IN EQUAL MEASURE

A User Guide to Gender Analysis in Agroforestry

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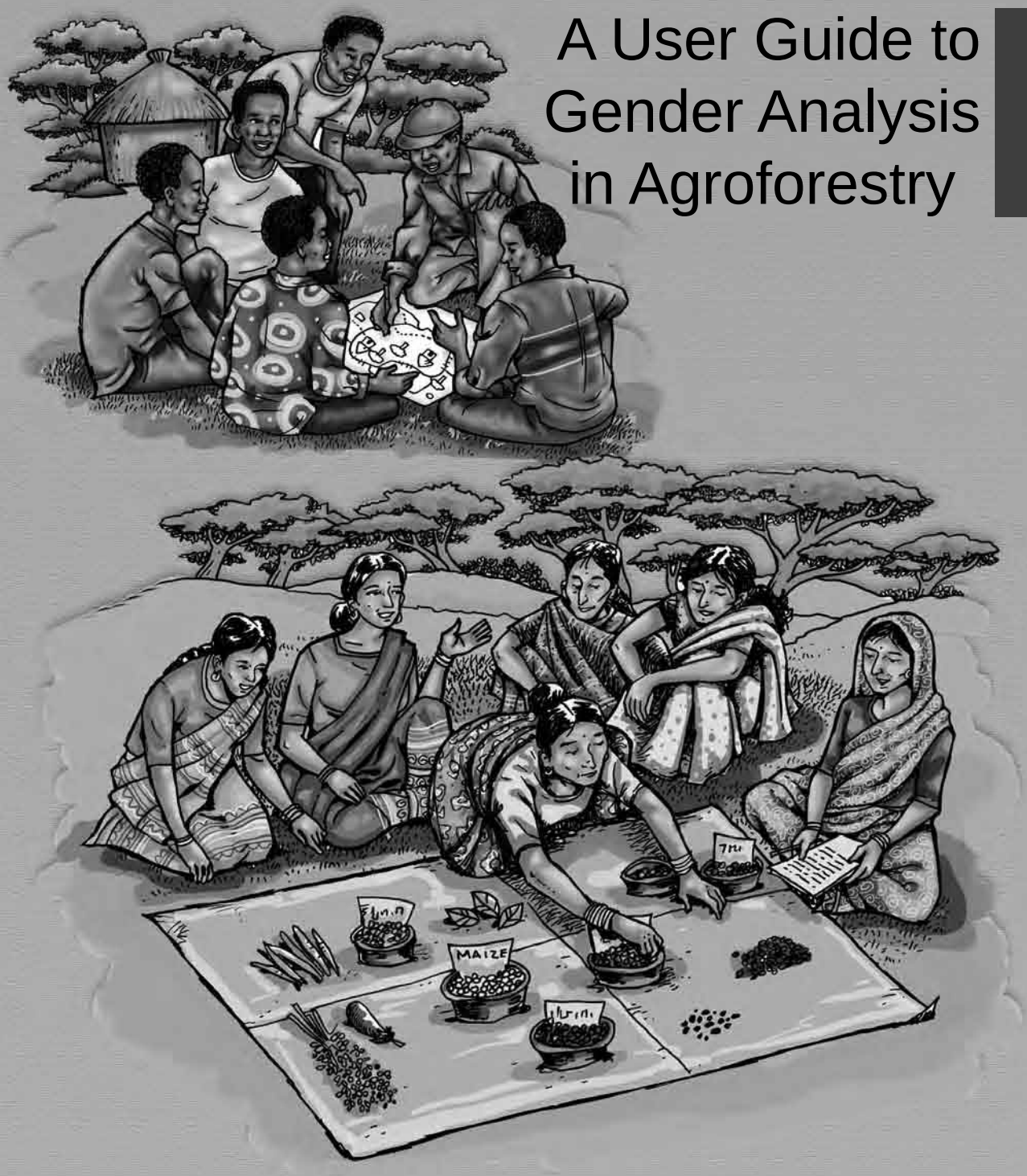

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Preface

The World Agroforestry Center (formerly known as ICRAF) sought the support of the International Institute of Rural Reconstruction (IIRR) to facilitate a three-day writeshop to produce a user guide on gender methods and tools currently being used by ICRAF researchers.

IIRR pioneered the writeshop process in the 1980s. IIRR has since then facilitated and produced numerous publications globally. A writeshop is an intensive, participatory writing process that aims to produce written materials by a multidisciplinary team under one roof. The process has been adapted by many international and local organizations for knowledge documentation and management.

Objective

The publication compiles various methods and tools in a user guide on gender analysis that ICRAF researchers were able to develop, innovate or apply in Africa and Asia.

Target readers

The book is useful for researchers, scientists, and program officers and managers doing basic gender analysis and research in agroforestry.

About the book

The researchers were asked to draft their papers before they came to the writeshop. The writeshop was held on 17-19 July 2013 in Bohol, Philippines. The objective and target readers of the user guide were agreed upon. The drafts were subjected to comments and critique through plenary and small group discussions. After a series of revisions and with the help and guidance of resource persons, facilitators, illustrator and graphic designer, the participants came up with a third draft of their papers including artworks.

After the writeshop, the drafts were then subjected to an external expert peer review. The final draft was further edited, designed and printed.

The book is structured to cover a range of gender issues in various forest, trees and agroforest management areas from tree species identification to landuse decision-making. Participatory research tools are featured such as ranking, mapping, modeling, participatory GIS; and other tools that can aid in looking at gender issues, roles and preferences primarily but not limited to agroforestry research and development.

Introduction

Delia Catacutan, Esther Mwangi, Bimbika Sijapati Basnett, Ujjwal Pradhan

The Consultative Group on International Agriculture Research (CGIAR) is committed to addressing gender concerns in research and action. The Forest, Trees and Agroforests (FTA) initiative is a global research program implemented by CGIAR centres–the Center for International Forestry Research (CIFOR), the World Agroforestry Centre (ICRAF), Bioversity International, the Centre for International Tropical Agriculture (CIAT) and the Agricultural Research for Development (CIRAD)–in collaboration with international, regional, national, and local partners.

FTA has developed a Gender Strategy that promises to generate an understanding of key institutional, cultural, and attitudinal contexts that entrench inequity across a relevant set of issues. It also promises to identify policies, technologies, and practices that will enhance gender equity in access, use, and management of forests and trees, as well as the distribution of associated benefits.

The FTA gender strategy acknowledges that despite a wealth of studies demonstrating the critically important role women play in managing forests, agroforestry and tree genetic resources, women's contributions remain underappreciated. Women are traditionally the main collectors of fuelwood, medicinal and aromatic plants, and other non-timber forest products from forest and agroforestry landscapes. Their participation in decision making at household and community levels, although limited, has demonstrably improved forest regeneration, increased crop yields, improved financial management, and prioritized funding for pro-poor and empowerment programs (Colfer 2005; Shanley & Gaia 2001; Agarwal 2007; Agarwal 2009; Acharya & Gentle 2006; Komarudin et al. 2008). Women in forest communities can generate more than 50% of their income from forests, compared with about a third for men (World Bank et al. 2009).

The Strategy further mentions that although the policy environment for addressing gender inequity has improved over the past decade, women continue to be disadvantaged by insecure access and property rights to forest, tree and land resources, by discrimination and male bias in the provision of services like

credit and technology, and by exclusion from decision making at household, community and national levels (Quisumbing et al. 2001; Meinzen-Dick et al. 2010; Bose 2011; Place 1995; German et al. 2008; Bandiaky-Badji 2011; Peach Brown 2011). Women disproportionately bear the costs of tree and forest management, realize only a fraction of the benefits, and tend to be enlisted for decision making only when forest and tree resources are degraded (Agrawwal & Chhatre 2006).

Moreover, because women lack formal education, employment, and personal networks, they are poorly placed to influence resource allocation or research (Crewe & Harrison 1998; Ferrier 2002). Changes in tree cover and loss of community access to forests can have a disproportionately adverse impact on women, with indirect impacts on households and, consequently, on the livelihoods of 5–10 times as many people. Gender equity in the forestry and agroforestry sectors can thus contribute to the achievement of broader social and economic goals, including the post-2015 development goals.

Furthermore, the Strategy recognizes the importance of contextualizing the constraints facing women in tree and forest management and conservation. It argues that gender inequality intersects with other social relations and is relational. Any focus on women must therefore examine the interplay of power, institutions, and practices that animate disparities between men and women in tree and forest management if such disparities are to be reduced or eliminated. Studies on gender and value chain demonstrate that women tend to concentrate at nodes of the value chain that are characterized by low visibility. Should their presence extend to more visible nodes (such as processing and marketing), the higher visibility would result in higher returns. These disparities are particularly pronounced in communities where division of labour within the household is non-negotiable and where female seclusion is strongly practiced.

In a recent case study of the value chain of agricultural commodities among Muslim communities in the Terai region of Nepal, it was found that women were barred from interacting with men outside of their family and immediate surroundings. They had to depend on their male relatives to learn about new technologies, to engage with male agriculturists, to market their produce beyond the village level, and so on. But reliance on male relatives was becoming increasingly difficult due to the growing migration of males to the Persian Gulf and South Asia in search of higher-paying work. Another case study suggested that Dalit women entrepreneurs were prevented from entering certain lucrative markets, such as the dairy industry, because of the practice of untouchability. People of higher castes, which comprised the majority of potential customers, refused to buy milk sold by Dalits (Basnett 2013a).

At the same time, rural areas in many countries and contexts are rapidly changing and no longer rely exclusively on land and agriculture. For example,

in many countries, circular migration is emerging as one of the largest sources of employment, and the remittances sent home by migrants is estimated to be greater than the sum total of foreign aid and foreign direct investment. Such changes mean that the importance of livelihoods derived from agriculture and natural resources (such as forests and agroforests) are either dwindling in importance or constitute only part of a broader portfolio of rural livelihoods. These shifts in agrarian settings also have profound ripple effects on how forests are governed and who governs them.

A recent study exploring the nexus between migration, rural livelihoods, and forest governance in the context of the mid hills region of Nepal serves to demonstrate that the impacts of migration are determined by operations of interlocking relations of gender, caste, and ethnicity. In one village where gender norms were lax but women depended on men to negotiate with extra-local actors such as the state, the impact of migration was such that community forestry became dominated by women, with men acting as mere intermediaries between female decision makers and forest officials. In another village, male out-migration was promoting new forms of inequality between women and men and further entrenching male domination in forest governance (Basnett 2013b).

Taking note of these developments, it appears that focusing on the dynamic relationships between men and women (rather than solely on women) has a higher probability of providing guidance for changes to institutions, policies, and practices relevant for transforming gender inequality. Such a focus must, however, avoid a zero-sum struggle between men and women. To effect change, the role of gender research is to unpack 'farmers' and 'choices'; to identify opportunities for leveraging empowerment and inclusive change; and to engage with the various actors of change such as government, civil society and the donor community.

As a result, the FTA gender strategy particularly recognizes the importance of collecting gender-disaggregated data, and then analysing this data from a gender-sensitive perspective to identify interventions that will ultimately enhance gender equity. The regular and consistent gathering of gender-disaggregated data on various aspects of the forest-tree-people interface is integral for identifying men's and women's different perceptions, experiences, contributions, and priorities. These must be coupled with relevant gender-based analyses to provide in-depth information on gender differentiation and, in particular, to identify the institutional, cultural, and attitudinal factors that underpin these differences. Gender analysis must identify options and priorities for transforming inequality, as well as the roles and responsibilities of relevant stakeholders in realising these options and priorities. Although gender differentiation is inherently a local experience, the analysis of conditioning factors will spotlight features of institutions (including markets, policies and legal regimes) at multiple governance levels that influence local-level outcomes.

Mainstreaming gender in the research and development cycle, however, is fraught with lack of capacity for sound analysis. Social science researchers are expected to include gender issues in their work and researchers in the natural science fields are also beginning to integrate gender in their work. But many encounter problems when it comes to finding research methods for collecting gender-disaggregated data and tools for gender analysis that are appropriate for a particular gender issue or setting. Thus, this volume was developed.

