6	28.5	72.4
69.8	177.3	22.2	56.4	79.8	202.7	25.4	64.5	89.8	228.1	28.6	72.6
70.0	177.8	22.3	56.6	80.0	203.2	25.5	64.7	90.0	228.6	28.6	72.8

Conversion: girth ↔ diameter, inches ↔ centimetres, page 4

Girth		Diameter		Girth		Diameter		Girth		Diameter	
[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]	[inches]	[cm]
90.2	229.1	28.7	72.9	100.2	254.5	31.9	81.0	110.2	279.9	35.1	89.1
90.4	229.6	28.8	73.1	100.4	255.0	32.0	81.2	110.4	280.4	35.1	89.3
90.6	230.1	28.8	73.3	100.6	255.5	32.0	81.3	110.6	280.9	35.2	89.4
90.8	230.6	28.9	73.4	100.8	256.0	32.1	81.5	110.8	281.4	35.3	89.6
91.0	231.1	29.0	73.6	101.0	256.5	32.1	81.7	111.0	281.9	35.3	89.7
91.2	231.6	29.0	73.7	101.2	257.0	32.2	81.8	111.2	282.4	35.4	89.9
91.4	232.2	29.1	73.9	101.4	257.6	32.3	82.0	111.4	283.0	35.5	90.1
91.6	232.7	29.2	74.1	101.6	258.1	32.3	82.1	111.6	283.5	35.5	90.2
91.8	233.2	29.2	74.2	101.8	258.6	32.4	82.3	111.8	284.0	35.6	90.4
92.0	233.7	29.3	74.4	102.0	259.1	32.5	82.5	112.0	284.5	35.7	90.6
92.2	234.2	29.3	74.5	102.2	259.6	32.5	82.6	112.2	285.0	35.7	90.7
92.4	234.7	29.4	74.7	102.4	260.1	32.6	82.8	112.4	285.5	35.8	90.9
92.6	235.2	29.5	74.9	102.6	260.6	32.7	83.0	112.6	286.0	35.8	91.0
92.8	235.7	29.5	75.0	102.8	261.1	32.7	83.1	112.8	286.5	35.9	91.2
93.0	236.2	29.6	75.2	103.0	261.6	32.8	83.3	113.0	287.0	36.0	91.4
93.2	236.7	29.7	75.4	103.2	262.1	32.8	83.4	113.2	287.5	36.0	91.5
93.4	237.2	29.7	75.5	103.4	262.6	32.9	83.6	113.4	288.0	36.1	91.7
93.6	237.7	29.8	75.7	103.6	263.1	33.0	83.8	113.6	288.5	36.2	91.8
93.8	238.3	29.9	75.8	103.8	263.7	33.0	83.9	113.8	289.1	36.2	92.0
94.0	238.8	29.9	76.0	104.0	264.2	33.1	84.1	114.0	289.6	36.3	92.2
94.2	239.3	30.0	76.2	104.2	264.7	33.2	84.2	114.2	290.1	36.4	92.3
94.4	239.8	30.0	76.3	104.4	265.2	33.2	84.4	114.4	290.6	36.4	92.5
94.6	240.3	30.1	76.5	104.6	265.7	33.3	84.6	114.6	291.1	36.5	92.7
94.8	240.8	30.2	76.6	104.8	266.2	33.4	84.7	114.8	291.6	36.5	92.8
95.0	241.3	30.2	76.8	105.0	266.7	33.4	84.9	115.0	292.1	36.6	93.0
95.2	241.8	30.3	77.0	105.2	267.2	33.5	85.1	115.2	292.6	36.7	93.1
95.4	242.3	30.4	77.1	105.4	267.7	33.5	85.2	115.4	293.1	36.7	93.3
95.6	242.8	30.4	77.3	105.6	268.2	33.6	85.4	115.6	293.6	36.8	93.5
95.8	243.3	30.5	77.5	105.8	268.7	33.7	85.5	115.8	294.1	36.9	93.6
96.0	243.8	30.6	77.6	106.0	269.2	33.7	85.7	116.0	294.6	36.9	93.8
96.2	244.3	30.6	77.8	106.2	269.7	33.8	85.9	116.2	295.1	37.0	93.9
96.4	244.9	30.7	77.9	106.4	270.3	33.9	86.0	116.4	295.7	37.1	94.1
96.6	245.4	30.7	78.1	106.6	270.8	33.9	86.2	116.6	296.2	37.1	94.3
96.8	245.9	30.8	78.3	106.8	271.3	34.0	86.3	116.8	296.7	37.2	94.4
97.0	246.4	30.9	78.4	107.0	271.8	34.1	86.5	117.0	297.2	37.2	94.6
97.2	246.9	30.9	78.6	107.2	272.3	34.1	86.7	117.2	297.7	37.3	94.8
97.4	247.4	31.0	78.7	107.4	272.8	34.2	86.8	117.4	298.2	37.4	94.9
97.6	247.9	31.1	78.9	107.6	273.3	34.3	87.0	117.6	298.7	37.4	95.1
97.8	248.4	31.1	79.1	107.8	273.8	34.3	87.2	117.8	299.2	37.5	95.2
98.0	248.9	31.2	79.2	108.0	274.3	34.4	87.3	118.0	299.7	37.6	95.4
98.2	249.4	31.3	79.4	108.2	274.8	34.4	87.5	118.2	300.2	37.6	95.6
98.4	249.9	31.3	79.6	108.4	275.3	34.5	87.6	118.4	300.7	37.7	95.7
98.6	250.4	31.4	79.7	108.6	275.8	34.6	87.8	118.6	301.2	37.8	95.9
98.8	251.0	31.4	79.9	108.8	276.4	34.6	88.0	118.8	301.8	37.8	96.1
99.0	251.5	31.5	80.0	109.0	276.9	34.7	88.1	119.0	302.3	37.9	96.2
99.2	252.0	31.6	80.2	109.2	277.4	34.8	88.3	119.2	302.8	37.9	96.4
99.4	252.5	31.6	80.4	109.4	277.9	34.8	88.5	119.4	303.3	38.0	96.5
99.6	253.0	31.7	80.5	109.6	278.4	34.9	88.6	119.6	303.8	38.1	96.7
99.8	253.5	31.8	80.7	109.8	278.9	35.0	88.8	119.8	304.3	38.1	96.9
100.0	254.0	31.8	80.9	110.0	279.4	35.0	88.9	120.0	304.8	38.2	97.0

Random angles (0-360 degrees) used when relocating plots

First time: start in a random column and row. After use, cross out the chosen value. Next time: use the value to the right of the previous one (move to next line if necessary)

258	185	306	273	78	225	31	243	298	139	104	198	93	313	296
230	295	206	165	336	137	344	239	82	112	239	267	150	263	72
202	230	184	107	242	188	52	189	39	218	140	197	280	314	17
123	346	348	175	187	315	359	61	95	354	268	146	300	120	149
155	102	92	185	57	72	50	359	155	326	202	79	283	59	113
48	106	226	293	5	13	199	199	244	74	40	118	111	258	193
206	82	125	71	306	163	332	359	34	319	241	73	237	70	231
127	279	179	312	324	169	223	7	336	256	157	316	74	114	44
200	154	182	268	63	81	38	263	29	138	58	28	201	95	218
186	68	206	201	100	136	296	28	91	124	248	316	1	277	340
67	192	74	330	129	30	353	102	334	92	219	288	152	297	164
250	204	251	301	93	136	111	253	117	345	36	336	157	189	252
323	287	138	218	93	353	245	274	25	319	342	348	52	7	158
293	5	80	73	38	273	45	270	66	321	35	288	18	46	140
252	349	12	114	355	147	180	127	16	227	340	330	213	340	15
226	252	38	158	346	78	343	41	237	349	54	49	136	236	148
260	320	132	120	299	321	126	48	52	312	51	46	354	216	348
103	63	313	287	357	286	290	2	39	65	150	53	28	149	45
19	226	221	48	254	292	301	142	292	352	294	27	162	203	335
150	11	99	301	61	165	209	308	30	235	165	219	52	84	157
71	3	225	335	14	62	70	245	333	326	93	254	148	103	175
76	243	30	28	248	330	308	233	98	191	79	287	1	204	95
4	169	345	239	53	234	51	45	242	65	237	191	244	105	158
2	281	3	220	342	288	3	170	165	221	124	42	193	284	102
202	330	247	120	312	255	320	299	177	24	210	62	184	42	310
6	255	350	98	61	137	201	291	338	198	308	67	235	245	159
147	193	5	191	49	90	27	357	81	337	306	83	205	275	266
141	303	306	127	75	266	319	280	271	59	87	200	214	267	274
54	204	154	272	81	344	357	194	203	133	131	66	120	141	310
66	282	284	275	226	135	208	311	4	123	188	351	175	216	122
105	352	73	230	284	259	188	93	51	2	106	179	165	276	36
151	313	333	299	141	297	161	118	101	268	297	337	209	101	304
305	167	296	21	331	146	294	239	104	89	3	22	241	324	324
139	286	84	321	145	69	263	119	166	160	210	333	352	127	141
263	196	73	208	33	335	200	30	109	246	76	291	335	219	324
246	105	150	81	237	69	277	5	239	122	78	277	281	251	114
285	104	28	109	269	213	255	272	126	5	21	115	93	4	190
41	119	189	139	129	59	315	127	80	22	226	109	2	318	165
47	206	262	285	12	301	11	52	93	244	167	168	298	46	126
96	164	162	229	176	124	328	172	313	316	198	28	22	261	250
29	110	185	82	54	281	6	189	129	234	326	202	288	312	221
205	250	40	63	287	140	93	144	56	257	279	274	127	355	142
17	49	182	182	333	158	251	242	61	18	344	165	213	217	120
71	74	352	61	11	99	48	126	230	128	74	312	232	89	63
119	261	23	142	94	263	123	46	58	188	316	124	272	184	244
28	327	29	152	213	12	265	134	224	14	32	334	291	56	332
27	248	201	351	100	83	350	352	55	46	246	248	103	92	46
157	271	124	114	91	127	68	34	357	9	71	22	247	94	256
313	107	24	20	57	32	57	189	50	189	177	241	237	247	259
288	236	313	35	131	105	294	304	32	157	227	357	26	97	70

