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Field Manual for Participatory Data Collection on Biophysical Stock of Ecosystem Services

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ABSTRACT

If ecosystem services (ES) are to be managed to help alleviated poverty, then ecosystem service research must act to fill knowledge gaps and address data deficiencies. This manual presents a series of data-collection tools utilising indigenous knowledge to provide biophysical data via Participatory Rural Appraisals (PRAs). Systematically recording this knowledge can help to rapidly and cheaply fill data gaps, whilst also ensuring that local people are included as stakeholders in decision-making. This manual was developed drawing on the experiences of the ESPA-funded ASSETS project, investigating the links between ecosystem services, food security and nutritional status at the forest-agriculture interface. By applying the methods presented here, users will (in collaboration with local communities) be able to obtain information on ecosystem services including provisioning (e.g. timber, food), regulating (e.g. carbon storage, pollination) and cultural (e.g. recreation, education) services. The methods presented here should be of interest to researchers and practitioners seeking to create an evidence base to support ES-based decision-making in data deficient areas.

INTRODUCTION

The negative consequences of climate and land use change coupled with the desire to increase human well-being and conserve biodiversity around the globe have focussed attention on how ecosystem services (ES; the goods humans derive from nature) can be efficiently and equitably sustained (Bennett et al., 2015). Such focussed ideals have been internationally agreed as part of the United Nations sustainable development goals for 2030 (UN, 2015).

Research on ecosystem services has been at the forefront of providing data to support sustainability-focussed policies with evidence. The rural poor are often highly dependent on ES for their livelihoods, especially as a safety net during crises (Enfors and Gordon, 2008 and Shackleton et al., 2008). However, the poorest regions of the world are also the most data-poor, and so exhibit little proof of evidence-based ES decision-making (Willcock et al., 2016).

Rapid assessment methods are needed in data-deficient areas, maximising cost and time efficiencies (Willcock et al., 2012; Willcock et al., in press). Although rarely used for biophysical research, participatory research methods have the potential to rapidly address data deficiencies, ensuring the knowledge retained in local peoples is incorporated into decision-making (Poppy et al., 2014).

The purpose of this document is to provide guidelines on how to carry out data collection on biophysical stock of ecosystem services by means of meta-analyses of the literature and participatory rural appraisals (PRAs). Our aim is to provide sufficient information to ensure that a standard set of information is collected to create and validate models of ecosystem service stock. The remainder of this document provides detailed instructions for the application of individual and group data-collection activities relevant to the research questions of the project. Example diagrams have been included as illustrative examples. This manual should be used alongside Schreckenberg et al. (2016).

This manual was originally prepared in August 2013 to provide guidelines for the collaborators on the ASSETS project (http://espa-assets.org/). The methods were trialled within the ASSETS study area in Malawi, and have been updated to take into account this field experience. Although designed to meet the specific research objectives of the ASSETS project, we hope that the methods presented here will also be of interest to other researchers working on ecosystem services and well-being issues.

SEQUENCE OF DATA COLLECTION

Who?	What?	Expected time length
Lead researchers	**Preparation for literature review** • Using secondary data and local expertise finalise the lists of ES stock to be investigated.	½ day
Fieldwork staff / student volunteers	**Conduct literature review of ES stock** • Consult literature and secondary data (wildlife data, any research reports, forest dept. reports etc.) to populate the standardised excel spread sheet.	28 days
Fieldwork staff / student volunteers Community members Key informants	**Conduct fieldwork within villages** • Game, pests, pest-control and pollinator ES • Cultural ES • Seasonal household decision-making (optional) • Vegetative biomass measurement	3-5 days per village (all exercises can be conducted in parallel)
Lead researchers GIS expert Fieldwork staff / student volunteers	**Draft community report** • Based on secondary data and data collected via this manual • Highlight issues for crosschecking with community • Prepare copy of key findings for community	3-5 days per village
Modelling experts	**Create models of biophysical stock at the village level** • Use the literature review of ES to populate standardised models to estimate the biophysical ES stock at village level • Validate these models against the PRA results	3-5 days per village
Lead researchers Community members	**Feedback meeting** • Summarise and crosscheck findings with community	½ day
Lead researchers	**Complete community reports**	1 day

DATA COLLECTION PROTOCOL

The data collection protocol should follow the protocol presented in the Schreckenberg et al., (2016). This is as follows:

a) Based on the secondary data collected for each village, the lead researcher will brief the fieldwork team about the main ecological features of the site to be visited and key issues to be aware of and study (e.g., presence of illegal activities).