This volume describes 15 methods that have been used for gender analysis (in agroforestry in particular and natural resources management in general). The methods are not entirely new—they have been used in various research topics—but as illustrated in this volume, these methods were adapted to elicit gender-specific information and to improve understanding of gender preferences and choices, as well as gendered impacts.

The various methods featured in this volume capture gender-specific perceptions and preferences for ecosystem services, farming systems, gender division of labor in production, marketing of agroforestry products, tree germplasm flow, and other subjects. Gender-differentiated access to social networks and ways in which women acquire information related to agriculture and agroforestry are also included. Methods for capturing the gender dimensions of pressing policy issues such as reducing emissions from deforestation and degradation (REDD+) and large-scale land acquisitions are also included. Fun methods that are likely to sustain the interest of research participants are also included such as the 'Bao game', as well as innovative ones such as 'role play games' and 'agent-based modeling'. Each method guide includes detailed steps as well as practical tips for implementing them during the research process. The advantages of each method are outlined as well as potential shortcomings to be overcome or circumvented.

The methods described in this publication may be quite diverse, but they are drawn together by one common thread—a strong commitment towards gender-responsive participatory research that involves the participation and represents the different needs of the end users. Each of the methods showcased in the guide recognizes that smallholder farmers play key roles in food production, have specialized knowledge regarding the management of natural resources in their specific environments, and are conscious of the value of biodiversity and a healthy environment. The methods further recognize that differences in access, interests, and needs along gender, ethnic, age, and socio-economic lines have an impact on innovation in natural resources management. As such, these methods are in line with the FTA Gender Strategy commitment to promoting gender-sensitive participatory research techniques that foster inclusion, learning, and empowerment.

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Gendered tree species evaluation using the Bao game

Evelyne Kiptot, Steven Franzel

The last few years have witnessed a dramatic increase in the use of participatory tools in evaluating tree species. These tools are able to generate data that can capture farmers' perceptions about their preferences and ratings of various species for different uses. Furthermore, such tools are able to capture the differences in perceptions between men and women. One tool that has been successfully used in East and Southern Africa is known as the 'bao' game.

The bao is a traditional board game played throughout Africa, Asia and the Caribbean. It is most popular among the Swahili people of Tanzania and Kenya. The name itself, 'bao', is a Swahili word for 'board' or 'board game'. In Malawi, a close variant of the game is known as 'bawo'.

The bao game is a competitive game in which players move seeds along a matrix of carved out pockets of a board. The number of rows and columns vary, depending on the area. In East and Southern Africa, the game traditionally involves two competing individuals or two opposing groups. By following agreed

procedures and rules, seeds are moved and removed from the board. The game ends when a group or player has only a few seeds without any moves left.

Various researchers (Kuntashula and Mafongoya 2005; Roothaert and Franzel 2001; Franzel 2000; Franzel et al. 1995) have made adaptations to the game and have used it in farmers' evaluation of different tree species. The bao game can be adapted to crop varieties, tree attributes and even socioeconomic indicators in a community. Evaluations can be done individually at the household level or by a group of male and female farmers. Men and women farmers play with one group sitting on one side of the board and the other on the opposite side. In communities where men and women cannot interact freely, the players can be grouped male against female.

Materials

- The bao board (alternative materials can be used such as making pockets on the ground or on a flip chart placed on the floor)
- Seeds/stones/pebbles
- Leaves/twigs of different tree species
- Markers

Steps

1. Assemble the materials.

2. Recruit a facilitator to lead the process and an observer to record it.

3. Decide on the criteria to be used for rating/ranking (e.g. benefits of trees, fertility improvement, fodder, light construction material, poles, fuelwood, medicine or tree attributes such as straightness) as identified by farmers through discussions/farm walks.

4. Decide on the scoring through discussion (e.g. a 1–4 scale, where 1 seed = poor, 2 seeds = good, 3 seeds = very good, 4 seeds = excellent).

5. Label the pockets according to the criteria of tree species or put various leaves/twigs of tree species beside the pockets of the board if the focus is on species selection.

6. Agree on the rules of the game (e.g. no influence from the facilitator, seeds cannot be moved after the game has ended).

7. Score by placing seeds in different pockets of the board as per the desired rating.

8. Explain the reason for the score.

9. At the end of the game, count the number of seeds per pocket to get totals across rows and columns.

10. Document the findings of preferred species/attributes and the reasons for scoring.

Table 1: Rating trees for major benefits differentiated by gender in eastern Zambia[a]

Species	Soil fertility		Fuelwood		Poles		Light construction materials		Fodder	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Acacia angustissima	3.1	3.4	2.3	2.6	1.5	1.9	2.7	2.7	3.1	3.3
Leucaena pallida	2.6	2.6	2.8	3.1	2.7	2.6	3.4	3.3	2.4	2.8
Leucaena esculenta (Machakos)	2.3 [b]	2.7 [b]	2.1	2.2	1.4	1.5	1.8	2.0	2.4	2.7
Leucaena diversifolia (35/88)	2.3	2.2	2.3	2.4	2.0	2.0	3.0	2.8	2.6	2.9
Leucaena diversifolia (53/88)	2.3	2.5	2.5	2.6	2.0	2.1	3.0	2.8	2.6	2.9
Calliandra calothyrsus (ex Embu)	2.8	3.0	2.8	2.8	1.8	1.9	2.9	2.8	2.9	3.0
Senna siamea	1.7	1.6	3.0	3.0	2.2	2.6	1.9	2.1	1.4	1.6
Leucaena esculanta (52/87)	2.8	2.7	3.0	3.0	2.4	2.6	3.5	3.3	2.6	2.9
Senna spectabilis	2.0	2.0	2.2	2.3	1.3	1.6	1.5	1.6	1.4	1.4
Leucaena collinsii (45/85)	3.2	3.2	3.0	3.1	2.5	2.7	3.3	3.4	2.8 [b]	3.2 [b]
Grilicidia sepium	3.8	4.0	2.7	2.7	1.9	1.9	2.9	2.8	1.7	1.7

[a] A total of 55 males and 57 females were involved in the study.

[b] Mean score difference is significant at 5% level.

Source: Kuntashula and Mafongoya 2005

Example of results from a Zambian agroforestry project

Eighteen farmers experienced in agroforestry from the study areas were invited to Msekera Research Station in Zambia to identify the benefits that they consider before planting agroforestry trees. In the first stage, the farmers were asked to rank 11 tree species according to the benefits they would expect. At the end of the ranking exercise, the group discussed the benefits of the tree species.

The second stage involved the use of the bao game with a larger sample of farmers interested in agroforestry. The benefits identified by the 18 farmers were discussed and a consensus was reached. The use of the bao game was explained to farmers who were then asked to appraise the 11 tree species. Before the game, researchers and farmers labelled some pockets of the bao board with benefits of trees such as soil fertility improvement, fodder, light construction material, poles and fuelwood. Each farmer had a good look at each of the 11 species, scoring each of the five benefits by moving seeds among the pockets of the board. Scoring was done on a 1–4 scale where 1 seed = poor, 2 seeds = good, 3 seeds = very good, and 4 seeds = excellent. The farmers (55 men and 57 women) gave 55 different ratings. They were then asked to explain why they gave certain scores to certain trees. Both males and females rated the trees in a similar pattern—in only two of the ratings were there a significant difference between men and women (table 1).

Advantages

- The game is easy to play.
- It can easily be adapted in most parts of the developing world.
- It gives farmers an opportunity to take charge of the process.
- It gives farmers an opportunity to freely discuss the criteria that they consider important.
- Men and women can play separately or together.
- The discussions fully engage farmers.
- Since it is a visual tool, farmers have the flexibility to make changes before the end of the game.
- The game generates quantitative data that can be statistically analysed.

Limitations

- The number of pockets on the board may be a limitation.
- Having too many criteria may take up too much time.
- If farmers do not know the species, it may be difficult to score.

- The board game is associated with men in many countries and may put off female farmers.
- Farmers may find it difficult to rate a species based on a criteria relative to other species if the procedure is not well explained at the beginning.
- Reaching a consensus may prove problematic in some cases.

Do's and don'ts

- Do encourage farmers to leave a pocket blank if they are not sure of how the species performs on a particular criterion.
- Do have preparatory farm visits so that farmers are familiar with the species to be scored.
- Do record the reasons for scores as farmers discuss.
- Don't fill in your chart on the farmers' scores until you are sure they have completed scoring and modifying their scores for a particular criterion.
- Don't influence farmers' discussions.

Key considerations

- Because the bao game requires practice and can generate inaccurate results if not implemented carefully, the facilitator must master the game.
- It may be best to put the game on a table, so that participants do not have to keep bending over to reach the seeds/stones/pebbles.

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Gender participation in tree germplasm flow

Alice Muchugi, Ramni Jamnadass, Sammy Carsan

Getting good quality and quantity tree planting material is one of the challenges limiting successful incorporation of trees into smallholder farming (Graudal and Lillesø 2007). This affects the quantity and quality of the tree products from smallholders thus reducing economic returns and other benefits. Appropriate intervention in tree germplasm delivery systems is therefore essential (Graudal and Lillesø 2007; Lillesø et al. 2011).

Because such an intervention is location-specific, it is important to understand the existing tree germplasm flow and the various players involved. The tree germplasm flow method can be used to identify gender segregation or gendered networks of germplasm circulation among stakeholders in a community. It helps participants get a better understanding of the interactions among stakeholders of agroforestry germplasm and identify key partners for future programs.

A seed flow analysis approach described by De Boef and Thijssen (2007) was used to establish crop seed flow at Jihligaon village, Koraput district, during a regional training on plant genetic resources and seeds in India in 2012.

Materials

- Coloured cards of two different sizes
- Markers
- Large paper sheets (eg. brown paper or flipchart)

Study team

- Facilitator
- Documenter

Steps

Forming the sample groups

1. Mixed group: A manageable group size would have a maximum of 10 participants. Aim for equal number of men and women participants, and randomly select them either from a target population, or from a list of project participants.

2. Female group: Randomly select 10 female participants.

3. Male group: Randomly select 10 male participants.

Groupwork on tree germplasm flow

4. Participants identify stakeholders where they source tree germplasm. Indicate the gender of the stakeholders involved. Note that 'tree germplasm' refers to any agroforestry tree propagation material such as seeds, seedlings, cuttings and grafts.

5. On bigger cards, ask participants to identify additional stakeholders involved in agroforestry tree germplasm exchange (genebanks, community nurseries, private nurseries, local markets, farmers, NGOs, government agencies). Indicate the gender of stakeholders involved in each card.

6. Ask participants to identify trees by functional group. Use the smaller cards to identify the main use groups (fruit, fertilizer, timber, medicinal, aesthetics). A card colour represents each tree use group—several cards may be needed for each function and one tree can serve many functions.

7. On a large sheet of paper, let participants display the bigger cards that show the

germplasm source (stakeholder). The distance between the stakeholders shows how closely they work. Place the small cards that show the tree functions next to the bigger card. A stakeholder can have several small cards indicating the different tree functions s/he is dealing with.

8. Analyse the germplasm flow using a marker pen, draw the flow of germplasm among stakeholders. Arrows indicate the direction of flow and may run in one or more directions. Using a different colour marker pen, draw the flow of germplasm information among stakeholders. Arrows indicate the direction of flow and maybe in one or more directions.

9. Invite the participants to discuss the diagram and confirm the germplasm flow.

10. Generate response from the participants on the diagram. Sample questions that can be answered include:

- How often do you get the planting material from each of the stakeholders?
- How much planting material do you source out?
- Are any issues relating to quality and quantity of planting material provided?

11. Closely observe dynamics of men and women participation during the groupwork. Encourage those who are not participating as much as others to speak up and be more active.