Corrected length of sides and diagonals in metres (sides up / down the slopes are corrected, sides across are not)																	
Plot type			**Rectangular 20x25 plot**				**Rectangular 10x15 plot**				**Square 5x5 plot**		**Square 2x2 plot**		**Square 1x1 plot**	
Plot shape			Short side	Diagonal	Long side	Diagonal	Short side	Diagonal	Long side	Diagonal	Side	Diagonal	Side	Diagonal	Side	Diagonal
Horizontal distance			20.00	32.02	25.00	32.02	10.00	18.03	15.00	18.03	5.00	7.07	2.00	2.83	1.00	1.41
Slope (degrees)	Slope (%)	Correction factor	(Long side 25.00)		(Short side 20.00)		(Long side 15.00)		(Short side 10.00)		(Other side 5.00)		(Other side 2.00)		(Other side 1.00)	
0	0.000	1.000	20.00	32.02	25.00	32.02	10.00	18.03	15.00	18.03	5.00	7.07	2.00	2.83	1.00	1.41
2	3.492	1.001	20.01	32.02	25.02	32.03	10.01	18.03	15.01	18.04	5.00	7.07	2.00	2.83	1.00	1.41
4	6.993	1.002	20.05	32.05	25.06	32.06	10.02	18.04	15.04	18.06	5.01	7.08	2.00	2.83	1.00	1.42
6	10.510	1.006	20.11	32.08	25.14	32.12	10.06	18.06	15.08	18.10	5.03	7.09	2.01	2.84	1.01	1.42
8	14.054	1.010	20.20	32.14	25.25	32.21	10.10	18.08	15.15	18.15	5.05	7.11	2.02	2.84	1.01	1.42
10	17.633	1.015	20.31	32.21	25.39	32.32	10.15	18.11	15.23	18.22	5.08	7.13	2.03	2.85	1.02	1.43
12	21.256	1.022	20.45	32.30	25.56	32.45	10.22	18.15	15.34	18.31	5.11	7.15	2.04	2.86	1.02	1.43
14	24.933	1.031	20.61	32.40	25.77	32.62	10.31	18.20	15.46	18.41	5.15	7.18	2.06	2.87	1.03	1.44
16	28.675	1.040	20.81	32.53	26.01	32.81	10.40	18.25	15.60	18.53	5.20	7.21	2.08	2.89	1.04	1.44
18	32.492	1.051	21.03	32.67	26.29	33.03	10.51	18.32	15.77	18.67	5.26	7.26	2.10	2.90	1.05	1.45
20	36.397	1.064	21.28	32.83	26.60	33.28	10.64	18.39	15.96	18.84	5.32	7.30	2.13	2.92	1.06	1.46
22	40.403	1.079	21.57	33.02	26.96	33.57	10.79	18.47	16.18	19.02	5.39	7.35	2.16	2.94	1.08	1.47
24	44.523	1.095	21.89	33.23	27.37	33.90	10.95	18.57	16.42	19.23	5.47	7.41	2.19	2.97	1.09	1.48
26	48.773	1.113	22.25	33.47	27.82	34.26	11.13	18.68	16.69	19.46	5.56	7.48	2.23	2.99	1.11	1.50
28	53.171	1.133	22.65	33.74	28.31	34.67	11.33	18.80	16.99	19.71	5.66	7.55	2.27	3.02	1.13	1.51
30	57.735	1.155	23.09	34.03	28.87	35.12	11.55	18.93	17.32	20.00	5.77	7.64	2.31	3.06	1.15	1.53
32	62.487	1.179	23.58	34.37	29.48	35.62	11.79	19.08	17.69	20.32	5.90	7.73	2.36	3.09	1.18	1.55
34	67.451	1.206	24.12	34.74	30.16	36.18	12.06	19.25	18.09	20.67	6.03	7.83	2.41	3.13	1.21	1.57
36	72.654	1.236	24.72	35.16	30.90	36.81	12.36	19.44	18.54	21.07	6.18	7.95	2.47	3.18	1.24	1.59
38	78.129	1.269	25.38	35.63	31.73	37.50	12.69	19.65	19.04	21.50	6.35	8.08	2.54	3.23	1.27	1.62
40	83.910	1.305	26.11	36.15	32.64	38.28	13.05	19.88	19.58	21.99	6.53	8.22	2.61	3.29	1.31	1.64
42	90.040	1.346	26.91	36.73	33.64	39.14	13.46	20.15	20.18	22.53	6.73	8.38	2.69	3.35	1.35	1.68
44	96.569	1.390	27.80	37.39	34.75	40.10	13.90	20.45	20.85	23.13	6.95	8.56	2.78	3.42	1.39	1.71
46	103.553	1.440	28.79	38.13	35.99	41.17	14.40	20.79	21.59	23.80	7.20	8.76	2.88	3.51	1.44	1.75
48	111.061	1.494	29.89	38.97	37.36	42.38	14.94	21.17	22.42	24.55	7.47	8.99	2.99	3.60	1.49	1.80
50	119.175	1.556	31.11	39.91	38.89	43.73	15.56	21.61	23.34	25.39	7.78	9.25	3.11	3.70	1.56	1.85

Height Measurement Reference Table

(For checking your clinometer readings in the field...)

Positive clinometer readings are above horizontal, negative are below. Remember to write signs in the Tree Measurements form

To use this reference table, add the percentages measuered to the foot of the tree and the top of the tree and look up the height in this table.

In practice this is most easily done by subtracting the signed reading to the foot from the signed reading to the top.

Examples: Top +35%, foot -7%: Total 35-(-7) = 42%. Top +30%, foot +3%: Total: 30-(+3) = 27%. Top +71%, foot -10%: Total 71-(-10) = 81%

Remember that clinometer readings should always be taken from a point that is at least as far from the tree as the height of it.

The distance to be measured is the distance from the point where the clinometer reading is taken to the centre of the tree.

Remember that leaning trees must be measured in a direction perpendicular to the direction of inclination.