b) A member of the fieldwork team will be named responsible for putting together all the data obtained from a particular village. This person will be in charge of compiling all relevant material, including photos and audio files, and handing them over to the lead researcher. It is important, in addition, that this person keeps a diary of events, which details the dates, times, and key features of the fieldwork process (e.g., logistical challenges, number of sessions per exercise).

c) Before conducting a new exercise or interview:

- The fieldwork team should prepare for the exercise by reviewing all the relevant information from previous exercises and secondary data sources (e.g., the results from the PRA manual should be consulted).
- The team should be well-informed about the research outputs they are expected to produce from each exercise (See “What for?” section in the instructions for each exercise) and the types of questions they will ask (See “How?” section).
- The team members in charge of conducting an exercise should divide their roles as main or supporting facilitators in advance.
- The main facilitator for a given exercise should coordinate with the lead researcher the logistics involved. Review the “What with” section in the exercises’ instructions so as to make sure the facilitators are provided with the necessary materials.
- Selection of participants: Review the “Who with” section in the exercises’ instructions to verify the social, economic or cultural profile of participants required for each exercise. The up-to-date list of households developed within the PRA manual can be used to select participants. Coordinate with key informants and local authorities to this effect. However, be aware that residents should be invited, not ordered, to attend.
  Depending on the number of households present in a village, try to vary the households invited. Although some PRA exercises are interrelated, there is no need to rely on the same informants continuously. Varying participation across the community, in addition, will prevent obtaining biased information and demanding too much time from busy residents.

d) During the exercises or interviews:

- Informed consent should be obtained from participants at the beginning of each group exercise or interview. Proceed as follows:

i. Make sure all participants are well informed about the project (e.g., its objectives and organisations involved), their rights as informants (e.g., to refuse answering some questions, risks and benefits, if present, as well as about how the data will be managed.

ii. For key informants, read a consent form with them and initial the corresponding boxes detailing their agreement with the study policies. Ask them to sign the form.

iii. An oral consent form can be used for groups participating in PRA exercises. The form should be read out at the start of the exercise and consent recorded on a dictaphone or witnessed by another researcher. Participants' names should be recorded at the bottom of the sheet with signatures if participants are literate.

- Notes should be taken by both the lead facilitator and the supporting one(s). The main facilitator should use a notebook and the field manual so as to make sure all relevant questions are covered.
- If participants agreed to being recorded, use the dictaphone provided to record all group discussions. The supporting facilitator should ensure the digital recorder is working throughout the exercise and it is placed in a suitable location to record all of the participants' interventions. Remember that participants have the right to request that you stop recording at any time. Facilitators should always keep detailed notes of the discussion.
- Every single chart or diagram produced during the group exercise should be photographed.
- At the end of each exercise, give participants the opportunity to ask questions or add any comment they may consider relevant.

e) The lead researcher and the main facilitator should coordinate the implementation of the form of compensation agreed with the local population. Keep records of the procedure followed (e.g., if compensation was distributed through a local authority instead of being given to individual participants).

f) After completing the exercises:

- The main and supporting facilitator(s) should meet to summarise the results. To this effect, they should compare their notes, review the charts and tables generated, and listen to the recording of the group discussion.
- Before handing over the flipcharts to the lead researcher, the facilitators must catalogue every single page used. Write down in one corner of each page the following information: (i) the village's name, (ii) type of exercise, (iii) social group represented (e.g., men or women, very poor or the "well-off"), and (iv) the page number. Write down the first three pieces of information on the tape or paper used to secure the individual pieces of paper together.
- Be aware that participants' names should not be included in any of the outputs generated (e.g., charts) so as to guarantee them the necessary confidentiality. The identity of participants for each exercise can only be recorded in the corresponding consent forms.
- Hand over the consent forms to the lead researcher.
- Hand over the digital files containing the pictures and recordings obtained during the group exercises.

g) The lead researchers should keep all consent forms, flipcharts, and written field reports in a locked cabinet. Audiovisual digital files should be kept in a password-protected computer. Always make copies of diagrams – preferably a paper copy and a photograph.

h) Transparencies and maps used in a given exercise should be scanned and turned into a geo-referenced digital image file.

i) After all exercises have been written up, the person responsible for a given village should compile all the different reports into a single document and verify all the produced material has been duly returned to the lead researcher.

j) The fieldwork teams can create their own electronic reports in MS Word, however all tabular data should be entered into MS Excel. The person in charge of a particular village will coordinate with the lead researcher to fill in these electronic documents.

k) All digital files produced during a given exercise (recordings of interviews, pictures of flipcharts, scanned maps or transparencies, etc.) should be named containing the following information: (i) the village's name, (ii) exercise name, (iii) type of document (maps, pictures of landscape, pictures of charts, etc.), and (iv) number of file (more than one version of a map, chart, or audio files may be generated for a single exercise).

l) A feedback meeting should be organised in order to return the information obtained to the communities. In addition to presenting our key findings to local authorities and residents, make sure a paper copy of each table or diagram produced is returned to the community during this meeting.