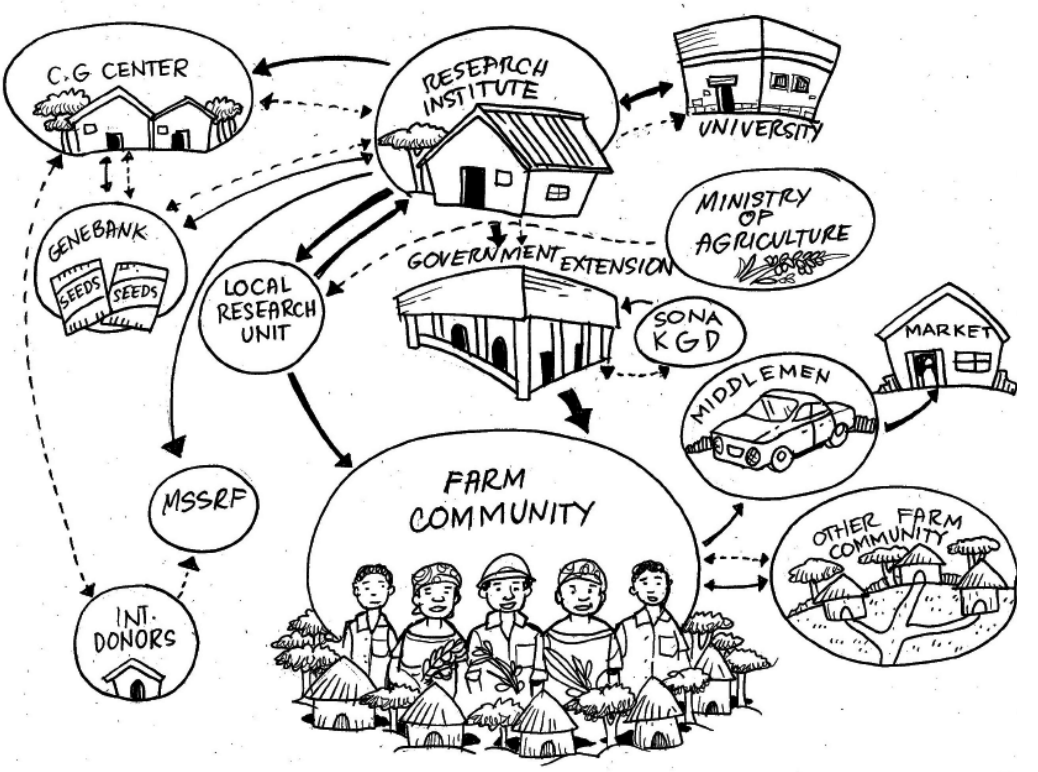
12. Document by taking notes or through use of audio or video recorder.

13. Do the same process for male, female and mixed groups.

14. Observe variations, similarities of flow charts by gender and validate results with the mixed group.

Example of results in India

In the seed flow analysis using the flow chart in Jihligaon village in Koraput district, India, key stakeholders were identified. Further probing revealed why some stakeholders, such as the cooperative and government agencies, were close to the community.



Stakeholder Analysis and flow chart

Do's and don'ts

- Encourage everyone's participation.
- Establish that everyone should respect the views and opinions of others.
- Drawings should be done by consensus.
- Facilitate and broker agreements on differing opinions.
- Do not allow one person to dominate the discussion.

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Exploring gender dimensions of farming through participatory mapping

Alice Muchugi

Women farmers contribute much more than their male counterparts in crop production and management (Ogato et al. 2009). However, despite their significant contribution to the agricultural sector, their roles are often undervalued.

Farm mapping is one of the many tools used in participatory agricultural research. In Prochalate, El Savador, farm mapping was used to study gender segregation on farm use and decision-making (De Boef and Thijssen, 2007). The method is very useful in exploring the contributions of household members (women, girls, men, boys) in farm use and management. It helps provide insights as to how space is used in the farm, and how women, girls, men and boys are segregated in decision-making and in implementing farm activities. It can also be used to explore access and control over resources and income.

Materials

- Flip chart
- Marker pens

Steps

1. Decide on the number of households to involve in farm mapping. Select the households randomly from a population list in the study area (e.g. village) or seek advise/recommendations from the village leader or farmer leader. It is good to select sample households according to (a) income levels; (b) size of farms; and (c) number of household members. This is useful if you wish to study gender dynamics in relation to household endowments or resources.

2. Once the household samples are selected, arrange a visit to schedule the farm mapping.

3. Guide household members to start drawing the map by locating key reference points such as house, roads, fields and forests. The household members can then insert drawings of the farm details such as food crops (maize, beans, etc.), trees (eucalyptus, mangoes, etc.) and livestock (goats, cows, chickens, etc.) to complete the map. Only an image to communicate an intended message is needed and no expertise of drawing is required. All household members are invited to participate freely in the discussion.

4. Using different colour marker pens and symbols/letters, indicate contributions by household members to the management of specific resources.

- Use different colours for men (husband, grandfather, boys) and women (wife, grandmother, girls).
- Indicate responsibility by using the letter D for the one who decides; the letter W for the one who does the work.
- A letter will be added to each card where both male and female household members are involved in decision-making and implementation of specific farming activities.

5. When the map is finished, discuss and analyse the various roles and functions of the household members, the farm structure, and any changes they would like to make relating to farm use, especially trees. Ask participants how much time women and men allocate for the tasks, and if they are happy with such arrangements.

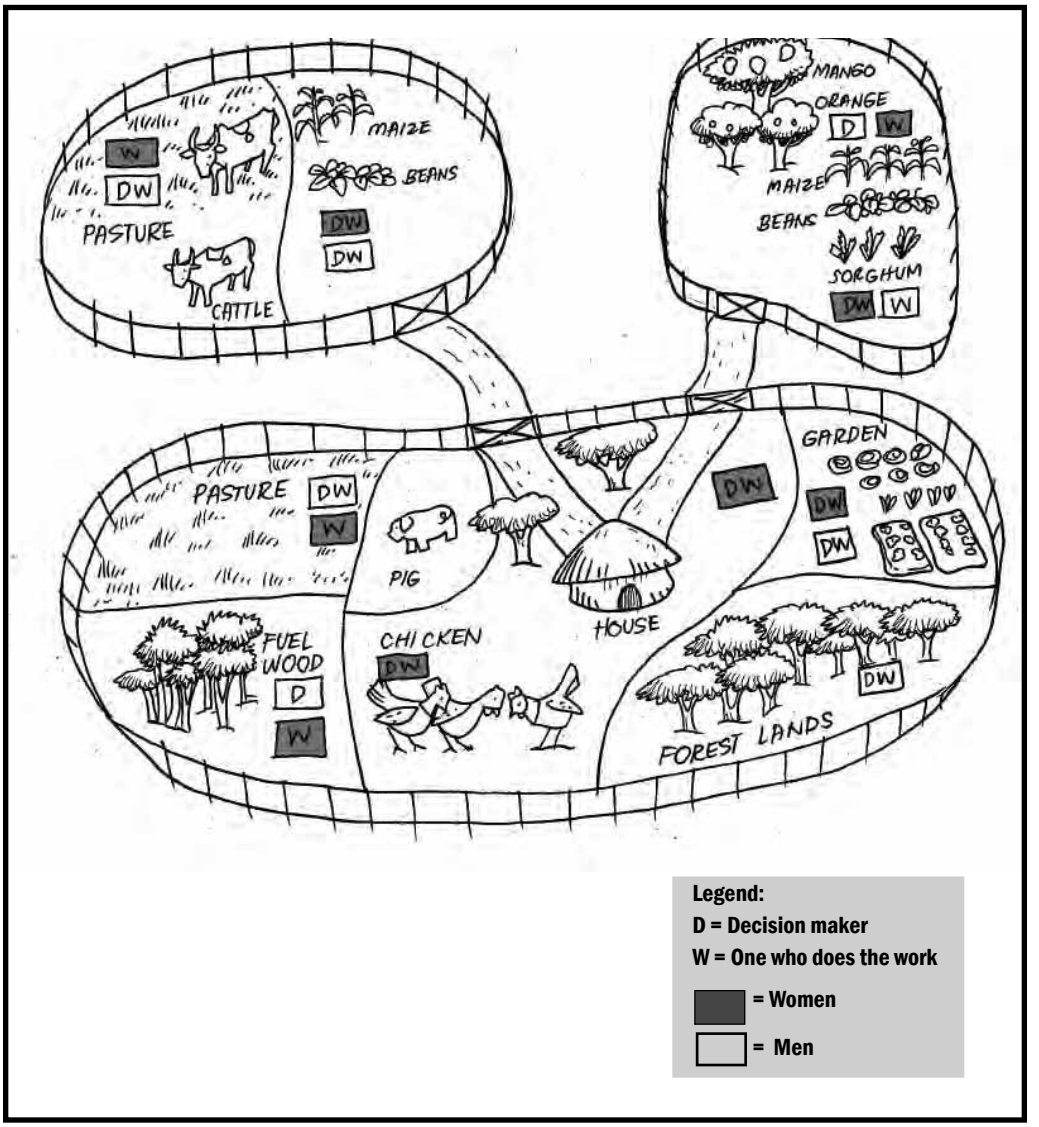
6. If there are older members in the household, a second map can be drawn showing the land use and management for example, from 20 years ago. This is helpful in showing the changes that have taken place over the years in land use

and management. Discussion will reveal the reasons for these changes as well as some key aspects of inter-generational knowledge transfer.

7. Other maps may be drawn featuring other issues such as access and control over resources and income. Ask household members to identify the resources in the farm and to put labels on who has access and who controls them (men or women). Then ask them who decides what to do with the income from the farm.

8. Observe and document the discussions taking place during mapping, as well as the participation of every household member.

Example of results in Prochalate, El Salvador



Farm map showing gender roles in Prochalate, El Salvador (adopted from De Boef and Thijssen 2007).

Advantages

- Participatory mapping involves all household members.
- The tool can demonstrate how a farm space is used, and the different contributions of women and men in farm agrobiodiversity management.

Limitations

- No quantitative data is obtained but it can be inferred.
- Some household members may dominate the discussion.

Key consideration

- Effective facilitation is key to ensure every household member is given a chance to share in the exercise.

References

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Mapping gender preferences for tree and shrub forages

Sammy Carsan, Esther Karanja, Mieke Bourne, Alice Muchugi, Steve Franzel, Ramni Jamnadass

Feed shortages due to droughts have serious impact on livestock in East Africa and other parts of the world. Climate change is exacerbating these impacts. The CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS) examines indigenous tree shrubs and forages in the Rift Valley and parts of central Kenya to generate knowledge on how these feeds can be utilized to improve milk production and provide labour savings to women who spend hours on feed collection. The project's aim was to identify indigenous and exotic forages that can be promoted to enhance feed management strategies in Kenya.

Participatory learning and action (PLA) tools such as livelihood and resource maps are commonly used in farmer workshops and group discussions to meet this requirement (Pretty et al. 1995). In this project, livelihood and resource mapping was carried out to identify important livelihood activities and feed resources that can improve feed management strategies. It was also used to identify gender roles in livelihood activities.

Materials

- Flip charts
- Marker pens (different colours)
- Notebooks and pens for taking notes
- Known fodder tree samples (leaves, seeds, flowers for exhibits or props)
- Provide refreshments and a snack or meal organized by a local community member if possible.
- Provide a small amount of funds for the transport costs of farmers and stakeholders.
- Prepare a checklist of questions to be used as reference during the farmer workshop.

Steps

1. Prepare workshop logistics and gather background information.

- Inform and involve key stakeholders such as extension staff and local administrators on the plan to conduct the workshop, and its expected benefits.
- Set out criteria for selecting male and female participants to attend the workshop. About 20-30 participants should be recruited from existing farmer groups, of which half should be female.
- Identify a central location such as a farmer homestead where the workshop can be held. A convenient venue and time for the women will increase the likelihood of their participation.
- Emphasize the importance of farmer participation and open discussion. Make it clear that you are not coming to teach but to share experiences.
- Before starting the workshop, discuss matters of concern to the farmers (e.g. how dairy production is faring in general, or whether impacts of climate change are understood).
- After finding an entry point for discussion from the previous step, find out how farmers perceive climate change and how it affects dairy production. For example, if drought has been experienced in the area for several seasons, lead the discussion toward suggestions as to how feed shortage is linked to climate change. This part of the discussion will form a concurrence with your research interest to assess current feeding strategies.