Sum of angle per-centages	Distance [m]																	
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
50	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
52	4.2	5.2	6.2	7.3	8.3	9.4	10.4	11.4	12.5	13.5	14.6	15.6	16.6	17.7	18.7	19.8	20.8	21.8
54	4.3	5.4	6.5	7.6	8.6	9.7	10.8	11.9	13.0	14.0	15.1	16.2	17.3	18.4	19.4	20.5	21.6	22.7
56	4.5	5.6	6.7	7.8	9.0	10.1	11.2	12.3	13.4	14.6	15.7	16.8	17.9	19.0	20.2	21.3	22.4	23.5
58	4.6	5.8	7.0	8.1	9.3	10.4	11.6	12.8	13.9	15.1	16.2	17.4	18.6	19.7	20.9	22.0	23.2	24.4
60	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4	15.6	16.8	18.0	19.2	20.4	21.6	22.8	24.0	25.2
62	5.0	6.2	7.4	8.7	9.9	11.2	12.4	13.6	14.9	16.1	17.4	18.6	19.8	21.1	22.3	23.6	24.8	26.0
64	5.1	6.4	7.7	9.0	10.2	11.5	12.8	14.1	15.4	16.6	17.9	19.2	20.5	21.8	23.0	24.3	25.6	26.9
66	5.3	6.6	7.9	9.2	10.6	11.9	13.2	14.5	15.8	17.2	18.5	19.8	21.1	22.4	23.8	25.1	26.4	27.7
68	5.4	6.8	8.2	9.5	10.9	12.2	13.6	15.0	16.3	17.7	19.0	20.4	21.8	23.1	24.5	25.8	27.2	28.6
70	5.6	7.0	8.4	9.8	11.2	12.6	14.0	15.4	16.8	18.2	19.6	21.0	22.4	23.8	25.2	26.6	28.0	29.4
72	5.8	7.2	8.6	10.1	11.5	13.0	14.4	15.8	17.3	18.7	20.2	21.6	23.0	24.5	25.9	27.4	28.8	30.2
74	5.9	7.4	8.9	10.4	11.8	13.3	14.8	16.3	17.8	19.2	20.7	22.2	23.7	25.2	26.6	28.1	29.6	31.1
76	6.1	7.6	9.1	10.6	12.2	13.7	15.2	16.7	18.2	19.8	21.3	22.8	24.3	25.8	27.4	28.9	30.4	31.9
78	6.2	7.8	9.4	10.9	12.5	14.0	15.6	17.2	18.7	20.3	21.8	23.4	25.0	26.5	28.1	29.6	31.2	32.8
80	6.4	8.0	9.6	11.2	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0	25.6	27.2	28.8	30.4	32.0	33.6
82	6.6	8.2	9.8	11.5	13.1	14.8	16.4	18.0	19.7	21.3	23.0	24.6	26.2	27.9	29.5	31.2	32.8	34.4
84	6.7	8.4	10.1	11.8	13.4	15.1	16.8	18.5	20.2	21.8	23.5	25.2	26.9	28.6	30.2	31.9	33.6	35.3
86	6.9	8.6	10.3	12.0	13.8	15.5	17.2	18.9	20.6	22.4	24.1	25.8	27.5	29.2	31.0	32.7	34.4	36.1
88	7.0	8.8	10.6	12.3	14.1	15.8	17.6	19.4	21.1	22.9	24.6	26.4	28.2	29.9	31.7	33.4	35.2	37.0
90	7.2	9.0	10.8	12.6	14.4	16.2	18.0	19.8	21.6	23.4	25.2	27.0	28.8	30.6	32.4	34.2	36.0	37.8
92	7.4	9.2	11.0	12.9	14.7	16.6	18.4	20.2	22.1	23.9	25.8	27.6	29.4	31.3	33.1	35.0	36.8	38.6
94	7.5	9.4	11.3	13.2	15.0	16.9	18.8	20.7	22.6	24.4	26.3	28.2	30.1	32.0	33.8	35.7	37.6	39.5
96	7.7	9.6	11.5	13.4	15.4	17.3	19.2	21.1	23.0	25.0	26.9	28.8	30.7	32.6	34.6	36.5	38.4	40.3
98	7.8	9.8	11.8	13.7	15.7	17.6	19.6	21.6	23.5	25.5	27.4	29.4	31.4	33.3	35.3	37.2	39.2	41.2
100	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	42.0

Appendix 4: Focus group discussion questions

If time allows, questions in sections A and B can be asked to the same group of people in a single focus group discussion. Otherwise, two separate meetings need to be organised.

For adults:

A. Impact of earthquake on people's livelihoods in the area and coping strategies

1. If you compare your life and life generally in the VDC to that during the same period last year, what are the main changes that have occurred?
2. What has been the most important effect of the earthquakes on your livelihoods?
3. Have the earthquakes affected different (groups of) people differently? How? (different effects can be in terms of, e.g., asset losses, health damages and effects of damages to infrastructure).
4. In what ways are people coping/have people coped with the damages from the earthquakes?
5. Did/do people help each other to cope with damages after the earthquakes? How/examples?
6. Has there been/is there competition for resources among people after the earthquake? What resources and what people?
7. In what ways is the functioning of local authorities and groups affected by the earthquakes?
8. Is there anything else you would like to say about life and livelihoods in the VDC since the earthquakes?

B. Publicly provided and private group-based coping mechanisms

1. What kind of support has the VDC received from outside and from whom (government, NGOs etc.)? (probes include: housing, infrastructure - like roads, irrigation channels, schools, health post, compensation, food, medicine, credit)
2. Have local groups played a role in the stabilization after the earthquakes? What groups and in what ways?
3. Is the support equally distributed or is there variation according to kin, caste or other?
4. What kind of support has been most important for coping with the earthquakes and the consequences?
5. Is there anything else you would like to say about support you have obtained following the earthquake?

For children:

1. What have you or your family lost due to the earthquake? (Hint to facilitator: we want to collect information about damage to material assets)
2. What did/do you do to personally cope with that loss?
3. Have you or has anyone in your household become sick or injured following the earthquake?
4. Have you done anything to cope with those injuries or sickness? If so, please explain.
5. Have there been periods after the earthquake when you didn't get enough food from home?
6. What did you personally do to cope with that lack of food?
7. Is there anything else you would like to say about life in the village since the earthquake?

Appendix 5: GEQ Code List

Codes to be used in Section B

This document contains the codes used in the Microsoft Access databases containing the total household accounts, including environmental income, from the four research sites in Nepal (Mustang, Kaski, Gorkha, Chitwan) and the three survey rounds (2006, 2008/9, 2012). The document is based on the PEN code list (PEN 2009) and includes the PEN categorization of codes, the relevant PEN codes and additional codes added only in Nepal. *Non-PEN codes are marked with italics*. The PEN codebook is much more comprehensive than what is presented here; many specific product codes of no relevance to the Nepalese data are omitted whereas some categories not relevant for Nepal are included so as to provide the general idea of the coding system. Some codes are specified in the questionnaires, these are not included here. The advise on using the PEN codes found in this Appendix is taken directly from PEN (2009).

1. General introduction to the coding system

Several questions are 1-0 questions, where 1 = yes and 0 = no

Some questions may not apply or the respondent simply cannot answer. The following codes are used for that:

- 8 = does not apply
- 9 = the respondent (or I) does not know

Note the minus (-) to be put in front. This is done to clearly distinguish between these answers (-8,

-9) and any regular answer.

Where sex is distinguished: female = 1 and male = 0.

All years are written with 4 digits, i.e., yyyy. All dates should be written in the year-month-date format, i.e.: yyyymmdd

The code 999 can also be used for “other” in all the code lists below, although this should be kept to an absolute minimum. Instead, new codes should be requested.

2. Common codes used in prototype questionnaire

Products (code-product)

This code list covers all products for which data are being collected. Thus it includes forest products (raw and processed), agricultural products, and products collected from non-forest areas (labelled “non-forest environmental income” in the questionnaire).

One important distinction is made between unprocessed (raw-material) forest products and processed forest products. “Processed” means a significant modification or change of the product, e.g., turning wood into charcoal or a chair, or turning clay into a pot. Minor modifications, for example, cutting rattan canes or bark into smaller pieces, or washing and drying the product would not qualify, and the products should still be classified as unprocessed.

Note that codes from the agricultural products code list (201-) can be used for products collected from the forest. For example, a wild fruit can be classified under the general code for wild fruits

(21) or as that particular fruit, e.g., durian (315).

3. Overview of product codes (the additional Nepal codes may not follow this system):

1. Harvested products from the wild (incl. forests) – in the raw	**1-100, ++**
i. Wooden perennials and wooden-based products	1-20, **651-750, 901-1000, 1151-1200,1401-1500**
ii. Non-wooden plants and plant-based products	21-50, **551-599, 751-900;1351-1400**
iii. Animals and animal-based products	51-70, **601-650, 1001-1100**
iv. Minerals and others	71-100
2. Processed products from the wild (incl. forests)	**101-200**
i. Wooden-based products	101-130, **1301-1350**
ii. Non-wooden based products	131-200
3. Agricultural crops	**201-550**
Cereals	201-220
Roots and tubers	221-240
Legumes	241-270
Vegetables	271-310, **1101-1150**
Fruits	311-350, **501-550, 1201-1250**
Beverages	351-360
Spices	361-380
Other food crops	381-400
Non-food crops or non-food parts of crops	401-420, **1251-1300**
Miscellaneous & unclassified	421-500

Product	Code	Comment
1. Harvested products from the wild (incl. forests) – in the raw	**(1-100)**	
i. Wooden perennials and wooden-based products	**(1-20)**	
Timber	1	Including trees cut for charcoal production
Poles	2	
Fuelwood/firewood	3	
Tree barks	4	
Tree leaves	5	
Tree roots	6	
Lianas and vines	7	
Rattan	8	
Bamboo	9	
Frond	10	Leaves of palms, This code is given to "Wooden stick" in the reference table of 2006 and 2009 dataset
Tree branches	11	This code is assigned to "rope" in the reference table of 2006 and 2009 dataset.
Logs	12	Can also be classified in the broader category of timber ("logs" often refer to short pieces of timber)
Tree seedlings	13	
Fence posts	14	
Brooms	15	Unprocessed
Leaf for food	16	
Leaf for medicinal purpose	17	
Root for medicinal purpose	18	
Bark for medicinal purpose	19	
Timba/ Lumber	*1401*	
Green fuelwood	*1402*	Used to distinguish from dry fuelwood
Fuelwood twigs	*1403*	
Nigalo	*1404*	Very thin small sized bamboo, wild or planted
Bhatta	*1405*	Thin /small rafter
Syaula	*1406*	Tree leaves used for thatching
Ghochha	*1407*	Thick /big rafter
Sottar	*1408*	Forest litter
ii. Non-wooden plants and plant-based products	**(21-50, 1351-1355)**	
Wild fruits	21	
Nuts	22	
Mushroom	23	
Roots and tubers	24	Tree roots are included above (code 6)
Wild vegetables	25	This code is given to product type "grass" in the reference table of 2006 and 2009 dataset.
Seeds	26	