LITERATURE REVIEW OF ECOSYSTEM SERVICE STOCK

Why?

The researchers should perform the literature reviews prior to undertaking the PRAs in the field to develop a thorough understanding of current scientific knowledge.

What for?

The overall aim of this topic is to create a dataset capable of support Ricker-type ES models. Such models function from a single input variable (land cover/use), thus stocks of ES will vary between villages based on differences in land cover amount (not configuration) – i.e. hectares of forest, km^2 of agriculture. These models will be aspatial at the scale of the village and validated through PRAs.

What with?

- Secondary data
- MS Excel

Table 1 - Example functional groups for Africa

Livestock	Game	Pollinators	Pests	Pest-control	Culture
Calf Steer/Heifer Cow Bull/Ox Donkey Mule/Horse Goat Sheep Pig Chicken-Layer Local-Hen Chicken-Broiler Local-Cock Turkey Duck Guinea Fowl Beehive Pigeon	Small Birds Large Birds Hyrax Small Antelope Large Antelope Small Monkeys Large Monkeys Crabs Fish Rabbit Snake Caterpillar Termites Hippo Crocodile Rats Mice Cane Rats Voles Buffalo Pig Lizards Civet	Honey Bee stingless bees bumble bees solitary bees wasps Ants Hover flies Other flies Beetles Thrips Birds Bats	Small Birds Large Birds Rats Mice Cane Rats Voles Hyrax Small Antelope Large Antelope Small Monkeys Large Monkeys Rabbit Caterpillar/Insects...E.G. Flying Ants, Crickets Termites Bats mites wasps Ants	Small Birds Large Birds Rats Mice Cane Rats Voles Hyrax Small Monkeys Large Monkeys Snake Bats Wasps Ants	Spiritual and religious Cultural heritage Recreation and ecotourism Aesthetic/Scenic beauty Educational Sense of place Medicinal Appreciation of nature Inspirational

Who with?

Models can be built using functional groups as opposed to specific species. This is because there are numerous species can be amalgamated into a single group (e.g. many species and subspecies can be combined). Even if data were available (which is unlikely for all species), working at a species specific level would make the model too complex. Therefore, species/cultural uses have been collated into overarching groups (Table 1).

Data from the literature should be obtained by systematically entering search terms into Google Scholar, JSTOR and ISI Web of Knowledge search engines. The search terms should combine the group of interest (e.g. small birds is a group within the game category; Table 1) with column headings (e.g. habitat, feed preference; Table 2) plus geographical terms (e.g. Malawi, Africa, Tropical) The bibliographies of all the sources used for data should be checked for additional relevant references and data. To be included, the studies must report raw data, and studies should be excluded if the land use type is absent from the (tropical) study site (e.g. temperate grasslands). Example search terms are given in Table 2.

Table 2 - Search terms used to gather the data required. The title for the data required can also be used as a search term. In addition, the functional group can be included in the search and where possible, the search can be narrowed to a geographical area.

Data required	Search Terms
Habitat preference (living)	Territory, habitat
Habitat area required (living) (km2)	Habitat, territory, area for living, nearest neighbour, competition, area required
Habitat preference (feeding)	Foraging, food, consumption, diet
Habitat area required (feeding) (km2)	Foraging, food, consumption, diet
Range (km)	Range, distance travelled,
Feed preference	Diet, food, food consumption, food requirement
Quantity of food required (kg/month)	Energy, energy balance, energy needs
Quantity of water required (litres/month)	Water balance, water needs, trophallaxis, water metabolism
Mortality – food (days)	Mortality, starvation
Mortality - water (days)	Mortality dehydration
Death rate (month-1)	Survivorship, life history, life expectancy, demography, longevity
Reproductive rate (yr-1)	Fecundity, life history, reproduction, demography, birth rate
Age at sexual maturity	Reproductive age, sexual maturity, birthing, pregnancy, reproductive cycles
Birthing month	Pregnancy duration, reproductive cycles
Change in agricultural yield (%)	Yield, crop quantity, increase yield, decrease yield
Benefits	The products obtained by people
Benefit quantity	The quantity of the products obtained
Benefit value	The value of the products obtained to the local people

Once data have been identified, the information should be recorded into the relevant column of a standardised MS Excel spread sheet. When values for the category selected cannot be found, alternative means must be used (e.g. if amount of food cannot be determined, this can calculated through weight of the individual). First order estimates of ES abundances can be obtained by linking the information provided by this table with the available habitat as indicated by a land cover map (see Weyell et al. (2015)).