2. Use livelihood maps to capture activities of men and women farmers.

- Use simple tools such as livelihood maps to identify and capture livelihood activities so that farmers can assess how availability of feed relates to livelihood options and to the dynamics of labour division between female and male farmers.
- Before mapping, ask the participants to name economic activities that constitute their livelihood options on their own farms and within the community. Encourage women to name the activities they engage in.
- Using a flip chart, draw a circle or any other shape to represent an individual farmers' farm/homestead. Draw a larger circle surrounding the homestead circle to depict the boundaries of the local community. The different types of livelihood activities undertaken within and outside the farm should be indicated. Each farmer should construct his/her own livelihood map to avoid getting homogeneous maps that could emerge from a group discussion. If the exercise is undertaken by persons from the same household, the mapping can be done jointly.
- After mapping the livelihood activities, estimate the size of enterprise contribution to the household quantitatively through the farmer's own assessment and indicate it as a percentage of total annual income. If farmers are not comfortable using percentages, they may rank the enterprises in importance. Estimation of the size or importance of the enterprise by male

and female farmers can be an indicator of the amount of labour and other resources spent on these activities.

- In adding up the proportionate contributions for all farm and non-farm enterprises, ask farmers to try to ensure that the total equals 100 percent.

Figure 1: Farmer discussion and mapping exercise of livestock feed resource available within their homesteads and the community

3. Use resource maps to prioritize feed availability.

After successfully mapping the livelihood enterprises of farmers, address the problem of feed shortage through resource mapping. This will help farmers identify accessible feed resources and estimate the size of the resource relative to the size of their livestock enterprises. Thus, farmers can identify, quantify, analyse and plan feed resources available on farm and within their communities. The following steps should be considered:

- Undertake feed resource mapping immediately after the livelihood mapping to connect dairy livelihood activities with feed demands.
- Ask participants to list all the available and known feed resources, including trees and shrub species used on farm or within the community. This activity will probably generate a long list of feeds used in the study area.
- From this exercise, participants can identify feed sources often regarded as minor or unimportant.
- From the generated comprehensive list, group the broad types of feeds (e.g. basal feeds, concentrates/commercial feeds, trees and forages, industrial by-products) and estimate the amount and variety of feed available.
- Use local names to promote ease in sharing information. An example of feed resources identified in Kaptumo, Eldoret, Kenya, following a feed resources mapping exercise is shown in Table 1.
- Using a flip chart, draw a circle or any other shape to represent an individual farmers' farm/homestead. Indicate the different types of feed resources obtained on farm and outside their farm (Figure 2).

Table1: Feed resources identified by farmers in Kaptumo

Trees and shrub forages	Basal feeds and herbaceous legumes	Concentrates	Industrial by-products
Koiybeyot (S. sesban)	Napier	Dairy meal	Molasses
Tebesuet (C. macrostachyus)[1]	Maize silage	Wheat bran	
Asenwet (C. binderianum)	Bean haulms	Maize bran	
Avocado leaves (P. americana)	Rhodes grass	Cotton seed cake	
Grevillea leaves (G. robusta)	Rhodes hay	Mineral salt licks	
Tenduet (P. africana)[1]	Natural pasture		
Momoniet (M. alba)	Maize stovers		
Calliandra (C. calothyrsus)	Desmodium		
Trichandra (L. trichradra)	Lucerne		
Tree lucerne (C. palmensis)			
Mororwet (Ehretia cymosa)[1]			

[1] Medicinal trees or shrub used as part of livestock feed

- Use forage leaf samples and information gathered from the agroforestry database (www.worldagroforestry.org/resources/databases/agroforestree) on some of the local species to ensure that farmers and others unfamiliar with the species are better informed.
- Identify and record the main strategies used to ensure feed supply throughout the year. If feeds are particularly scarce during a certain period of the year (e.g. the dry season), it is useful to identify which feeds are available during that period.
- Conduct a ranking or scoring exercise to determine the feeds preferred by men and women farmers. Ranking refers to the order of preference where scoring refers to a score, say from 1 to 5, with 5 being excellent and 1 being poor. To obtain gender-disaggregated data, it is better if men and women rank or score in separate groups. Afterwards, they can share the results with each other to see if their ranks or scores are similar. Be sure to record farmers' views of the advantages and disadvantages of each feed. An engaging way to do scoring or ranking exercises with farmers is to use the bao game (see Gendered tree species evaluation using the Bao game by Evelyne Kiptot, Steven Franzel), an indigenous African board game in which farmers allocate seeds among pockets on the board to show how they rank or score different alternatives (Franzel 1995; Franzel et al. 1996).
- Depending on the population of the study site, researcher's time and resources, do this for two to three other groups for replication.

Example of results of CCAFS project in Kenya

During the workshop in Eldoret, one example of a finding using livelihood mapping of activities is that men are engaged in far more economic activities outside the homestead than female farmers. Females were mainly concerned with homestead enterprises.

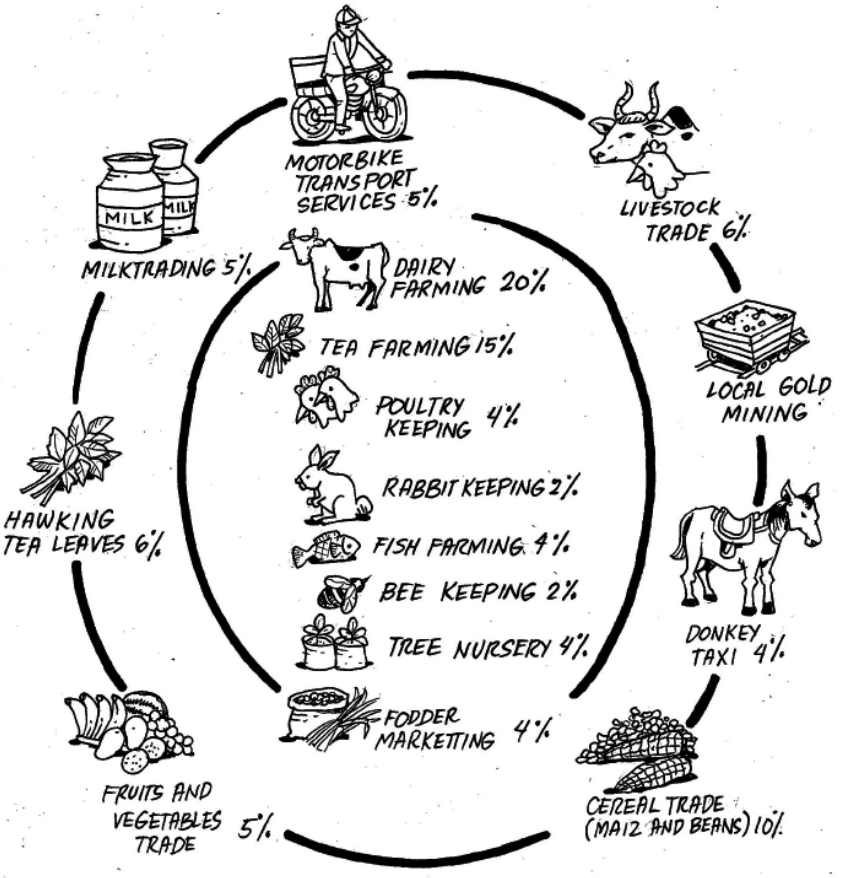

Figure 2: Livelihood mapping of a sample farm and homestead showing a diversified on-farm and off-farm enterprise portfolio, with contributions to livelihood indicated as percentages. Major on-farm, off-farm and non-agricultural activities are highlighted.

Advantages

By using the interrelated livelihood and resource mapping tools, it is possible to stimulate farmer discussion and to identify the activities men and women farmers consider economically important in dairy farming. The following were gathered from the workshop in Eldoret:

- The exercise provided a useful entry point for greater discussion on what feed resources are available within farmers' fields and within community

boundaries. It was useful in helping researchers and farmers gauge which feed resources are available or diminishing within their farms and/or communities.

- The methods lend themselves to additional studies that focus on more in-depth examination and quantification of resource use by gender, particularly with regard to dynamics of labour division where feed resources are diminishing. Importantly, new sets of criteria relating to farmer species selection and priority setting can be inferred.

Limitations

The typology of feed resources can vary by location due to biophysical and socioeconomic factors such as the size of land available to farmers. This means a good representation of the farming community is needed. These exercises can be challenging when undertaken with individuals rather than with groups because illiterate farmers may have difficulties completing the activities.

References

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Understanding gender roles in production and marketing of agroforestry tree products using task assessment

Charlie Mbosso

Individuals' roles are influenced by the different tasks, concerns and responsibilities in their daily lives. Assessing male and female tasks individually increases awareness of related issues and provides a framework for prioritizing tasks and roles. In gender analysis, assessment of tasks is used to develop an understanding of particular roles of both men and women. It can help in providing a comparative analysis based on the level of participation in a specific task. In such assessment, community members are invited to participate, specifically people who work with the product in the various stages of the value chain on a daily basis.

Women play a key role in different phrases of agroforestry value chains—production, harvesting, postharvest, processing, organizational arrangements and marketing. Task assessment results enable all concerned to identify the various gaps for women in each of the areas examined. Once these gaps are understood, implications and suggestions for future research can be provided to enhance the likelihood of women's empowerment.

This method was used in central Cameroon on two agroforestry species: *Ricinodendron heudelotii* and *Irvingia gabonensis*. The targeted product was the kernel of these species, but the tool is applicable for gender analysis for any other product (fruits, leaves, nuts, etc.). This assessment can lead to identification of capacity building projects to increase participation of women. In the project *Increase small-scale farmers' benefits from agroforestry tree products in West and Central Africa*, task assessment was carried out along the value chain, but more specifically in the production and marketing phases at the household level.

Materials

- Set of cards (if possible with pictures of women and men performing the same tasks at different stages of the value chain. If no picture is available, simply write down the different stages in harvesting, organizational arrangements and marketing tasks on each card)
- Flip chart
- Stones/pebbles
- Marker pens

Steps

Task assessment involves three key steps. All participants are together during the first step. They are then divided into two groups, female and male, for the second step. In the third step, everyone is joined in a single group.

1. All participants are together in this step.
- Ask everyone to sit together with the cards scattered on the table or on the ground so that they can all see the cards.
- Explain that each card shows pictures of both women and men performing tasks at different stages along the value chain, particularly on the following:
  - Harvesting and postharvest (fruit collection, pulp removal, nut washing, nut boiling, kernel extraction, kernel drying)
  - Organizational arrangements (available quantities, contact with traders, market date, market place)
  - Marketing (weighing of products, data records, money received and money distributed)
- Ask participants to discuss each task within each stage to arrive at a common

understanding of what each task entails. Ask participants who controls the income and how the activities conducted are linked to the control over income.

- For each stage of the value chain, ask participants to divide the cards according to those that are: (a) difficult to perform, (b) easy to perform, and (c) not too difficult and not too easy.
- Find out how participants interpret the levels of difficulty and how it is linked to what women are able to do as well as what they cannot do. Such information could provide useful entry points for subsequent efforts to empower women.
- Let participants discuss. Note the areas where arriving at a consensus is difficult. Make sure to take note of minority opinions.

2. Divide the group by gender.

- Group the participants according to gender.
- Put the cards with pictures of women and men for each task.
- Ask participants to place 10 stones to indicate the level of involvement in the task, 10 being the highest (e.g. very involved) and 1 the lowest. Participants discuss the number of stones to give to women and men and why. The group must agree first before moving to another task.
- On a flip chart, record the number of stones by gender for each group.

3. Call the participants together.

- Ask a participant from each group to present their results. Keep track of the discussion, noting when consensus is not easily reached and taking note of minority opinions.
- Put the results of the two groups onto one flip chart. Help participants draw conclusions from the results.