Product	Code	Comment
Medicinal plants	27	All (parts of) plants used for medicinal purposes should be put here, e.g., a tree root or mushroom (don't use categories above).
Ornamental/aesthetic/fashion	28	
Latex and resin	29	
Oils	30	
Dyes	31	
Non-animal manure/compost from liter	32	
Fodder grass/livestock browse	33	
Thatching grass	34	
Other grasses	35	E.g., for basket making
Reeds	36	
Spices	37	
Stalks	38	E.g., from millet
Banana fibres	39	
Banana leaves	40	
Wild yam	41	
Wild coffee	42	
Wild coffee seedlings	43	
"Cabbage palm"	44	
Brazil nut	45	
Rubber	46	
Natural straw	47	
Roasting sticks	48	
Mate	49	
Allanblackia paviflora	1351	
Elephant mushroom	1352	
Gaira Kasta	1353	NTFPs other than MAPs
Niuro	1354	Edible fern
Flowers	1355	General term
iii. Animals and animal-based products	**(51-70)**	
Game meat – mammals	51	
Game meet-reptiles	52	
Game meat-reptiles	53	
Game meat-insects and worms	54	
Birds nests	55	
Fish	56	
Animal skin	57	
Animal based medicine	58	
Honey	59	
Game meat-amphibian	60	
Animal manure	61	
Wild animals	62	
Jerky	64	

Product	Code	Comment
iv. Minerals and others	**(71-100)**	
Gold	71	
Diamonds	72	
Quarry stones	73	
Clay/mud	74	
Slate	75	
Sand	76	
Tooth cleaning twigs	77	
Stones	78	
Potash	79	
Salt	80	
2. Processed products from the wild (incl. forests)	**(101-200)**	
i. Wooden-based products	**(101-130, 1301-1303)**	
Sawnwood	101	
Charcoal	102	
Wooden furniture	103	
Other wooden tools/utensils	104	
Woodcraft	105	
Rattan furniture	106	
Other rattan products	107	
Bamboo furniture	108	
Other bamboo products	109	
Canoe	110	
Drums	111	
Other musical instruments	112	
Walking sticks	113	
Offcuts	114	
Rubber Shoes	115	
Shingles	116	
Thurong	117	
Kharang	118	
Lai	119	
Toloi	120	
Kula	121	
Dala	122	
Chaloin	123	
Birdcage	124	
Process wild vegetables	130	Both dried/fermented
Mortar	1301	
Pestle	1302	
Halo	1303	A plough set
ii. Non-wooden based products	**(131-200, 571, 572, 1304)**	
Woven products	131	

Product	Code	Comment
Juice and oils from forest products	132	
Alcoholic beverages	133	
Pottery	134	
Bricks	135	
Roasted cashew	136	
Fly swatter	137	
Fishing trap/net	138	
Catapult	139	
Broom	140	
Basket	141	
Roof of house	142	
Floor of house	143	
House	144	
Storage shed	145	
Veranda of house	146	
Wall of house	147	
Clothes	148	
Babassu kernels	149	
Babassu charcoal	150	
Babassu husks	151	
Babassu starch	152	
Babassu oil	153	
Babassu milk	154	
Amapá milk	155	
Açaí wine	156	
Miriti wine	157	
Miriti stems	158	
Toys made with miriti	159	
Fishing trap	160	
Ungurahuy, majo milk	164	
Açaí milk	165	
Açaí (canned)	168	
Bacaba wine	169	
Cupuaçu pulp	170	
Mauritia scraped fruit	171	
Andiroba seeds	172	
Red horse eye bean	173	
Caxinguba bark	174	
Veronica bark	175	
Succuba bark	176	
Andiroba bark	177	
Mauritia sticks	178	
Mauritia crafts (except toys)	179	
Sororoca stem	180	
Chitro	182	Bamboo woven mat (roofing purpose)
Bhakari/Mandro	183	Storage bin made by bamboo strips
Thumse	184	Conical basket finely woven by bamboo strips
Doko	185	Conical basket woven of bamboo strips
Tapari	186	Leaf plate

Product	Code	Comment
Ghum (Syakhu)	187	Traditional umbrella made up of cane, leaf and bamboo
Damlo/Namlo	188	Fibre rope used for carrying load
Andiroba oil	571	
Copaíba oil	572	
Leaf plates	1304	
3. Agricultural crops	**(201-)**	
Cereals	**(201-220)**	
Rice	201	
Maize	202	
Wheat	203	
Barley	204	
Millet	205	
Sorghum	206	
Simsim	207	
Teff	208	
Buck wheat	209	
Naked barley	210	
Amaranthus	211	
Fresh maize	212	
Dry maize	213	
Oat	214	
Rice (lowland)	215	
Roots and tubers	**(221-240)**	
Cassava/manioc (fresh)	221	
Potato	222	
Sweet potato	223	
Yam	224	
Cocoyam/taro	225	
Cassava/manioc (dried	226	
Cassava/manioc (flour)	227	
Angel's wing	228	
Wild taro (?)	229	
Malanga	230	
Tapioca	231	
Curcuma	232	
Turmeric	233	
Souchet	234	
Legumes	**(241-270)**	
Soybean	241	
Mung bean	242	
Stink bean	243	
Pigeon pea	244	
Cow pea	245	
Product	**Code**	**Comment**
Grams	246	
Groundnut (peanut)	247	
Bean (Mustang)	248	
String bean	249	

Product	Code	Comment
Red bean	250	
Field beans (fresh)	251	
Field beans (dried)	252	
Sesame	253	
Beans	254	
Enkole	255	
Legumes (general code)	256	
Fava bean, broad-bean	257	
Pueraria groundcover	258	
Bambara groundnut	259	
Peas	260	
Leaves of green beans	261	
Mung	262	
Chick Pea	263	
Vegetables	**(271-310, 1101-1150**	
Cabbage	271	
Carrot	272	
Cauliflower	273	
Chilli	274	
Cucumber	275	
Eggplant	276	
Garlic	277	
Ginger	278	
Lettuce	279	
Onion	280	
Paprika	281	
Pepper	282	
Pumpkin	283	
Spinach	284	
Squash	285	
Tomato	286	
Radish	287	This code is given to products "Radish" and "Turnip" in the reference tables of 2006 and 2009 dataset.
Turnip	289	This code is given to product "Esquaih" in the reference tables of 2006 and 2009 dataset
Gourd (bitter/spiny)	290	
Tree tomato (Tamarillo)	291	
Okra (Lady's finger)	292	
Callaloo	293	
Bitter solum	294	
Nakati	295	
Bitter Eggplant	296	
Sweet leaf	297	
Luffa	298	
Chayote	299	
Water spinach	300	
Green onion	301	
Chicory	302	

Product	Code	Comment
West Indian gherkin, burr cucumber	303	
Collard greens	304	
Parsley	305	
Arugula	306	
Jambú	307	
Eru	308	
Unspecified vegetables	309	
Beet	310	
Corriander leaf	1101	Leafy vegetable
Marfa	1102	Squash kind veg
Kachu	1103	
Mati aloo	1104	Tuber
Kakrol	1105	Veg
Korolla, bitter gourd	1106	Bitter melon
Jhinga	1107	Veg
Chichinga	1108	Veg
Borboti bean	1109	Long bean
Watercress	1110	
Greenleaf vegetables	1111	
Tindora	1112	
Tinda	1113	
Fruits	**(311-350, 502, 1214)**	
Avocado	311	
Banana	312	
Carambola/Star fruit	313	
Coconut	314	
Durain	315	
Guava	316	
Jack fruit	317	
Lemon	318	
Lime	319	
Lichee	320	
Mango	321	
Mangosteen	322	
Orange	323	
Papaya	324	
Passion fruit	325	
Pineapple	326	
Plantain	327	
Rambutan	328	
Soursop	329	
Watermelon	330	
Apple	331	Also given code 337
Peach	332	
Plum	333	
Apricot	334	