GAME, PEST, PEST-CONTROL, & POLLINATION SERVICES

Introduction

The following PRA exercise is a combination of participatory GIS, Trend analysis, Seasonal Calendar and Species discussion (Schreckenberg et al., 2016). However, to avoid repetition, all activities will be performed in conjunction.

What for?

- To identify and map what functional groups currently occur and their abundance;
- To identify and map the past abundance of functional groups 10, 20 and 30 years ago;
- To determine the change in the functional group across seasons;
- To determine what the functional group is used for;
- To determine how the functional group is controlled;
- To determine the effect each functional group has on agricultural yield.

Who with?

- This exercise will be conducted with four groups of participants: two groups of men and two groups of women;
- The groups should represent all members of the community. There should be a range of age, socioeconomic status and geographic spread;
- This activity should be conducted in groups of no more than eight participants.

What with?

- A spacious and shaded area/room;
- Space to write;
- Writing/drawing materials;
    - E.g. transparency sheets, permanent makers,
- An Google Earth image of the village;
    - A handheld GPS will be required to determine the location of the village to input into Google Earth (if not already known),
- Large sheets of paper;
- A digital recorder to document discussions;
- A camera to document the maps produced;
- A field note book to record notes;
- Laminated pictures of example species within the functional groups.

How?

Preparation:

1. Obtain the GPS co-ordinates of the centre of the village;
2. Input the co-ordinates into Google Earth;
3. Print off the Google Earth image of the village;

   a. Ensure the image extends as far as the village boundaries,
4. Put the GPS co-ordinates of the village edges at each corner of the transparency sheet;
5. Prepare a transparency sheet for each animal functional group;
6. Prepare large sheets of paper with the months/ seasons for each functional group.
7. Determine talking points for each functional group that need to be answered by discussion.
8. Ensure you have images of example species within the functional groups.

Conducting the exercise:

1. Explain the purpose of the exercise to the participants and get consent. Ensure that you address these questions:
   a. Are species within the functional group found within the region?
   b. Where are these individuals found within the region?
   c. How many individuals are found within the region?
      i. Draw on the transparency sheet where the functional group is found and how many individuals are found in each identified area (Figure 1);
   d. Where were the individuals found in the past?
      i. Draw on the transparency sheet where the functional group used to be found and how many individuals used to be present within each area (Figure 2).
      ii. Note: if individuals do not wish or are unable to use the map, ask them to state the land covers that the functional group is found within.
   e. How many individuals did there used to be?
   f. Have there been any changes in residents' use and access to game due to policy changes?
      i. Note: if individuals struggle to answer, attempt rephrase the question until they answer the broader question listed above (e.g. "how many individuals are found?" may need to be rephrased as "on average, how many of a given functional group do you see in a field?"
2. Draw in a table how the functional group changes throughout the season.

Specific questions to ask:

Show a picture of functional group X and explain that this represents all animals like this (not just the species in the picture). Then ask the following:

1. Is X in the village?
   a. ***No*** – continue to question *2*.
   b. ***Yes*** – continue to question *3*.
2. Has X ever lived in the village?
   a. ***No*** – move on to another animal.
   b. ***Yes*** – continue to question *3* but use past tense when asking the questions.

3. Where does X live? **NB** – our aim is to link the functional group to particular land use/cover types. Participants may indicate areas on the land use/cover map, from which land use/cover should be noted, or they may prefer to simply describe the land cover/use (i.e. forests, agriculture etc.).
4. How many of X is there?
5. 10 years ago how many of X were there and where? (linking to particular land uses/covers)
6. 20 years ago how many of X were there and where? (linking to particular land uses/covers)
7. 30 years ago how many of X were there and where? (linking to particular land uses/covers)
8. How does X change across the seasons?
9. What are the advantages and disadvantages of X?
10. How do you control X?
11. How does X change agricultural yield?
12. How difficult is X to obtain? (Work/time required)
13. Have there been any changes in your use of X due to policy changes?