Example of results from Cameroon

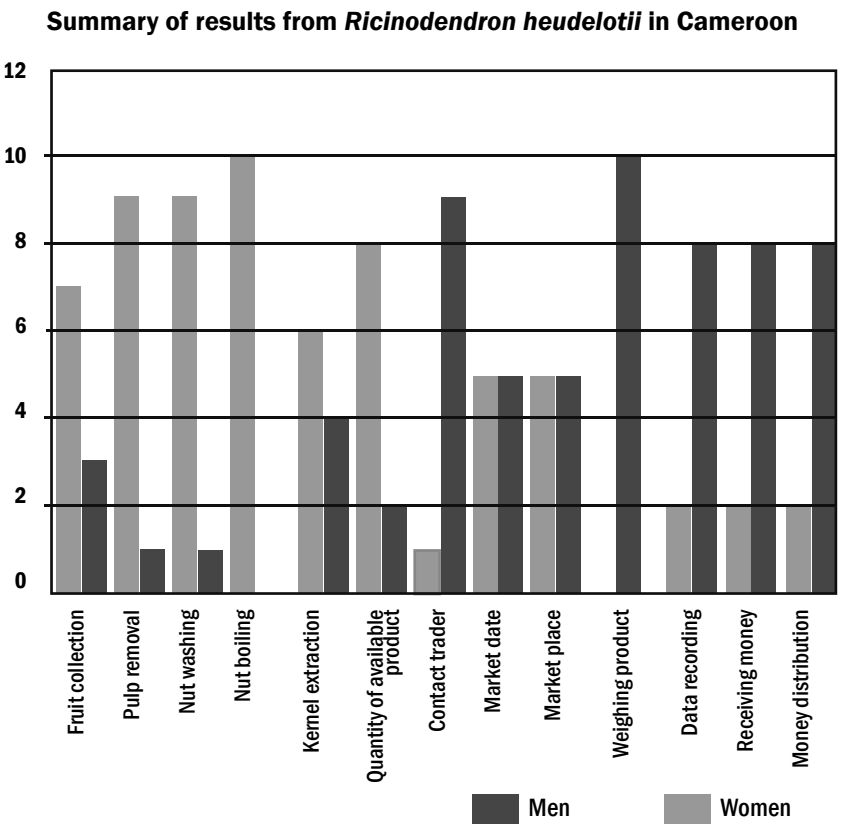

Figure 1: Levels of involvement of women and men in Ricinodendron heudelotii activities in Epkwassong village. As can be seen in the figure, women's tasks are more tedious than the men's.

Advantages

- Everyone is reassured that their input is both valid and valuable.
- The tool builds involvement and support of the community.
- The tool provides relevant data.
- The tool allows women and men to be visible in various areas within the value chain and in terms of work involvement, division, access and control and the like.

Limitations

- It is difficult to quantify all the information.
- The exercise is quite time-consuming.

Do's and don'ts

- Do choose your facilitator carefully.
- Do encourage everyone to participate actively.
- Don't influence the participants' answers.

Recommended readings

Mbosso C. 2007. Enjeux sociaux de l'évolution du système de commercialisation du njansang (Ricinodendron heudelotii) dans le Sud Cameroun. Mémoire Master. Geneva: IUED.

Method adapted from Narayan and Srinivasan 1994.

Gender-specific assessment of natural resources using the pebble game

Elok Mulyoutami, Noviana Khususiyah, Endri Martini, S Suyanto

Using a gender perspective to assess the preferences and values people associate with natural resources is essential, especially if the research aims to deepen understanding about men and women in relation to their natural environment. A game using pebbles has proven effective in classifying the value of natural resources, and the reasons behind the valuation. The pebble game is among many tools used in participatory rural appraisals (PRA). Sheil et al. (2002), for example, used the method to examine biological diversity in the context of landscape assessment. The pebble game was adapted in several gender researches in rural and migrant communities in Jambi, South and Southeast Sulawesi, Indonesia. These were supported by AgFor (Sulawesi Project funded by the Canadian International Development Agency) and REALU (Reducing Emission from Alternative Land Uses) projects. The studies assessed the importance of livelihood sources, the levels and nature of involvement of men and women in farming activities, the reasons for men and women preferences over natural resources, and the values they attach to them.

The weights and scores assigned to the preferences should not be seen as absolute or precise, but as indicative of their relative importance. The game can be played either within a group or individually using a structured interview. For the studies, the focus was on group discussion rather than individual interviews.

Materials

- Meta cards
- Tape
- Flip chart
- Marker pens
- Pebble or button
- Data sheet

Steps

Preparation

1. Make an effort to understand the issues and characteristics of the specific environment, especially the natural resources that affect the livelihoods of the community.

2. On meta cards, write the livelihood sources and their functions that were identified in step 1 (see example in Table 1) and if necessary, draw a figure or symbol to represent each category to help illiterate participants.

Table 1: Example of livelihood sources and land use function

Livelihood sources	Land use function
Paddy field	For income
Mixed garden	For income and preventing soil erosion
Farm labour	-
Estate labour	-
Other off-farm activity	For income
Wood lot	Building material
Community forest	Ritual and culture

3. Prepare a data sheet to record all the information gathered from the discussion. The data sheet should include both the discussion results and a checklist of observations, as well as any other background information that might influence the discussion.

4. Decide the number of pebbles. The more pebbles used, the greater the data variability. A good number of pebbles is 100.

5. Select participants. Consider gender balance, age, occupation or livelihood source, ensure that knowledgeable people (local leaders, elders) are included and limit the number of participants, ideally 4-12 people per group.

6. Set the time and location of the game. Choose a strategic location—it must be

accessible to both genders. Also, ensure sufficient space for separate discussions for men and women. Moreover, discussions can be simultaneous or parallel, depending on available resources.

7. Train at least one facilitator to lead each discussion group, and one recorder to document the process.

8. If necessary, hire a local language interpreter. Language is very important for building rapport with the participants.

The process

1. Introduce the facilitator and/or research team to the participants and explain the objectives of the game.

2. Ask the participants to introduce themselves. This is important in building rapport.

3. List and explain all the categories identified and ask the participants to confirm whether the list is accurate.

4. Ensure that all participants have the same understanding of livelihood issues and functions as well as all the questions that will be ranked or scored.

5. Ask participants to distribute pebbles for each item in Table 1 based on their degree of importance and or degree of male and female involvement. Ensure that all items are ranked or scored.

6. Observe the discussion process and note down pertinent points/issues.

7. Fill in the data sheet and make sure that all the results are documented.

8. Repeat the same process to 2-3 more groups for replication purposes.

Documentation

1. Data sheet should include:

- Each participant's gender, age, occupation or main livelihood source, house location, and other information considered important for analysis.
- Notes on the composition of participants: Do they reflect the research requirement for gender, age, education level? Has the process of the interview been properly recorded? Have notes been taken on comments, responses and gestures that influence the process of discussion and scoring?
- Discuss results: Tables of ranked and scored data, qualitative information related to the data, interesting statements or comments.

2. Capture the discussion by video or tape recorder, or both and take photos.

Example of results from the pebble game in Sulawesi

a. Gender involvement

The pebble game is useful in identifying how women and men use land-based livelihood sources. In the example shown in Table 2, for example, the results show that both genders were involved in mixed garden cultivation as against other livelihood sources, with women indicating a higher proportion of involvement.

Table 2: Sample results of the pebble game

Land-based livelihood source	Female involvement	Male involvement
Paddy field	13	17
Upland field	10	15
Mixed gardens	35	27
Timber forest products	3	2
Non-timber forest products	5	6
Tenant	24	17
Estate labour	-	-
Daily farm labour	10	16
Total	**100**	**100**

b. Roles and activities in land-based livelihood according to gender

In Figure 1, both genders demonstrated similar perceptions of how men and women are involved in managing a cacao farm. Both agreed that women's involvement was primarily focused on harvesting, post-harvest and marketing. The difference in perception was on how they saw gender involvement in the nursery. Men saw the role of women as higher than that of men, while women had the opposite perception.

c. Perceptions of natural resource functions and values according to gender

As shown in Figure 2, the perceptions of men and women on forest functions and values are different, although both assigned heavy weight to the environment function as opposed to the livelihood function. Women assessed soil erosion prevention as the highest function of forests whereas men felt its most important function is that of being a 'water reservoir'.

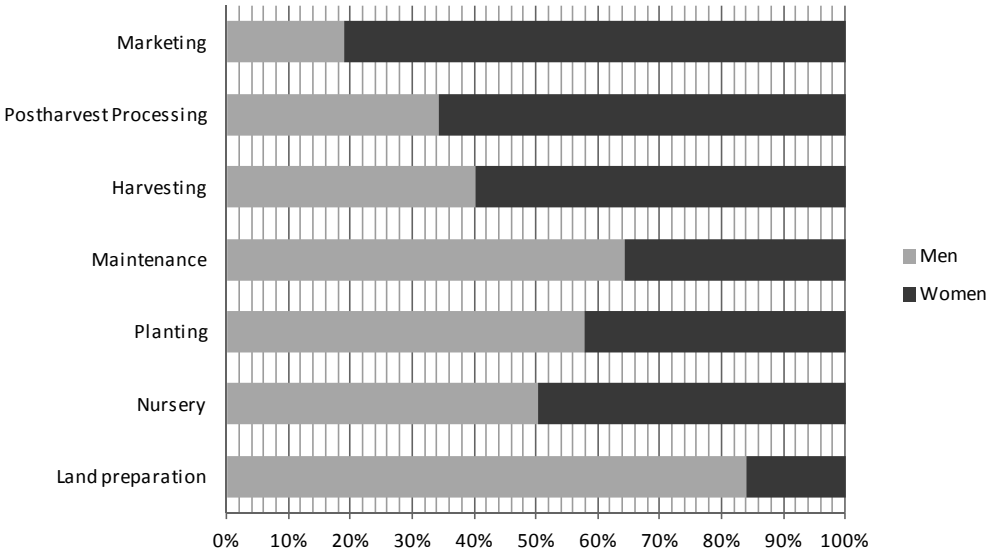

Figure 1: Men and women's role in every stage of cocoa management. Women have more roles than men in harvesting, postharvesting and marketing.

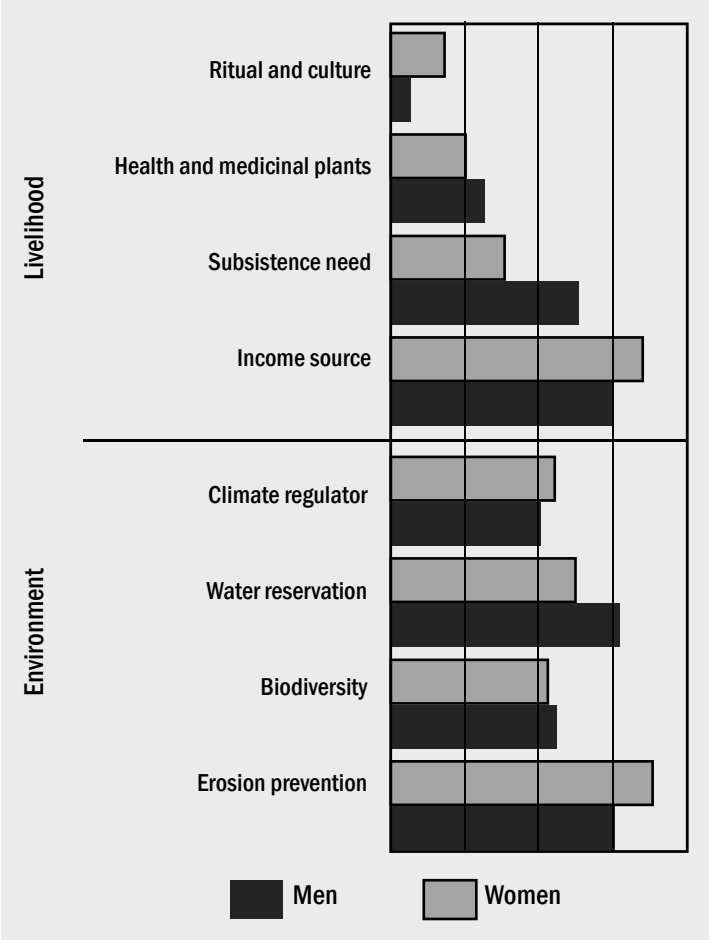

Figure 2: Forest functions and values by gender

Advantages

The pebble game is a flexible tool that can elicit important information on socio-cultural issues.