Product	Code	Comment
Cantelope	335	
Almond	336	
Apple	337	
Pond-apple	338	
Custard apple	339	
Grapefruit	340	
Cashew fruit	341	
Cashew seed/nut	342	
Craboo	343	
Plum	344	
Banana – cooking (Plantain)	345	
Banana - brewing	346	
Banana - roasting	347	
Banana - sweet (small)	348	
Banana - sweet (large)	349	
Tangerines	350	
Citrus fruit	502	
Several other fruits General code for fruits	1214	
Beverages	**(351-360)**	
Cocoa	351	
Coffee	352	
Tea	353	
Fresh coffee	354	
Dry coffee	355	
Cocoa seeds	356	
Spices	**(361-380)**	
Cardamom	361	
Cinnamon	362	
Clove	363	
Curry	364	
Ginger	365	
Mint	366	
Pepper	367	
Vanilla	368	
Xantohxylum	369	
Red pepper	370	This code is given to product type “Tumeric” in the references tables of 2006 and 2009 dataset
Coriander	371	
Oregano	372	
Lemongrass	373	
Turmeric	374	
Tucupi	375	
Achiote	376	
African basil	378	
Green leafy vegetables	380	

Product	Code	Comment
Other food crops	**(381-400)**	
Palm oil	381	
Sugar cane (and juice)	382	
Sunflower	383	
Mustard	384	
Sweets made from cultivated fruits	385	
Aloe vera	386	
Urucú	387	
Unrefined sugar	388	
Beverage	389	
Miscellaneous & unclassified	**(421-500)**	
Cotton	401	
Jute	402	
Sisal	403	
Rubber	404	
Tobacco	405	
Coca leaves	406	
Eucalyptus	407	
Palm stem (or heart?)	408	
Palm petiole	409	
Roselle flowers	410	
Roselle leaves	411	
Millet stem	412	
Acacia spp.	413	
Pinus spp. (pine)	414	
Mahogany	415	
Musizi	416	
Spanish/Mexican cedar	417	
Brazil nut tree	418	
Cannabis	419	
Atimezia	420	
Grass for domestic animals	421	
Legumes for domestic animals	422	
Leaves of cultivated crops	423	
Crop residues	424	
Brachiaria grass	425	
Elephant Grass, Napier Grass or Uganda Grass	426	
Kikuyo grass	427	
Kudzu	428	
Green manure	429	
Guinea grass, Tanganyika grass, buffalograss	430	
Thatching grass	431	
Bluestem grass	432	
Khosela	433	
Paral	434	Straw
Dhod	435	

Product	Code	Comment
Khoya	436	
Nal	437	
Mad fruit	501	
Breadfruit	503	
Cupuacu fruit	504	
Barbados cherry	505	
Guaraná fruit	506	
Inga fruit	507	
Peach Palm Fruit	508	
Ebidodoima	509	
Açai Palm Fruit	510	

Note: For unclassified codes/products check the references tables of the dataset .

4. Forest markets (code-market)

A major distinction is made between: (i) when the household sell the product within the village, and (ii) when the household itself (or in cooperation with other households) transport the produce outside the village and sell it there. Note that the relevant question is: To whom does the household sell the product? Thus it refers to the first step in the marketing chain, not where the product is being processed or consumed.

Some borderline cases will still exist. For example, your neighbour may take your product to the market in a neighbouring village and sell it there to consumers. If this is part of an arrangement where neighbours take turns and go to the market, and then are paid whatever price is obtained, code 21 would be the appropriate. If the neighbour buys it like a regular agent or trader, then code 12 should be used.

To whom	Code	Comments
1. Sold within the village	**(10-19)**	
Friends and relatives	10	
Directly to consumers	11	E.g., taking the produce to the market and selling directly to consumers, or selling along roadsides.
Private wholesale buyer	12	Agent, trader, middleman, or similar
Processing factory	13	
Producer organization	14	
Government agency	15	
Other	19	
2. Sold outside the village	**(20-29)**	
Friends and relatives	20	
Directly to consumers	21	E.g., taking the produce to the market and selling directly to consumers, or selling along roadsides.
Private wholesale buyer	22	Agent, trader, middleman, or similar
Processing factory	23	
Producer organization	24	
Government agency	25	
Other	29	

5. Land categories (code-land)

These categories correspond with table V1D1 (section D in Village survey 1). See also the definitions given in the main text of this document.

Category	Codes used in the 2006 and 2009 dataset	Codes used in the 2012 dataset	Code
Forests:			
Natural forest	1	11,12	10
Managed forests	2	21,22	20
Plantations	3	31,32	30
Agricultural land:			
Cropland	4	40	40
Pasture (natural or planted)	5	50	50
Agroforestry	6	60	60
Silvipasture	7	-	70
Fallow, < 15 years since cultivation, see guidelines	8	80	80
Other land categories:	9	-	
Shrubs	-	90	90
Grassland	-	100	100
Residential areas & infrastructure	-	-	110
Wetland	-	121	120
Other	-	199	199
Rented out	11	110	-
Rented in	12	120	-
Total land	10	1000	-

6. Forest categories (code-forest)

The forest categories follow the same three forest categories in the land classification above (see also the PEN 2007 guidelines on definitions). In addition, each forest category is split between open and closed forest, the dividing line being 40 % canopy cover. To the extent possible, the researchers should use the open/closed categories, that is, use codes: 11, 12, 21, 22, 31, 32. In some cases, however, it may be very hard to make this distinction and the aggregate categories can be used, that is, codes: 10, 20, 30.

Category	Code	Comments
Natural forest	10	
Natural forest – closed	11	Canopy cover > 40 %
Natural forest – closed (seasonally-inundated)	111	
Natural forest – closed (dominated by palms)	112	
Natural forest – open	12	Canopy cover < 40 %
Managed forests	20	
Managed forests – closed	21	Canopy cover > 40 %
Managed forests – closed (seasonally-inundated)	211	
Managed forests - open	22	Canopy cover < 40 %
Managed forests – open (seasonally-inundated)	221	
Plantations	30	
Plantations – closed	31	Canopy cover > 40 %
Plantations – open	32	Canopy cover < 40 %

7. Tenure regime (code-tenure)

The actual land tenure regimes consist of several dimensions, which should be reflected in the coding system used. We have used a lexicographic classification that consists of three dimensions or levels, where each dimension is represented by one digit in the three digit code used:

1. The formal or legal (de jure) owner of the land, which is the entity with the transfer rights (rights to sell, lease or rent out the land). We distinguish between three such entities: (1) the state at national or regional level; (2) communities or more generally: groups of people; (3) private entities (individuals or companies).
2. The actual or de facto owners of the land, that is, those that use it and have the de facto use rights (but normally not the transfer rights, neither de facto nor de jure). One problem in classifying land tenure is the overlapping use rights on the same piece of land, for example, some use rights can be held by individual households (e.g., using land for agriculture), while others are held by the community (e.g., collecting dead firewood or wild fruits). To capture this, we introduce a mixed category for community and individual de facto land rights, covering the situation used in the example. Thus we operate with seven categories: (1) state, (2) community, (3) private, (4) state-community, (5) state-private, (6) community-private, and (7) state- community-private.
3. The degree of enforcement of rules, which regulates access (who are the users), permissible uses, and possibly also the management of the land and its resources. Three categories are distinguished: (1) high, (2) moderate/low, and (3) no enforcement of rules. Note that the rules might be set by the de facto and/or the de jure owners, and may have the backing by either the state or customary institutions.

Note that open access is rarely a separate land category at the de jure level, in the sense that land almost always has a de jure owner (and the state often being the default owner). But de facto open access can appear within all categories of de jure owners, in situations with no enforcement of rules, or rules do not exist.

A distinction should be made between community and private de facto use rights. Private use rights refer to situations where only one individual, household or lineage has the rights to use the resource, while community rights refer to situations where a more or less well-defined group of people have the rights.

In the 3 digit tenure code the first digit refers to de jure owner, the second to the de facto user, and the third digit to the degree of rules enforcement. Only codes which specify all the three dimensions should be used, i.e., only the codes in bold in the table.

In short, land tenure should be categorized by asking three questions:

1. Who are the formal (de jure) owners: state, community or private? (1-3)
2. Who are the actual users: state, community, private, or some combination? (1-7)
3. To what extent do rules of access and use exist, and if they do, how well are they enforced? (1-3)

This generates a total of 3 x 7 x 3 = 63 combinations, shown in the table below. But, some of the codes will probably never be used as they are unlikely combinations.