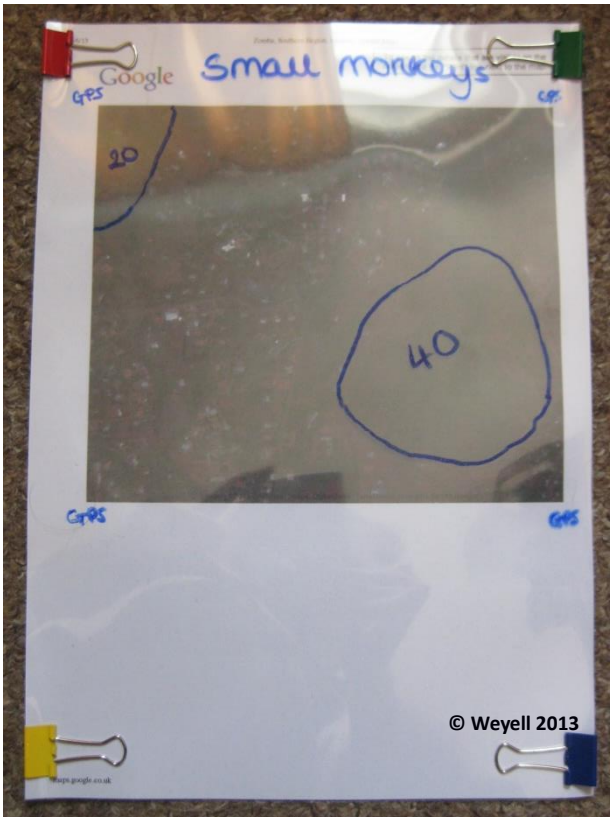

Figure 1 - An example map and transparency sheet showing the current distribution of a functional group

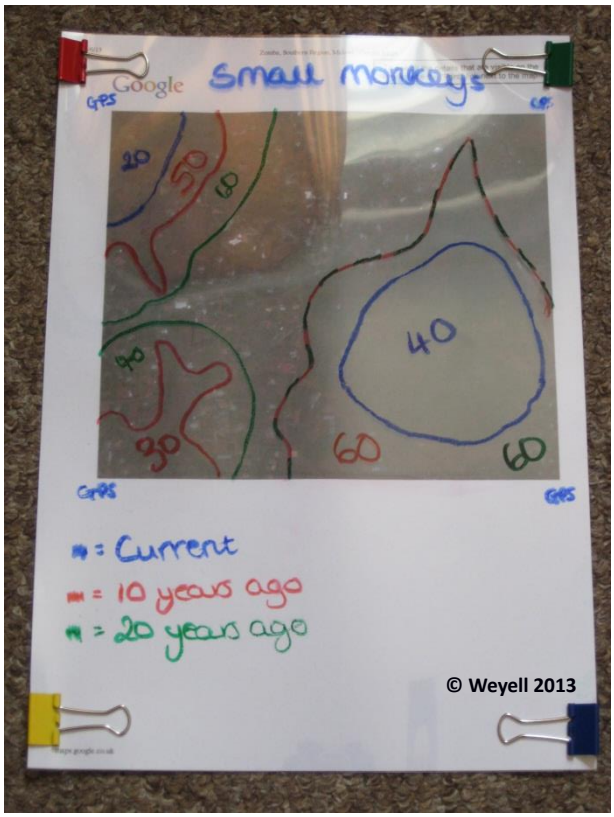

Figure 2 - An example map and transparency sheet showing the current and past distribution of a functional group

CULTURAL SERVICES

Introduction

A combination of group interviews and PRAs are to be carried out to determine the range, nature and spatial distribution of cultural ecosystem services at each site. This rapid assessment style was developed in order to compliment and extend the existing TESSA ecosystem services framework (Peh et al., 2012; http://tessa.tools/).

This exercise is divided into three smaller exercises:
1. Village transect walk and photos
2. Photo-based group interviews
3. ES importance group interviews

Definition of cultural ecosystem services:
"Non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences" (Millennium Ecosystem Assessment, p.40)

What for?

Village transect walk and photos:
- To identify the different land types in and around each village.
- To identify the cultural ecosystem services provided by different types of land in and around the villages.

Photo-based group interviews:
- To identify the cultural ecosystem services provided by different types of land in and around Malawian villages.
- To determine the replaceability of the cultural services identified.
- To evaluate the cultural services identified
- To develop and test a framework for assessing the value of cultural ecosystem services.

ES importance group interviews:
- To determine the replaceability of the cultural services identified.
- To evaluate the cultural services identified
- To develop and test a framework for assessing the value of cultural ecosystem services.

Who with?

Village transect walk and photos:
- For each village, an individual familiar with the village and with good knowledge of day-to-day activities should be requested to lead a tour around the village.

Photo-based group interviews:

- In each village four groups of 4-6 people should be requested; 2 groups of men and two groups of women, with mixed well-being levels.

ES importance group interviews:

- The same groups as above. It is suggested that one group does the photo-based interview, followed immediately by the ES importance interview.

What with?