Limitations

The game cannot capture the power relations between men and women within communities. The game is a participatory tool that depends on the quality of discussion. Bias can happen unexpectedly.

Do's and don'ts

- Do encourage active participation.
- Do ensure that all participants agree with the discussion results.
- To capture forces affecting the results of the game or influencing the discussion, always take note of who is dominating the discussion—this can be used to further the analysis.
- Do probe to get in-depth information on interesting issues.
- Don't direct or influence alternative answers.
- Don't dominate the discussion. Give the participants sufficient time to express their opinions.
- Don't force the participants to finish discussion in a given time. Be flexible.

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Participatory resource mapping for gender analysis

Martha Cronin, Mieke Bourne

Participatory resource mapping is a rapid assessment tool useful for understanding particular resources in an area and how these are valued and used by men and women. It can be used to ascertain the gender differences in perception and use of resources (both biophysical and social). It can also be used to assess the fine-scale spatial variations within a study site and the social, economic and ecological consequences of these variations. These are mapping exercises that provide information on the site from the perspectives of both men and women farmers.

This method was adapted in Ethiopia to enhance female participation. Instructions were taken from the hazard mapping methodology found in *Climate vulnerability and capacity analysis handbook* (CARE 2009), which focuses on discussion around a wide variety of community resources.

Using visual materials and drawings for expression amongst communities with lower education levels and rural communities is often very effective. Participatory resource mapping can be done with a mixed gender focus group but researchers have found that this misses key differences in women's and men's perspectives on local resources, details on the interplay between community and household, subsistence and commercial, and social and biophysical resources. Wealth and education status can also form the basis of focus group selection for a more extensive study.

Examples can be found in academic papers showing how participatory resource mapping has been applied to planning community-based resource management projects by better understanding the gender-sensitive knowledge about forest and agroforest resource locations (Kalibo et al. 2007).

Materials

- Flip chart

- Coloured pens and pencils
- Seeds

Steps

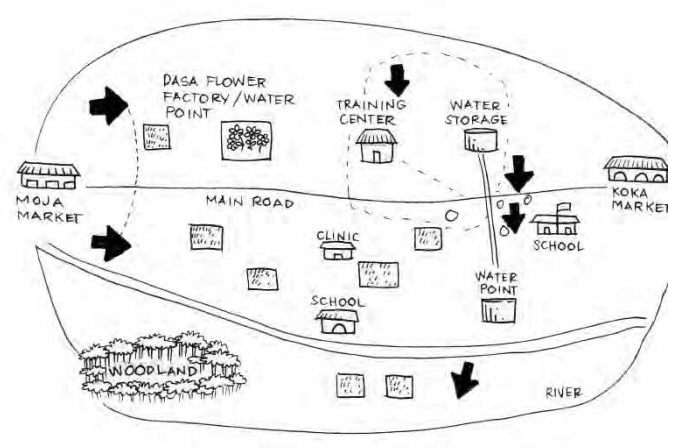
1. Participant selection
- Select the participants: men and women farmers and community members. This should be done through selection from baseline data or village household lists and then asking those selected if they are willing to participate.
- Between three and five people per group is optimal for participation in this type of exercise. Equal numbers of men and women should be considered. Women farmers should be a mix of household heads and wives of male-headed households if possible.
- The participants should be invited to a central location and briefed with the method and objective of the resource mapping exercise.

2. Mapping
- Separate the participants into two groups (male farmers and female farmers) and ask them to produce a map that shows their village, individual farmlands and any resources (both social and biophysical) they can identify. Provide sufficient time for this activity.
- To stimulate discussion within the female group, start by talking about daily activities and corresponding resources. From this discussion, an activity clock can also be constructed based on daily routines in both rainy and dry seasons.
- Literacy levels or culture may restrict women's participation and they may not want to draw. In such a case, the facilitator should offer seeds for them to place on the map. The facilitator can then record these resources on the map for the group by drawing around the seeds.
- The output of this activity is a gendered resource map.

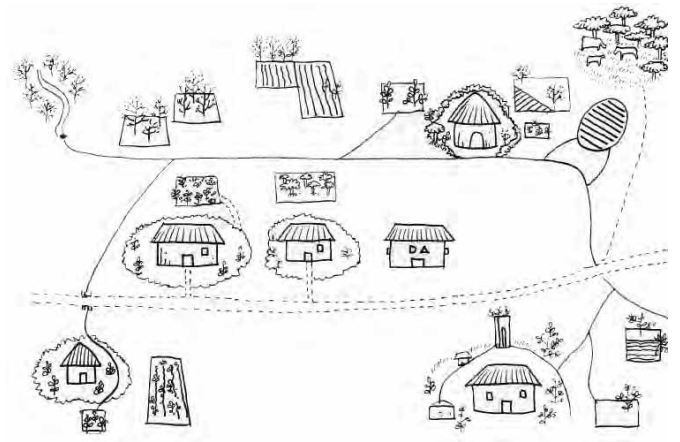
3. Discussion
- After the maps are created, invite the groups to come together for discussion and feedback on the two maps.
- If time permits, the facilitators may ask the groups to show them the mapped area by walking around. This is to prompt additional important resources they may have missed.

Examples of results in Ethiopia

Two study sites were surveyed for this case study, one located in the East and one in West Shewa Zone of Ethiopia. The sites were both rural villages with majority of the population involved in agriculture. The populations were mostly Oromo people indigenous to the area and the main religion was Ethiopian Orthodox. Literacy levels (especially amongst the female participants) were low in both sites.



Example of female group output



Example of male group output

The created maps provide a good landscape overview of the spatial arrangement of resources in the two sites. Participants can identify the key resources in their sites such as water sources, administrative buildings, schools, places of worship, markets, grazing areas, forests, roads, and their own properties.

As with other similar examples (Kalibo et al. 2007) male farmers spent a lot more time on the details of their own property, such as individual trees on property as well as resources directly utilized for agricultural production (water for irrigation, soil types, grazing areas, etc.), whereas women quickly identified resources for household subsistence (sources of fuel and drinking water) as well as enlarging the relative area of the map to encompass social and community spaces and sources of off-farm income.

Female groups provided better spatial details such as the distances between resources by explaining the time taken to walk to them. Male farmers were found to be more focused on the quality of agricultural land and provided good detail on the locations of eroded or poor quality soils and erosion features.

Farmers in both study sites were able to classify the common agroforestry features (such as tree species found on cereal fields, riparian species and species found around home compounds and in home gardens). Classification of land types were found to differ—with women referring to a stand of natural trees where fuelwood is collected as 'woodland' and men referring to the same land as 'grazing land'.

Advantages

- Provides spatial and visual display of priority resources of both men and women and clearly shows differences between the two.
- This method is easily adaptable to different cultures and locations.
- Men often seem genuinely enthusiastic about the task. Women may be more receptive to the task if the facilitators begin with an activity clock and discuss daily routines.

Limitations

- Women may be reluctant to construct their resource maps themselves, so the facilitator may need to draw based on instruction or the placement of counters. Using seeds to point out major resources can be a way to overcome this limitation.
- Often in a mix of female household heads and wives of male-headed households, female heads tend to speak more—likely because they are more confident of their household resources. If this is the case, then an explicit discussion on the general differences between resources held by female- and male-headed households may reduce the bias.
- The spatial arrangements can be roughly drawn by the farmers, with little accuracy or way of measuring distance. This emphasizes the need to ground source outputs for more accurate spatial arrangement. This issue can also be addressed by determining the system boundaries beforehand and starting with established boundaries on the page. Examples of resource maps can be shown to the groups to give them an idea of what should be produced. Walking the area with the participants after the mapping exercise is also helpful for validation.

Key considerations

- In some areas the community may not want to share information on resources or sacred sites, and in such cases this method should not be used or should be adapted to protect certain information. Be aware that this type of mapping

could potentially be used for biopiracy in some circumstances, so be sensitive to this.

- It is good to leave the maps with the community and take only the photos of the maps. In this way they are left with something at the end of the exercise.
- Added value can be derived from the exercise if the facilitator asks the men and women the reasons for inclusion or exclusion of particular resources. Their responses can add significant depth to the results and this can be done during the feedback and explanation of the two maps.

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Extrapolation framework to determine the application of gender-specific technology

Devashree Nayak

Extrapolation framework is a generic framework that combines various extrapolation methods for determining pre-condition for adoption of a preferred technology. The methodology presented here utilizes various parameters—biophysical, socioeconomic, anthropological—in addition to government support and regulatory mechanisms that help researchers determine the suitability of the target area for application of gender-preferred technology. It determines the gender specificity in application of technologies, e. g. in fodder, fuel, nursery, etc., in the target area.

The potential area for technology extrapolation is characterized using the above parameters and delineated into homologous zones using agroecological parameters. Using the same parameters, promising interventions in agroforestry, livestock science or socioeconomic systems are catalogued. The homologous zones are then classified with numeric ratings of suitability of identified technology and used to map the suitability classes quantitatively.

The results of this exercise are physically verified through ground truthing field surveys as well as men and women farmers' expert knowledge to validate secondary data on climate, land use, land tenure, access to land and resources by gender, wealth rank, education status, etc.

This framework is employed in a study in Uttar Pradesh, Rajasthan and Uttra Khand states in India to assess the vulnerability of both smallholder farmers and landless farmers as regards their farming and livelihood systems, including fodder, fuelwood and nurseries. The methodology matches the gender-preferred technology with the target area for suitability in current and predicted climate changes in the project sites.

Materials

- Gender-disaggregated household data

- Biophysical, socio-economic and anthropological parameters from the target area
- Technology profile of preferred technologies
- Geographical information system (GIS) maps
- Field surveys
- Ground truthing data

Parameters required for extrapolation

- Biophysical parameters may include climatic data (temperature, solar radiation, humidity), land use and cover, soil, hydrology (groundwater), farming systems and practices, and cropping patterns.
- Gender disaggregated socioeconomic and anthropological parameters may include men and women farmers' preferences of crops and trees, land tenure structure, access to land and other resources by gender, wealth rank, education status, markets (market structure, input cost and value of the produce), accessibility of market by women and men.
- Government support and regulatory mechanisms may include the gender-specific policy, support and regulations about tree crop farming.
- Technology profile/technology application requirements include agroecological conditions, species, inputs, plantation care, harvesting, processing, etc.

The parameters depend on the scope and objectives of the study. These are generic, open-ended and flexible, allowing researchers to add new parameters and drop unwanted ones as needed.

Steps

The framework requires data inputs such as biophysical and socioeconomic characteristics of the target site and the profile of gender-preferred technology (Figure 1). The biophysical and disaggregated socioeconomic parameters are analyzed and interpreted through GIS mapping, of which the output is a characterization of agroecological zones for expansion (extrapolation domain) of the preferred technology (Figure 2).

1. Catalogue the main farming/livelihood systems preferred by women and men through the identified bio-physical, socioeconomic and anthropological parameters as mapping and characterizing units, and profile the selected technologies for both current and predicted climate.