Tenure regime	**Code**	**Comments/examples**
State *de jure* owner	1	
State *de facto* user	11	
High enforcement of rules	**111**	E.g., a well-protected national park
Medium/low enforcement of rules	**112**	
No enforcement of rules (open access)	**113**	
Community *de facto* user	12	
High enforcement of rules	**121**	E.g., a community forest management system, where the state is the legal owner, but the forest is managed and used by the community with strong enforcement of the rules set.
Medium/low enforcement of rules	**122**	
No enforcement of rules (open access)	**123**	A typical open access case: forest owned *de jure* by the state, but used by villagers and few/no rules exist or are enforced.
Private *de facto* user	13	E.g., squatters on public (state) land which use it for agriculture.
High enforcement of rules	**131**	
Medium/low enforcement of rules	**132**	
No enforcement of rules (open access)	**133**	
State-community *de facto* user	14	
High enforcement of rules	**141**	
Medium/low enforcement of rules	**142**	E.g., a forest reserve owned *de jure* by the state, but with weak enforcement and some (illegal) local use
No enforcement of rules (open access)	**143**	
State-private *de facto* user	15	
High enforcement of rules	**151**	
Medium/low enforcement of rules	**152**	

No enforcement of rules (open access)	**153**	
Community-private *de facto* user	16	E.g., shifting cultivators in *de jure* state forest, with individual use rights based on regular forest clearing and cultivation, and collection by community of NTFPs.
High enforcement of rules	**161**	
Medium/low enforcement of rules	**162**	
No enforcement of rules (open access)	**163**	
State-community-private *de facto* user	17	
High enforcement of rules	**171**	
Medium/low enforcement of rules	**172**	
No enforcement of rules (open access)	**173**	
Community *de jure* owner	2	
State *de facto user*	21	These categories seem unlikely.
High enforcement of rules	**211**	
Medium/low enforcement of rules	**212**	
No enforcement of rules (open access)	**213**	
Community *de facto* user	22	Similar to 12, but the community fully owns the forest.
High enforcement of rules	**221**	
Medium/low enforcement of rules	**222**	
No enforcement of rules (open access)	**223**	
Private *de facto* user	23	
High enforcement of rules	**231**	
Medium/low enforcement of rules	**232**	
No enforcement of rules (open access)	**233**	
State-community *de facto* user	24	
High enforcement of rules	**241**	
Medium/low enforcement of rules	**242**	
No enforcement of rules (open access)	**243**	
State-private *de facto* user	25	
High enforcement of rules	**251**	
Medium/low enforcement of rules	**252**	
No enforcement of rules (open access)	**253**	
Community-private *de facto* user	26	E.g., a community owned forest with community use but also some agricultural encroachment by farmers.
High enforcement of rules	**261**	
Medium/low enforcement of rules	**262**	
No enforcement of rules (open access)	**263**	
State-community-private *de facto* user	27	
High enforcement of rules	**271**	
Medium/low enforcement of rules	**272**	
No enforcement of rules (open access)	**273**	
Private *de jure* owner	3	
State *de facto* user	31	These categories seem unlikely.
High enforcement of rules	**311**	
Medium/low enforcement of rules	**312**	
No enforcement of rules (open access)	**313**	

Community *de facto* user	32	
High enforcement of rules	**321**	
Medium/low enforcement of rules	**322**	
No enforcement of rules (open access)	**323**	
Private *de facto* user	33	
High enforcement of rules	**331**	The 'classical' private property case. May also include land rented in/out in this category
Medium/low enforcement of rules	**332**	
No enforcement of rules (open access)	**333**	
State-community *de facto* user	34	
High enforcement of rules	**341**	
Medium/low enforcement of rules	**342**	
No enforcement of rules (open access)	**343**	
State-private *de facto* user	35	
High enforcement of rules	**351**	
Medium/low enforcement of rules	**352**	
No enforcement of rules (open access)	**353**	
Community-private *de facto* user	36	E.g., NTFP harvested by villagers from a *de jure* private forest, but neither logging nor agriculture accepted.
High enforcement of rules	**361**	
Medium/low enforcement of rules	**362**	
No enforcement of rules (open access)	**363**	
State-community-private *de facto* user	37	
High enforcement of rules	**371**	
Medium/low enforcement of rules	**372**	
No enforcement of rules (open access)	**373**	

8. Mode of transport (code-transport)

Mode of transportation	Code	Comments
Foot	1	
Bike	2	
Motorbike	3	
Donkey/horse/ox cart	4	Include directly carrying the load on their back
Tractor	5	Refers to the conventional tractors with 2 (or more) large driving wheels, and 2 (or 1) steering wheels. Does *not* include the small, two-wheel engine-powered devices (sometimes called hand-tractors).
Car/van	6	
Truck/lorry	7	
Bus	8	
Non-motorized boat/raft	9	
Motorized boat/raft	10	
Rickshaw/3 wheel van	11	
Jeep/ chander gari	12	
Baby Taxi/ 3 wheeler auto	13	
Motocar, trimobile	14	
Other	19	

9. Type of wage work (code-work)

This code refers to table F on wage income in the quarterly survey. Note that only wage work is included here, business is covered elsewhere in the questionnaire.

Type of work (sector)	Code	Comments
Small-scale agriculture	1	E.g., casual labour during harvesting
Large-scale (commercial)	2	E.g., working on plantations
Agricultural processing	3	E.g., beer making
Forestry – logging	4	
Forestry – processing	5	E.g., wage work in sawmills and other forms of processing
Forestry – transport	6	
Forestry – other	7	
Fishing	8	
Transport/porter	9	Not forestry-related transport (see 6 above)
Trade and marketing	10	
Carpentry	11	
Construction	12	
Mechanical	13	E.g., working in a garage and similar
Mining	14	
Local cottage industry (not included elsewhere)	15	"Cottage industry" refers to small scale producers working from their homes, typically part time. (And has nothing to do with making cottages ….). Some cottage industries might fall in other categories (e.g., carpentry), and should be classified there (code 11)
Manufacturing industry	16	

Service industry	17	E.g., restaurant, hotel, store
Government employee	18	E.g., a teacher
Community employee	19	E.g. forest watcher, secretary of FUG
Tailor, shoe maker, or similar	20	This code is given only for work type “tailor” in the reference tables of 2006 and 2009 dataset
Blacksmith/goldsmith	21	
Domestic work	22	E.g., cook, servant, babysitter, … in another home, This code is assigned to “Shoe maker/cobbler” in the reference tables of 2006 and 2009 dataset.
Field/research assistant/guide	23	This code is assigned to “household works” in the reference tables of 2006 and 2009 dataset.
Forest guard/ranger	24	This code is assigned to “teachning/HH survey” in the
		reference tables of the 2006 and 2009 dataset.
Quarrying	25	This code is assigned to “painting” in the reference tables of 2006 and 2009 dataset
Guard (non-forest related)	26	This code is assigned to “miscellaneous” in the reference tables of 2006 and 2009 dataset.
Painter	27	This code is assigned to “cooking” in the 2006 and 2009 dataset.
Aquatic products processing	28	This code is assigned to “beehive farming” in the reference tbales of 2006 and 2009 dataset
Cook	29	This code is assigned to “worship” in the reference tables of 2006 and 2009 dataset.
Road construction/maintenance	30	
NGO worker	31	
Business managerial position	32	
Electrician	33	
Musician	34	
Midwife	35	
Shaman	36	
Craftsman	37	
Fishfarm worker	38	
NTFP worker (harvest & management)	39	
Teacher (private lessons)	40	
Boat repair shop employee	41	
Processing plant employee	42	
Oil company reforestation crew	43	
Driver	44	
Wage work grazing	45	
Other	99	
Non government employee	181	Code used in 2006 and 2009
Skilled labour	182	Code used in 2006 and 2009

10. Units of measurement (unit-code)

Local units of measurement can be used, both when filling out the questionnaire, and when entering the data into the databank. If local units are used, the conversion factor to metric units must be reported.

Unit of measurement	Code	Metric equivalent (1 unit =x metric units)	Metric unit	Comments
Weight and volume	**(1-100, 301-400)**			
Grams	1	0,001	Kg	
Kg	2	1	Kg	
Tonnes	3	1 000	Kg	
Pound (lb)	4	0.454	Kg	
Litres	5	1	Litre	
Imperial Gallon	6	3.79	Litre	
US gallon (fluids)	7	4.55	Litre	
Bag/sack	8			
Bucket	9			
Bale	10			
Bundle	11			
Cord	12			
Cob	13			
Cup	14			
Headload	15			
Scotch cart	16			
Wheelbarrow	17			
Mana	18			Weight (Nepal)
Pathi	19			Weight (Nepal)
Muri	20			Weight (Nepal)
Quart (liquids)	21			
Krokis sack (50 lb bag)	22			
Krokis sack (100 lb bag)	23			
Bucket (5 lb bucket)	24			
Bucket (1 lb bucket)	25			
Bunch	26			
Ounce	27			
Tin/Debe	28			
Basket	29			This code is given to a unit “dalo” in the reference tbales of 2006 and 2009 dataset
Basin/Bucket	30			
Bunch	31			Same as 26
Heaps	32			

Number (pieces)	33			Use if simple counting, e.g. number of machete
Stick	34			
Trays	35			
Handful	36			
Cajas	37			
Latas	38			
cm	39			
cm^2	40			
cm^3	41			
m	42			
m^2	43			Has a code of 218 too according to the reference tables of the dataset.
m^3	44			
Leaves	45			
Boards	46			
Square Beams	46			
Dose (*vaccine*)	47			
Ball of fencing	48			
Jerrycan (5 litre)	49			
Jerrycan (20 litre)	50			
Polythene bag	51			
Saucepan/plate	52			
Bottle	53			
Lorry (truck load)	54			
Spoon	55			
Rope	56			
Box	57			
Tablet	58			
Kettle	59			
Bowl	60			
Packet	61			
Block	62			
ml (millilitres)	63			
People/worker	64			See also code 203
Months	65			
Barrica	66			
Jug	67			
Arroba	68			
Ear of corn	69			
Fence	70			
Stable/Corral	71			
Veterinarian visit	72			
Package of vitamins	73			
Heads (of cattle)	74			
Fine ($)	75			
Pole	76			
Inch	78	2.54 cm		