Village transect walk and photos:

- Digital camera
- Notebook
- Printed land use map of village
- Writing materials
- Photo printer (regular printer can be used)

Photo-based group interviews:

- A room/space to sit
- Photographs of cultural ES in village (from the transect walk)
- Digital voice recorder
- Notebook
- Writing materials

ES importance group interviews:

- A large room/space
- Photographs of cultural ES in village
- Digital voice recorder
- Notebook
- Writing materials
- Large sheet of paper/ground to drawn on
- Material for markers (e.g. stones, seeds)
- Camera to document output

How?

<u>Village transect walk and photos:</u>
The aims of the study should be communicated to the village guide prior to the transect walk. Each ecosystem type in the village should be photographed and relevant information provided by the guide noted down. Potential ecosystems not identified by the guide should also be photographed to ensure that all relevant ecosystems are recorded.
The following ecosystem types are identified as having for potential for cultural ecosystem service provision:

- General forested area
- Grassland
- 'Sacred' forested area/cemetery

Table 3 – Questions supporting the photo-based group interviews.

Questions to accompany each photo	Response type
What is this area?	Open
Do you use this area?	Y/N
If yes, how often?	Coded scale
What do you use this area for? What do you do here? Probe if required + remind about cultural/non-monetary aspect - Religious - Recreation - Relaxation - Social - Education - Inspiration - Spiritual	Open with thematic coding
Can everyone use this area?	Y/N
If no, who can?	Open
→ Why can these people use it?	Open
Could you [list activities identified above] somewhere else in the village?	Open
If yes, where?	Open
If no, why not?	Open
Do other villages in Zomba have this type of area?	Coded scale
If yes, can you use this area in another location?	Y/N
If yes, how long would it take you to/how would you travel there?	Open with thematic coding
If no, why not?	
Do you like this area? (Subject to previous answers)	Y/N scale
→ Why/ why not?	Open
Do you think this area is beautiful? (Subject to previous answers)	Y/N scale
→ Why/ why not?	Open
How would you feel if this area no longer existed in [name of village]? Probe if required: - Sad - Neutral/indifferent - Other emotion e.g. anger Note down scale of response (informal likert)	Open
If this area no longer existed, what would be needed in its place to fulfil the same function? Probe if required: - Building - Other type of land - Houses	Open with thematic coding
Do you have any memories associated with this area? Probe for more detail - Can you tell me more about that? - When was this/what age were you?	Open
Has the importance of this area changed over time? Probe if required: - In what way?	Open
Do you think the importance of this area will change in the future? Probe if required: – In what way?	Open
Is there anything else you want to add about this area?	Open

- Important tree/central village tree (can be identified by chief/village guide)
- Shade-providing tree
- Social meeting area (gardens etc)
- Cropland
- Recreational area e.g. sports pitch
- Water system e.g. river/stream
- Any other village specific land type(s)

Where there are more than two areas in the village of the same land type they should be differentiated and investigated separately. Each ecosystem should be marked on the printed map and coded to correspond with the correct photo.
This exercise must be conducted the day prior to commencing the below interviews because the photographs obtained need to be printed using a photo printer ready for use in these exercises. This sub-exercise need only be done once for each village.

Photo-based group interviews:
The interviews are semi-structured (Table 3). In accordance with best practice they gather information on three main areas; facts, behaviour and attitudes/beliefs.
The interviews are centred around a range of photographs (see village transect walk and photos), which facilitate discussion and minimise the language barrier.
Prior to interviews the translator should be briefed extensively on the aims of the study and to ensure that they have a good understanding of cultural ES. A definition of cultural ES and the aims of the study should be introduced to the respondents at the start of the interview and reinforced when needed.
The interviews should be recorded on an audio device and notes taken throughout.

ES importance group interviews:
An overall score for the 'importance' of a cultural ecosystem service should calculated using the matrix framework below. This should be sketched out on a large sheet of paper (but could also be drawn in the ground depending on the setting; Table 4).
Stones or previously bought counters can serve as markers to score each cultural ES against a list of criteria. The end result should be both photographed and sketched out. A higher score does not always denote a higher importance; to make it simpler for the participants it was decided that each importance factor should be scored in the most logical way i.e. 5/5 for 'beauty; means extremely beautiful and thus important whilst a 5/5 for 'alternatives' shows that the same service was provided by many places in the village and thus the ecosystem was less important. A universal scoring system should be applied retrospectively by inverting the relevant groups.
The participants' discussion accompanying this exercise is of equal (if not greater) importance than the scoring itself. The participants should be asked why they had allocated the decided importance to each service and their responses should be noted throughout the session. The session should also be recorded on an audio device.