2. The technology utilization requirements (TURs) will be based on the profile of climate-resilient technologies.

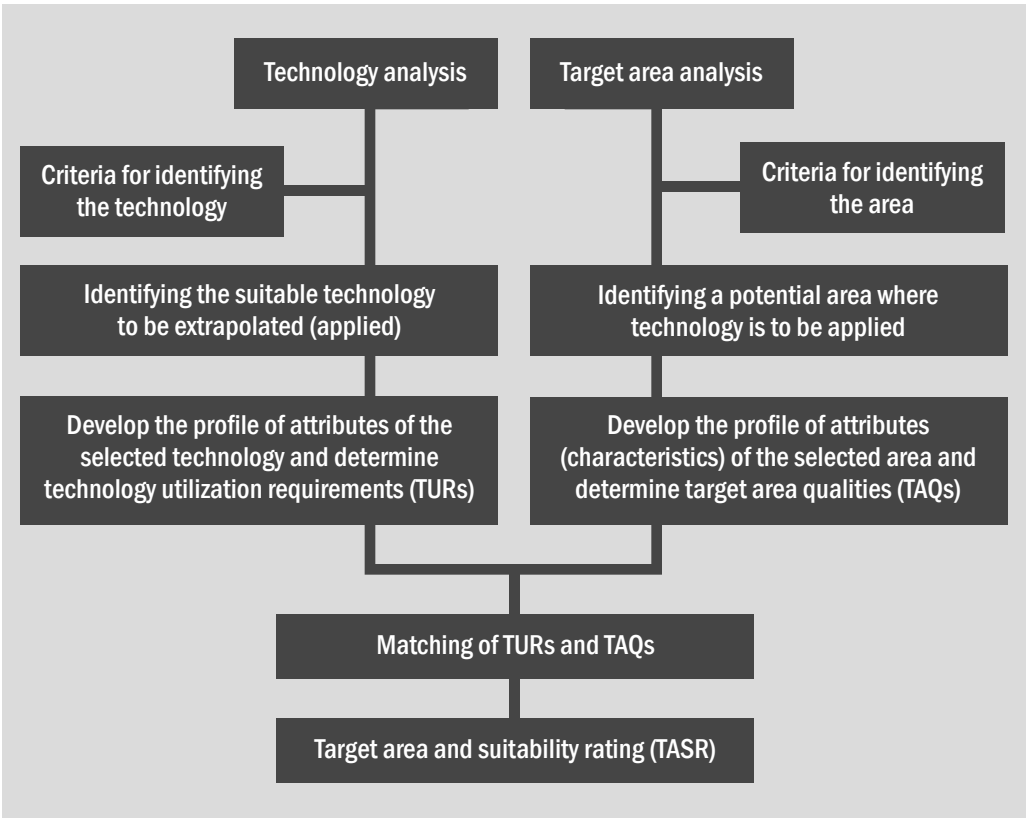

Figure 1: Schematic diagram of the methodology for ecosystem delineation and characterization (Minh 1995).

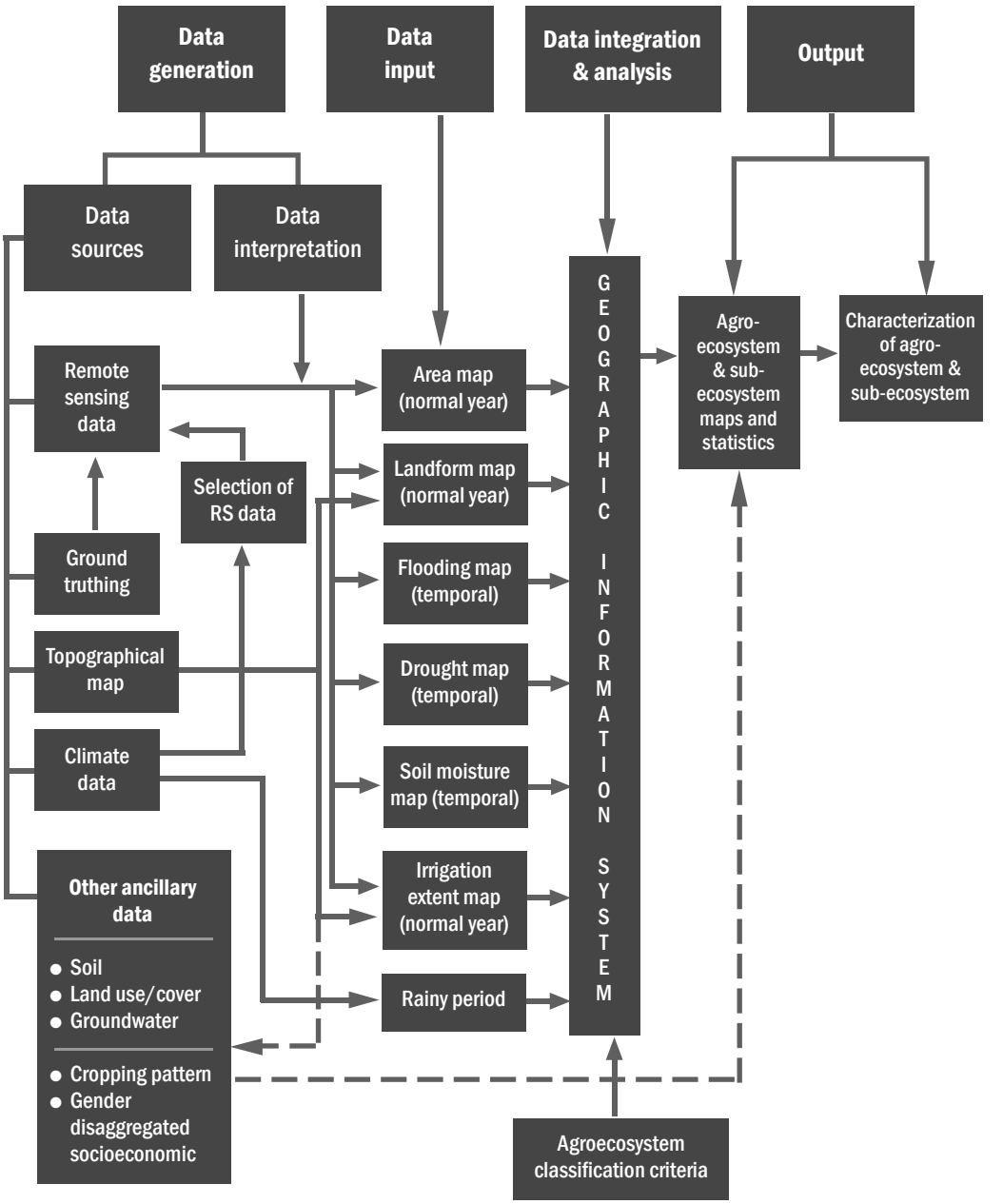

Figure 2: Schematic diagram of the methodology of technology extrapolation (Singh et al. 1999)

3. Similarly, the resource base of both women and men farmers is analysed within the target area under both current conditions and under the conditions expected due to changing climate to come up with the target area qualities (TAQs).

4. The potential target area is classified into homologous zones using agroecological parameters as described in Figure 2.

5. TURs are matched with the TAQs that will identify the technology suitability classes.

6. Based on the matching indexes of TAQ and TUR, the suitability of an area for a particular gender-specific technology or its application in a certain area is classified into (a) highly, (b) moderately, (c) marginally, and (d) unsuitable categories under both current and expected climatic conditions.

7. The technology suitability maps are validated by ground truthing, field surveys, and farmers' knowledge.

Example of results

- Delineated agroecological zones based on socio-agro-anthro, and gender parameters and technology suitability maps of the selected sites where agroforestry systems/practices are intended for application.
- Suitability classes of women-specific and preferred technologies are identified for the potential area.

Advantages and limitations

- The methodology helps to determine the application domain of women-specific preferred technologies, including the characterization of the potential area for technology extrapolation and developing the detailed profile of the selected technologies.
- The methodology presented is generic for scaling up technologies.
- The selection of parameters is generic, open-ended and very flexible, allowing researchers to add new parameters and to drop unwanted ones as needed.
- The suitability ranking of the women-specific and preferred technologies depends on the socioeconomic and anthropological parameters selected.

Do's and don'ts

- Do collect all the available biophysical and anthropological data.
- Do gather socioeconomic data through sex-disaggregated surveys to obtain gender-differentiated information.
- Don't fail to define the parameters for each category while planning the study so that the survey captures all the information required for the TURs and TAQs.

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Capturing gendered appreciation of multi-functional landscapes through viewscape interpretation

Caroline D Piñon, Isidra B Bagares

Viewscape refers to people's views of their surroundings such as landscapes and seascapes. These views are based on knowledge, beliefs and perceptions. Viewscape interpretation is a method that uses photos as visual stimuli to characterize and analyse people's preferences to inform planning and decision making. This method is widely used in urban architecture and planning.

In the southern Philippines, the viewscape interpretation method was used to complement household interviews aimed at understanding gender-specific appreciation of landscape functions. The viewscape represents the visual connection of women and men farmers with regard to the spatial arrangement of landscape features, such as ecosystem services (ES) and land use practices which they regard as valuable.

Examples of ecosystem services

- Gas regulation
- Climate regulation
- Disturbance regulation
- Water regulation
- Water supply
- Erosion control and sediment retention
- Soil formation
- Nutrient cycling
- Waste treatment
- Pollination
- Biological control
- Refugia
- Food production
- Raw materials
- Genetic resources
- Recreation
- Cultural/spiritual

Based on Costanza et al. 1997

Materials

- Landscape photos[1]
- Ecosystem services photos[1]
- Land use photos[1]
- Post-it notes for ranking (different colors)
- Marker pens
- Audio recorder
- Camera

[1] The photos should be based on the participants' understanding of these concepts.

Study team

- Mixed-gender team of facilitator and documenter for the focus group discussion (FGD) and interview

Steps

1. Participatory identification of landscapes, ecosystem services and land uses

- Secure a list of individual residents in the study area (in this case, watershed), and segregate according to gender. Randomly select men and women participants, or ask for assistance in identifying men and women participants from a key informant in the area using gender as criteria—this will save you a lot of time.
- Conduct separate FGDs for men and women using focus questions (Box 1). FGDs should not be more than 1.5 hours so as not to tire out the participants.
- Each FGD may involve 8-10 participants for easier facilitation.

Box 1. Focus questions/ discussion

What is your understanding about landscape, ES and land use?

What are the existing landscapes, ES and land uses in your area? Their current conditions? Their historical changes over time?

What landscapes, ES and land uses do you aspire to expand or sustain in your area?

2. Taking photographs

- As described by the participants at the FGDs, take 3-5 panoramic shots of the landscape and all its features within the study site, e.g., different ES and land use practices for each landscape, etc. Print and laminate the photos (suggested size is 5x6).

3. Household interviews

- Prepare for the interview
  - Identify 3 villages located along an elevation gradient: upper, middle, lower elevations of the watershed.
  - From the village household list, randomly select interviewees. Visit each of them to schedule the interview. Ensure that you have sufficient numbers of household interviewees and male and female

During the household visit:

- Introduce yourself and explain the purpose of the interview.
- Ask if both husband and wife would like to participate (voluntary with no compensation involved).
- If either or both agree, schedule the interview at their most convenient time.
- Inform them that the interview will take approximately 1½ hours.
- Interview the wife first, followed by the husband.

participants. The number of interviewees depends on the village population, as well as the researcher's time and resources.
- Household interviewees should be different from the FGD participants.

- Introduce yourself and ask preliminary questions
  - Review the purpose and method of the interview.
  - Ask the farmers for their basic socio-economic profile.
- Viewscape interpretation
  - Display the 3-5 landscape photos.
  - Provide the farmer with sufficient time to understand the photos.
  - Ask the farmer to describe the photos.
- Viewscape ranking

  Landscape ranking
  - Display 3-5 landscape photos.
  - Ask the farmer to rank the landscape photos according to their economic (first round), social (second round), and environmental (third round) benefits.

  ES ranking
  - Display 3-5 ES photos for each landscape.
  - Provide the farmer with sufficient time to understand the photos.
  - Ask the farmer to choose the 3 most important ES that each landscape can provide.
  - Ask the farmer to rank the ES based on economic (first round), social (second round), and environmental (third round) benefits.

Talking points
Landscape features, factors behind choices, current condition, changes through time

Interview guide
What is going on in this landscape?

Among these landscapes, ecosystem services and land uses, which are most important to you based on environmental, economic and social benefits? Why?

  Land use practices ranking
  - Display the different 3-5 land use practices photos per landscape.
  - Provide the farmer with sufficient time to understand the photos.
  - Ask the farmer to choose the 3 most important land use practices for each landscape.
  - Ask the farmer to rank the land use practices based on environmental (first round), economic (second round), and social (third round) benefits.

4. Clustering and data analysis
- Cluster men and women's responses and preferences to explore similarities and differences.
- Identify patterns of women's and men's responses and preferences.