Plate Yoruba	80			
Small plastic bag	81			Used in West Africa
50 kg rice bag	82			
100 kg rice bag	83			
Leaves woven together	84			
Roll	87			
Feet	91			
Square feet	92			
Cubic feet	93			
Granary	96			
Canari	97			
Pesticide can	98			
Seed can	99			
Tomato can	100			
Thurong	308			for fuelwood
Cubic feet	309			for timber
Napo	310			Length of the rope used for measuring the fixed circumference of a bundle of thatch grass
Bhari	311			
Hal	312			
Timba	313			
Doko	314			
Number	315			
Glass bottle	317			
Area	**(101-200)**			
Hectares	101	10 000	m^2	
Acres	102	4 047	m^2	
Hal (plough)	103, 312			Nepal
Ropani	104, 316	500	m^2	Mountain region
Aana	318	0.0625	Ropani	Mountain region
Kattha	321	338	m^2	Lowlands
Others	(201-)			
Piece/Number	201			One unit of the products. This is used for, for example, fruits (one coconut), animals, eggs
Dozen	202			Used for selling, for example, eggs.
One person-day	203			See also code 64
One animal-day	204			
Hour	205			Has a code of 995 according to the reference table of the 2009 data set

One trip	206			
One hundred units	207			
One thousand units	208			
Quarter of a hectare	209			
Donkey load	210			
Bhari	211			
Tractor hour	212			
Tractor load	213			
Seed kit	214			
Plough (Hal)	215, 103			
Support trees	216			
Bigha	217			
Sq. meter	218, 43			
Sq. feet	220			
Hal (plough)	221, 103, 215, 312			
Sq. hands	225			
Aana	226			
Paisa	227			
Plant/tree	228			
Inch	229			
Leaf plates	230			
Tree	231			
Buta	232			
Hand	233			
Dam	234			
Katha	235			
Dhur	236			
Ghari	238			
Jhyal	239			
Gaj	240			
LS	250			
Aali	251			
Congo 7	301			
Congo 14	302			
Livestock water trough	303			
Livestock feeding trough	304			
Hen house	305			
Arbol (tree)	306			
Maito	307			
Cubic feet	309			
Napo	310			
Bhari	311			
Timba	313			
Doko	314			
Number	315			
Trailor/tractor	991			

Cf.t.	317			
Mutha (handful bundle of vegetable)	319			
Chatta (5ft*5ft*20ft, volume)	320			
Trip/times	992			
Cft	994			
Hour	995			
Chatta	996			
Doko	997			
Timba	998			
Bhari	999			

Codes used in specific tables in questionnaire

Note: these are listed in the questionnaire, but new codes may be added below without the prototype questionnaire being updated.

1. QH2: Agricultural inputs

Code	Inputs	Comments
1.	Seeds	Can use more detailed codes: 60+
2.	Fertilizers (inorganic)	
3.	Pesticides/herbicides	
4.	Manure	
5.	Draught power	
6.	Hired labour	Can use more detailed codes: 40+
7.	Hired machinery	
8.	Transport/marketing	
9.	Machete	All the codes belw this (including) does not match with the codes we have in the 2006 and 2009 dataset except code 20 which is given to "payment for land rentals" This is not a problem with the reference table of the 2012 dataset
10.	Chainsaw (incl. chains)	
11.	Gasoline, oil	
12.	Rasp (sharpener) for blades, machete etc.	
13.	Tool that a grim reaper holds	
14.	Sacks	
15.	Ax	
16.	Large hoe	
17.	*Boca de lobo*	
18.	Shovel	
19.	Other, specify:	
20.	Payment for land rental	
21.	Planting machine	
22.	Sickle	
23.	Plastic sheets	Used to dry for example rice or beans
24	Rake	
25	Basket	
26	Crop cover or greenhouse	
27	Pallette	
28	Garden fence	
29	Nails	

Code	Inputs	Comments
30	Sprocket	
31	Spark plugs	
32	Work boots	
33	Tools in general	
34	Trellis	Used for growing squash, luffa, or chayote
35	Plough	
More detailed codes for hired labor:		
40.	Cutting down the small trees using a machete	
41.	Cutting down the big trees using a chainsaw or ax	
42.	Planting	
43.	Maintenance	
44.	Harvest	
45.	Caretaker	
46.	Food for hired labor	
47.	Transportation for hired labor	
More detailed codes for seeds/seedlings:		
60.	Banana	
61.	Cabbage	
62.	Corn	
63.	Cucumber	
64.	Grape fruit	
65.	Lettuce	
66.	Onion	
67.	Orange	
68.	Pepper	
69.	Rice	
70.	Seedlings	
71.	Tomato	
72.	Okra	
73	West Indian gherkin, burr cucumber	

2. QI1: Livestock

Code	Animal	Comments
1.	Cattle	Code given to ox in 2006 and 2009 dataset
2.	Buffalos	Code given to cow in 2006 and 2009 dataset
3.	Goats	Code given to buffalo in 2006 and 2009 dataset
4.	Sheep	
5.	Pigs	
6.	Donkeys	
7.	Ducks	
8.	Chicken (see also code 24)	
9.	Horses	
10.	Guinea pigs	
11.	Rabbit	
12.	Turkey	
13.	Guinea fowl	
14.	Bull/ox (adult, > 3 yrs)	
15.	Cow (adult, >3 yrs)	
16.	Steer (young bull/ox) or heifer (young cow) (1-3 years)	
17.	Calf (< 1 year)	
18.	Juvenile chicken	
19.	Other, specify:	
20.	Doves	
21.	Dog	
22.	Goose	
23.	Piglets	
24.	Bees (bee hives)	Can use bee hives as the unit
25.	Goru	Ox (Nepal)
26.	Ranga	Male buffalo
27.	Parewa	Pegion
28.	Mules	
29.	Helmeted Guineafowl	(*Numida meleagris*)
30.	Goat kid (young goat)	

3. QI2: Livestock products

Code	Product	Comments
1.	Meat	
2.	Milk	
3.	Butter	
4.	Cheese	
5.	Ghee	
6.	Eggs	
7.	Hides and skin	
8.	Wool	

Code	Product	Comments
9.	Manure	
10.	Draught power	
11.	Bee hives	This code is given to “mule carrier” in the 2006 and 2009 dataset.
12.	Honey	This code is given to “horse riding” in the 2006 and 2009 dataset
13.	Curdled milk	This code is given to “honey” in the 2006 and 2009 dataset
14.	Soap	
15.	Quail eggs	
19.	Other, specify:	
20	Individual animal	
21.	Curd	
111.	Mutton (meat)	
112.	Chicken (meat)	
113.	Pork	
114.	Goat	
115.	Animal breeding	
116.	Buffalo selling	
117.	Animal selling	

4. QI3: Livestock inputs

Code	Input
1.	Feed/fodder
2.	Rental of grazing land
3.	Medicines, vaccination and other veterinary services
4.	Costs of maintaining barns, enclosures, pens, etc.
5.	Hired labour
6.	Inputs from own farm
7.	Salt (This code is give to input/cost type “tax” in the 2006 and 2009 dataset)
8.	Transport to market
9.	Other, specify:
12	Bought buffalo/animal
13	Bought Namlo
14	Maize
15	Egg
16	Ghee
17	Milk
18	Salt (in 2006 and 2009 datasets)
19	Bamboo
20	Damlo
21	Water
22	Transportation

5. QJ1: Other income sources

Code	Type of income
1.	Remittances
2.	Support from government, NGO, organization or similar *NOTE: can use more detailed codes from 10 onwards*
3.	Gifts/support from friends and relatives
4.	Pension
5.	Payment for forest services
6.	Payment for renting out land (if in kind, state the equivalent in cash)
7.	Compensation from logging or mining company (or similar)
9.	Other, specify:
10.	Maternity leave (All the codes below this (including) does not match with the codes with have in the reference table of 2006 and 2009 dataset)
11.	Support for sickness or disease
12.	Educational fund
13.	NGO food donation
14.	Seeds (usually for annual crops)
15.	Seedlings (usually for perennial crops)
16.	Tools (sale, renting out)
17.	Payment to agricultural producers
18.	Rubber tapper retirement
19.	House rental
20.	Sale of standing trees
21.	Research/NGO assistance (e.g., lump sum payments from researchers/NGOs for general assistance). Note: if regular wage work, use section F of quarterly questionnaire. If not linked to particular services, use code 2 (or 13) above.
22.	Widower's payment (or other death in family)
23.	Land sales
24.	Dowry
25.	Work in political campaigns
26.	Watchman
27.	Fishermen insurance
28.	Government social programs (eg: Bolsa família – Brazil)
29.	Rural credit
30.	Business of buying and selling of agriculture and extarctive products, This code is given to "monthly salary" in the 2012 dataset reference table.
31.	Business related to fishing
32.	Transportation of passengers