Table 4 - Example matrix framework

Importance factor	Cultural Ecosystem services (info from individual interviews)			
	Land type (photo) 1	Land type (photo) 2	Land type (photo) 3	Land type (photo) 4
Non-replaceable (5 = highly replaceable, 0 = impossible to replace)	e.g. …	.	..	.
Beauty (0 = unattractive/neutral, 5 = extremely beautiful)				
Unique to village (5 = in all other villages in Zomba, 0 = completely unique to this village)				
Community (0 = used by no members of village, 5 = used by everyone in village)				
Alternatives (5 = service can be found in multiple places of same village, 0 = service found nowhere else in village and does not exist/inaccessible in another location)				
Changes over time (0 = no change in last 10 years, 5 = many/large change(s) in last 10 years)				

SEASONAL HOUSEHOLD DECISION-MAKING

Introduction

The following PRA exercise is a combination of a seasonal calendar and a group interview (conducted immediately after each other; Schreckenberg et al., 2016). The aim of the seasonal calendar is to ascertain coping strategies in drought years. In our specific case, the interviews were also used to obtain data on the fertiliser subsidies used in Malawi (this may be of less use elsewhere in the world, but can be adapted to evaluate the impact of any policy).

What for?

Seasonal Household Decision-Making:

- To identify seasonal changes in household decision making and livelihood strategies.
- To identify coping strategies when faced with drought.

Impact of Input Subsidies Interview:

- To determine whether households have access to input subsidies or not.
- To explore the types of subsidies available
- To identify perceived impact of input subsidies upon household decisions

Who with?

Seasonal Household Decision-Making:
Work with a small group of informants (eight at most).This exercise should be conducted separately with male and female heads of households from different socioeconomic groups. Thus, there should be four groups: very poor/poor female heads of household; very poor/poo male heads of household; medium/rich female heads of household; and medium/rich male heads of household.

Impact of Input Subsidies Interview:
The same group as above. The interview should be conducted immediately after the decision-making sub-exercise

What with?

Seasonal Household Decision-Making:

- A large space or spacious room.
- Seeds, coloured cards or pebbles to signal information.
- Writing/ drawing materials easy to amend (e.g. chalk, coloured powder, or pencils).
- A flipchart, board/ wall easy to clean or the ground.
- A camera to register all the material produced during the meeting.
- A digital recorder to record peoples interventions.
- A notebook to take notes.

Impact of Input Subsidies Interview:

- A digital recorder to record peoples interventions
- A notebook to take notes

Table 4 - Example of seasonal calendar

Months :	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season :	Rainy Season				Cold Season			Hot Season			Rainy Season	
Activity:												
Maize												
Sweet Potato												
Rice												
Pigeon Pea												
Tobacco												
Cassava												
Fishing												
Hunting												
Livestock												
Wild Foods												
Wood fuel												
Labour												
Sell at market												
Buy at market												
Other												
Total	60	60	60	60	60	60	60	60	60	60	60	60

How?

Seasonal Household Decision-Making:

Explain the purposes of the exercise. In general you want to learn about the following:

- How household decision making and access to food vary across the seasons.
- The coping mechanisms employed by households when under stress in the form of drought.
- The perceived impact of policy/ development actions in the form of input subsidies.

Identify the different seasons of the year (e.g. hot, dry, wet) and determine basic characteristics such as the duration of seasons (in months), which month/ season they consider to be the start of the year etc.

Draw a table with the seasons and corresponding months in the top row, starting with the 'beginning' of the year as specified by the participants. Add a column entitled 'household activity' and list the activities outlined in the example calendar below.

For each month, ask participants to divide 60 counters between each of the household activities according to the time they allocate (the greater the number of counters, the more time spent on a particular activity).

Ask the participants for reasons why the time spent on a particular activity and the quantity of resource obtained might vary between the seasons (e.g. rains).

Move on to discuss the impact of drought upon household decision making. First ask participants how they define a drought - how dry? Can they think of a historical example?
Complete the table a second time, but this time consider the impact of drought upon decision making and use a different coloured counter.
Thank the participants. Copy the tables produced and take pictures of them.

Impact of Input Subsidies Interview:
Conduct a semi-structured interview, focussing on the following questions:

1. Do the participants have access to input subsidies?
2. If so, what type of subsidies are made available e.g. fertilisers/ seeds?
3. And in what form are the subsidies made available? Is it voucher based?
4. What quantity of subsidies are made available e.g. kg bag of maize fertiliser? Is this per voucher?
5. In a typical year, when are the subsidies made available i.e. what months/ seasons?
6. How frequently are the subsidies made available i.e. every year/ sporadically?
7. If the input subsidies are voucher based, how many vouchers do they receive each time the subsidies are made available?
8. How do the subsidies affect the decisions made over what crops to plant and when?
9. How do the subsidies affect the amount of land allocated to each crop?
10. How do the subsidies impact the amount of yield?
11. How do the subsidies effect the ability to cope under stress e.g. drought.
12. Are there any other points they would like to raise about the input subsidy programme which have not been covered by these questions?

VEGETATIVE BIOMASS MEASUREMENT

Introduction

The following inventory plot method is designed to rapidly provide primary biomass data various land uses/covers. In our examples, there were four main land uses (tree-dominated land uses/covers; cropland; grassland; settlements) and 12 plots were created, three for each land use/cover.

What for?

- To provide primary biomass data for:
  - Tree-dominated land uses/covers
  - Cropland
  - Grassland
  - Settlements

Who with?

This exercise should be conducted with a villager (or two) with good knowledge of the land uses/covers in the village, as well as the local tree names

What with?

- Land use/cover map of the village
- Calculator
- DBH tape
- Measuring tape
- Clinometer
- Data sheets
- Local name – latin binomial database
- RAINFOR protocols
  - http://www.rainfor.org/upload/ManualsEnglish/RAINFOR_field_manual_version_June_2009_ENG.pdf
  - http://www.rainfor.org/upload/ManualsEnglish/TreeHeight_english[1].pdf)

How?

A transect walk around the village should be undertaken before sampling individual plots using a method of stratified random sampling. This provides a more accurate cross section of the population than the procedure of random sampling.

1) Establishing tree inventory plots
The village map is divided into three roughly equal sections along its length to enable a sample of forest to be collected from each section if one is present in each. If more than one site is present in a section they are assigned a numeric value and chosen with the use of a random number generator or tossing a coin depending on the number of sites.

The length of the parameters of the whole forest site are established using the map scale and the position of a 20m by 20m plot is determined by using random number generator. The SW corner of the plot can be established by walking a random number of paces along the length of the site and then a random number of paces along its width.

Within the 20m x 20m forest plot, all trees will be sampled abiding by the methodology set out by RAINFOR (http://www.rainfor.org/; 20m x 20m is the size of RAINFOR subplots). The diameter at 1.3m above the ground should be measured (diameter at breast height; DBH). For larger trees, a DBH tape should be used and, for smaller trees, a calliper should be used. In some cases (where the tree is deformed) it is necessary to shift the DBH; please see the RAINFOR manual for a full explanation (http://www.rainfor.org/upload/ManualsEnglish/RAINFOR_field_manual_version_June_2009_ENG.pdf). Tree height will be measured using a clinometer. The angle (degrees) between eye level and top tree branch visible is measured at a known distance away from the tree. A full description of how to measure tree height is available at http://www.rainfor.org/upload/ManualsEnglish/TreeHeight_english[1].pdf. The slope angle should be measured if uneven terrain is present.

The local tree species names and other details such as growth rate and uses should be identified primarily with assistance from a village forestry committee member and translator. Secondary data can be used to convert these local names into latin binomials. Data should be recorded in a standardised table (Table 5).

Table 5 - Example data sheet

Village Number	Plot Coordinates	Date	Plot Number	Section no.	No. Of canopies	Coordinates of tree	Tree Number	Local	English	Latin	DBH (mm)	POM if not 1.3m	Clinometer angle	Height (m)	Time to grow	Use	Tree canopy no.	Age (years)	Disturbance	Classification	Distance to tree (paces)	Distance to tree (metres)	Slope (deg)	Value	Output of grassland in bundles	Coordinates of whole plot	Notes

2) Establishing grassland, cropland and settlement inventory plots
The village should be divided into three sections and each section of the village should be sampled for grassland, cropland and settlement if present. If more than one area is present in one section they are assigned a numeric value and chosen with the use of a random number generator or tossing a coin depending on the number of sites. The edge of a selected area will be identified by the village forestry committee member if not apparent from

the map available and from this point a random number will be generated to determine the number of paces to walk along an established path in the area and if the land use is present on each side of the path when the randomly generated point is arrived at, a coin is tossed to determine which side of the path to sample. A plot can then be established at this location.

In the cropland and grassland plots, if the field owner is not available the village forestry committee member should be asked how much crop they estimate that the field produces and the same for the grassland. The selected field area is then measured with a tape measure. In addition, all woody vegetation must be recorded using the tree inventory methods described above.

For settlement areas all the trees within a 20m by 20m plot are measured for DBH and height and any bamboo or banana stems are counted, DBH recorded and average height is measured using the tree inventory method described above. If vegetation is herbaceous, it should be treated as cropland/grassland.

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