Codes to be used in Section C

Code Table 1

ID	Major Group	Code Name	CODE	Code definition
1	Assistance / help	Government help	AGH	Any assistance received from the government like monetary assistance (grants, scholarship), provision of goods (land, equipment), and services (training).
		Help from relatives	AR	Includes assistance getting a job, payment of school fees, loans, monetary gifts, etc.
		Help from friends	AF	Includes assistance getting a job, payment of school fees, loans, monetary gifts, etc.
		Political help	APH	Help from a political figure
		Help from CBO / NGO	ACN	Any assistance received from a community-based organization or NGO.
2	Loan / credit	Loan with low interest rate	LLI	Loans with low interest rate provided through e.g. an agricultural development bank
		Loan with high interest rate	LHI	Loans with high interest rate provided through a commercial bank or money lender
3	Health related	Illness	HIL	Any illness
		Health care costs	HHC	Heavy expenses associated with illness or accident
		Death of income earner	HDI	Income lost due to death of household member
		Accident / injury	HAI	Accident / injury resulting in health problems
4	Land related	Land improvement	LLI	Any improvement that increase land productivity; e.g. soil improvement, building terraces
		Land exhaustion	LLE	Loss of productivity due to poor soil quality, loss of irrigation
		Land acquisition/loss	LLAL	Acquisition refers to increase in land holdings through buying, inheritance, dowry, etc. Loss of land is due to selling, floods, landslides, expropriation etc.
		Land division	LLD	Land divided due to e.g. inheritance
ID	**Major Group**	**Code Name**	**CODE**	**Code definition**
		Land price	LLP	Land price has increased or decreased
		Land rent	LLR	Land rent provided extra income, or rent is too high
5	Agricultural related	Improved crop varieties	ACV	Use of crop varieties that improve production
		Cash cropping	ACC	Any cash crops.
		Crop price	ACP	Price development that positively or negatively affect crop income
		Crop disease	ACD	Any disease that caused crop failure
		Weather related crop production effects	ACW	Any climatic changes/shocks that caused crop production increase or failure (rain, drought, hailstorm)
		Crop inputs	ACI	Use and price of fertilizers, pesticides, insecticides. Prices might go up and down
		Crop implements	ACIM	Acquisition, prices and losses of machines and other tools

ID	Major Group	Code Name	CODE	Code definition
		Water/irrigation	AWI	Building irrigation system, improve water storage. Loss of irrigation
		Large livestock	AIL	Investment in large livestock species
		Livestock disease	ALD	Any livestock disease that caused loss of livestock
		Livestock shock	ALD	Any other livestock shock (theft, loss due to landslide) that caused loss of livestock
6	Income related	Government job, Nepal	IGJ	A household member got a government job in Nepal
		Private job, Nepal	IPN	A household member got private job in Nepal
		Job, India	IJI	A household member got a job in India
		Job, Other country	IJO	A household member got a job in other country
		Business gain / loss	IBGL	Includes starting up or expanding a business (e.g. small shop or selling food in the local market). Loss relates to business failure and loss of inventory/equipment.
		Casual labour	ICL	Obtained/loss of casual labor
		Diversification of income sources	IDS	Acquiring income through multiple stable sources, such as a household that earns money through farming, brewing, and a private sector job simultaneously, etc.
		Improved market access	IMA	Better roads (generally)
		Other infrastructure improvements	III	Could be electricity that started certain businesses, a new hospital or school made access to health care and education cheaper and better, etc.
		Inheritance	II	Inheritance of land, money, jewellery, etc.
		Remittances from household members	IRR	Remittances from household members, loss of remittances from household members
		Remittances from other relatives	IRF	Remittances from other relatives, loss of remittances from other relatives
7	Human related	Personal capacity	HPC	Attributes such as hardworking or clever. In a negative sense – less intelligent
		Laziness	HL	Lazy
		Education	HE	School education - can be sufficient or insufficient
		Training	HT	On the job training / training by extension services – can be sufficient or insufficient
		Age	HA	Age related causes, e.g. just getting old
		Polygamy	HP	More than one wife
		Big family size	HBF	Many children in the family to support
		Small family size	HSF	Family choose to have less children
		Discrimination	HD	Due to ethnicity, gender
8	Cost related	Marriage costs	CMC	Dowry, bride price
		Funeral costs	CFC	Cost related to funerals
		Living costs	CL	Living costs have become cheap or expensive
		Support to relatives	CS	Support of any form to a relative
9	Other	Litigation	OL	Legal problems
		Rebellions	OR	Suffered from effects of insurgence

ID	Major Group	Code Name	CODE	Code definition
		Other shock	OS	Other shock, please specify
		Other	OO	Other, please specify

Code table 2

Main occupation	CODE
Agriculture	1
Livestock	2
Forest exploitation	3
Environmental exploitation	4
Casual farm wage work	5
Unskilled non-farm wage work, private sector (job that do not require formal education like being a housekeeper, cleaner, working in a kitchen or shop, etc.)	6
Unskilled non-farm wage work, public sector (job that do not require formal education like being a housekeeper, cleaner, working in a kitchen or shop, etc.)	7
Skilled wage work, private sector (job that requires some kind of formal education like being a bus/taxi-driver, teacher, it-specialist, etc.)	8
Skilled wage work, public sector (job that requires some kind of formal education like being a bus/taxi-driver, teacher, it-specialist, etc.)	9
Unskilled migrant wage employment, India (like above, job that do not require formal education)	10
Skilled migrant wage employment, India (like above, job that do require formal education)	11
Unskilled migrant wage employment, other countries (like above, job that do not require formal education)	12
Skilled migrant wage employment, other countries	13

(like above, job that do require formal education)	
Retired	14
Student	15
Small-scale business (All types of small businesses. Includes shops, small restaurants, small poultry production, petty trading, tailor, black-smith, etc.)	16
Larger-scale business (All types of large businesses. Includes large poultry production and other commercial agricultural productions, e.g. dairy farming, hotel, lorry truck trading, etc.)	17
Home responsibilities	18
Unemployed	19
Other, specify	[TEXT]

Code Table 3

1	AGRICULTURE AND RELATED SERVICE ACTIVITIES
2	FORESTRY, LOGGING AND RELATED SERVICE ACTIVITIES
3	FISHING, OPERATION OF FISH HATCHERIES AND FISH FARMS
4	MINING OF COAL, PEAT, AND RELATED PRODUCTS
5	MINING OF METAL ORES (INCL GOLD)
6	MINING OF SAND / STONES
7	OTHER MINING AND QUARRYING, SPECIFY
8	MANUFACTURE OF FOOD PRODUCTS AND BEVERAGES
9	MANUFACTURE OF TEXTILES
10	MANUFACTURE OF CLOTHES
11	MANUFACTURE OF FURNITURE AND ARTICLES OF STRAW AND PLAITING MATERIALS
12	MANUFACTURE OF WOOD AND OF PRODUCTS OF WOOD
13	MANUFACTURE OF PAPER AND PAPER PRODUCTS
14	MANUFACTURE OF MACHINERY AND EQUIPMENT
15	OTHER MANUFACTURE, SPECIFY
16	BLACKSMITH

17	TAILOR
18	CONSTRUCTION
19	WHOLESALE TRADE, SPECIFY PRODUCT
20	RETAIL TRADE, SPECIFY PRODUCT
21	REPAIR OF RADIO, TV, PRECISION AND OPTICAL INSTRUMENTS, WATCHES AND CLOCKS
22	REPAIR AND MAINTENANCE OF MOTOR VEHICLES AND OTHER TRANSPORT EQUIPMENT
23	OTHER REPAIR ACTIVITIES, SPECIFY
24	PUBLISHING, PRINTING AND REPRODUCTION OF RECORDED MEDIA
25	RENTING OF MACHINERY AND EQUIPMENT
26	HOTELS AND RESTAURANTS
27	TRANSPORT BY MOTOR VEHICLE
28	WATER TRANSPORT BY BOAT
29	OTHER TRANSPORT ACTIVITIES (E.G CARRYING BY FOOT/LIVESTOCK), SPECIFY
30	RECREATIONAL, CULTURAL AND SPORTING ACTIVITIES
31	FINANCIAL INTERMEDIATION (LOANS)
32	REAL ESTATE ACTIVITIES
33	ACTIVITIES OF MEMBERSHIP ORGANIZATIONS
34	HEALTH AND SOCIAL WORK, SPECIFY
35	COMPUTER AND RELATED ACTIVITIES
36	OTHER ENTERPRISE ACTIVITIES, SPECIFY