5. Validation and refinement
- Conduct two separate FGDs for men and women with 8-10 participants from the interview sample.
- Display the most important landscapes, ES and land uses.
- Obtain feedback and discuss.

Advantages

- Photos easily capture farmers' interest.
- Farmers local knowledge and personal experiences are generated.
- Site- and context-specific landscape management preferences and options are identified.

Limitations

- Responses can be too site- and context-specific.
- This method takes time, especially the preparation of photos.

Do's and don'ts

- Do arrange for appropriate sizes of photos.
- Do anticipate the difficulty of finding available space to display the photos.
- Do take photos of landscapes that farmers easily relate to.
- Do take photos from vantage points.
- Don't forget to obtain farmers' consent to record the interviews.

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Capturing gender-specific understanding of landscape functions through participatory GIS

Caroline D Piñon, Marcel Langer, Isidra B Bagares

Geographic information system (GIS) is a computer application that can create, store, manipulate, visualize and analyse spatial and temporal information. GIS can capture the social and institutional dimensions in space and time by involving local stakeholders in the generation of information included in the analysis—an approach we call participatory GIS (PGIS). PGIS has been applied in a wide range of contexts, including urban planning, conflict management over natural resources and land boundaries, and land use and natural resource planning and management.

In Manupali watershed, southern Philippines, we used participatory GIS to capture spatially explicit gendered understanding of landscapes and their linkages to environmental services and livelihoods, and gendered access and control over resources.

Materials

- Manila paper or flip chart
- Coloured marker pens
- Environmental services (ES) chart
- Google earth satellite image
- Flat styropor (polystyrene)
- Coloured pushpins
- Coloured markers
- Global positioning system (GPS)
- GIS software
- Audio recorder
- Camera

Study team

- Mixed gender team of interviewer and documenter
- GIS specialist

Steps

1. Preparing the landscape map
- Access Google Earth or other online map of the studied landscape (e.g. watershed, sub-watershed, village).
- Create a geographically referenced map of the studied landscape from the Google Earth image.
- Print the map in large format (decide on an appropriate scale).

2. Preparing for the household interview and mapping
- Identify at least three villages that represent an elevation gradient of the study site: upper, middle, lower.
- Decide on the number of farm household interviewees for each village.
- Randomly select desired farm households from the village population list. When able, other criteria aside from gender may be considered.
- Visit selected households to schedule the interview.

During the visit:
- Introduce yourself and explain the purpose of the interview.
- Ask if both husband and wife are willing to be interviewed individually and privately for approximately 1½ hours.
- If they agree, schedule the interview at their most convenient time and place.

3. Household interview with landscape mapping
- Introduce yourself and refresh the purpose of the study.
- Explain the interview mechanics. Explain that you need to talk to the wife first, followed by the husband.
- Start the interview and mapping.
  - Begin with a friendly conversation by asking the husband/wife simple questions, e.g. how many children do they have? How old are they?
  - Ask how the husband/wife understands 'landscape and ecosystem services'. Provide sufficient time for discussion.
  - On a drawing paper or flipchart, let the husband/wife draw their

Consideration
You may need to provide examples that facilitate understanding of the concept of landscape, environmental services, land use, access and control.

landscape, and identify and draw the ecosystem services provided on the map.
- Ask which part of the landscape the wife/husband or both have access and control.
- On the map, let them mark A for access to any part of the landscape or to a particular environmental service, and C for control.

4. Household interview with land use and livelihood mapping
- Ask the husband/wife to locate and draw their house and farm on the landscape map drawn earlier, including other resources (e.g. water pump, farm equipment).
- Ask the husband/wife to add their land uses on the map (e.g. tree crops, food crops, livestock, grassland), farming practices (e.g. contouring).
- If husband/wife is involved in non- or off-farm livelihood, ask them to draw these on the map, depicting the type and location of this livelihood (e.g., a store owned by the wife close or away from the farm).
- On the map, ask wife/husband to mark productive and unproductive areas of the farm and discuss the indicators of these areas.
- Discuss the links between productive and unproductive areas with available environmental service or spatial arrangement of farm resources and land uses.

5. Mapping environmental services
- Prepare an ES chart as shown below.

Table 1: Sample Environmental Services Chart

No. on map	What ES?	Current condition			What do you use this ES for?	Rank by degree of importance	Why?
		1 Excellent	2 Good	3 Poor			

- On the chart, ask husband/wife to assess whether ES are in excellent, good or poor condition, and also identify benefits for each service.
- Ask wife and husband to rank each ES by degree of importance to farming and other livelihood activities.
- Review the ES chart and discuss reasons for ranking.
- Display the landscape map. Provide sufficient time for wife/husband to understand the map.
- Using coloured pushpins or markers, ask wife/husband to locate different ES in the map. Take a photo of the map with the marked services. At this stage, the landscape map would have many features such as the farmhouse, land uses, ES, and non- or off-farm sources of livelihoods.
- The colour and number of pushpins on the landscape map represent the type and availability of ES (e.g. yellow for indigenous people's sacred ground).
- Ask for observed changes in specific landscapes, ES, land use and livelihood patterns in the study area, and if these changes had any effect on the landscape, ES needs, land use or livelihood.
- Discuss changes in access and control that are linked to changes in landscape, ES, land use and livelihood patterns.

Focus question
In the first map, you drew your landscape and the ES that you benefit from it. Can you see them on this map? If so, can you locate them on this map?

6. Recording GPS of productive and unproductive areas and GIS map creation
- Save the coordinates of household as waypoints.
- Walk with the husband/wife around the area that they identified as productive and unproductive part of the farm. Record GPS points of the husband/wife's track.
- Download GPS points, and create a GIS map of productive and unproductive areas.

7. Map creation
- Overlay ES map on Google earth landscape map.
- Digitize the ES map.
- Create ES map layer by gender.

Advantages

- PGIS enables women and men to visually assess landscape, ES and land use.
- It captures spatially explicit perceptions of landscapes, ES and land use by gender.
- The tool promotes interdisciplinarity.

Limitations

- Time consuming
- Can be complex for participants

Do's and don'ts

- If wife or husband is unable to draw, do ask the children to draw the landscape, ES and land use map based on their mother's or father's ideas.
- Do observe cultural taboos, such as excluding landscape features regarded sacred by indigenous people.
- Do ensure availability of GIS software and a team member skilled in using the software.
- Don't forget the tools needed for interviews and mapping (e.g. batteries for recorder and GPS).

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Understanding gender perspectives in selecting tree species and farming systems using analytic hierarchy process

Janudianto, Sonya Dewi, Endri Martini, Anang Setiawan

Analytic hierarchy process is a decision-making framework used for large-scale, multiparty, multicriteria decision analysis developed by Thomas L Saaty in the 1970s. This framework was adopted and used in TreeFarm module to elucidate the decision-making process in tree species and farming system selection within different gender groups in Sulawesi, Indonesia.[1] Decision-making in the TreeFarm Module is undertaken by identifying:

- Criteria and assigning the relative importance of each criterion in selecting tree species and farming systems
- A range of potential tree species and farming systems in the area, assigning the relative preferences of each species and each farming system with regard to each criterion

In this method, in addition to ranking tree species and farming systems based on preferences, the sole output of the direct scoring method and the relative importance of each criterion are identified. Moreover, ranks of preferences of each tree species and farming system are developed for each criterion. Often, the list of criteria reflects the landscape context and other important information about households and gender classes. The more similar the list among various groups or stakeholders, the stronger the landscape context is, in relation to the larger community.

Gender specificities can be analysed by comparing the lists and ranks of criteria. Targeted interventions can be identified by combining ranks of criteria, species, and farming system preferences within each criterion. The ultimate output will show the tendency and trend of men and women in selecting tree species and farming system (including agroforestry systems) in relation to the wider context of landscapes under various climatic changes and natural disturbances.

[1] The TreeFarm module is developed by Dewi (2013) as part of Capacity Strengthening Approach to Vulnerability Assessment (CaSAVA) tool (Dewi et al. 2013) to analyse decision making in selecting tree species and farming systems that incorporates gender specificities.

Materials

- Flip charts
- Metacards
- Tape
- Pushpins
- Coloured marker pens

Study team

- Facilitator
- Documenter

Steps

1. Prepare to conduct separate discussions for groups of men and women. The discussion can be held parallel, but at different places in the study area. The group participants may represent certain villages, clusters or landscapes within the study areas, with 8-10 participants in each group.

2. Explain the discussion objective, the background of the study, and the general rules at the beginning of the discussion. Encourage participants to think and voice their perceptions based on their daily experiences.

3. Ask the participants to develop a list of existing and potential farming systems (annual cropland, monoculture perennials, mixed perennials, mixed annual-perennials) in their surroundings based on their perceptions. An example is shown in Table 1.

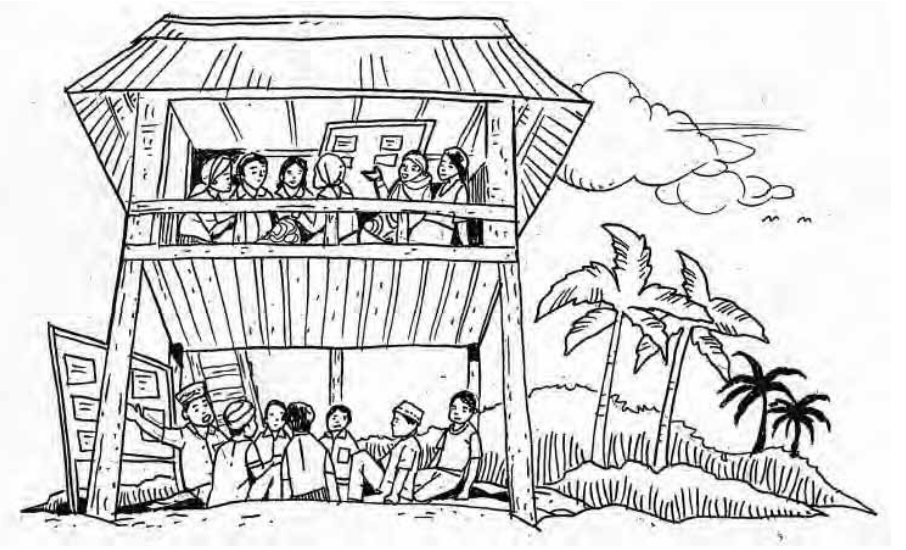

Table 1: List of existing farming systems in the community (the example is taken from a female group)

Farming system	Source of Cash (Yes/No)	Rank (1 = highest source of cash)	Source of Non-cash[a]	Rank (1 = highest source of food)
Annual cropland				
• Paddy	Y	3	1	1
• Patchouli	Y	2	2	
• Maize	Y	1	1	2
Monoculture perennials				
• Rubber	Y	1	3	
• Coconut	Y	2	3, 5	1
Mixed perennials	-	-	-	-
Mixed annual-perennials	-	-	-	-
Shrublands	-	-	-	-
Forest	-	-	-	-

Food=1; Medicinal=2; Timber=3; Energy=4; Handicraft=5; Cultural and aesthetics=6; Livestock=7; Bush meat=8; Other=9

4. Ask the group to rank the farming system according to the degree of importance to farmers (e.g. cash benefits, subsistence).

5. Ask the group to identify criteria for selecting the farming system. The criteria comprised the factors considered by participants when selecting their tree species and farming systems for their managed plots of lands in the community (e.g. price, market access, available technology). An example is shown in Table 2.

Table 2: List of criteria on selecting farming systems (or tree species) in the community.

No.	Criteria	Note
1	Easy to sell	
2	High output price	
3	High availability of seed	
4	Low initial investment	
5	Quick to produce	

6. Assess the relative weight of criteria by comparing each pair of criteria using a score of 1 to 5 based on importance to livelihoods. Put 1/1 if each pair of criterion is identified to be equivalent in terms of preference (equal weights); otherwise 1/5 if one criterion is very strongly preferred than the other. For example, Table 3 means that the third criterion, high availability of seed was extremely important compared to the second criterion (high output price).

Table 3: Criterion (high availability of seed)[a]

Criteria	Easy to sell	High output price	High availability of seed	Low initial investment, need less capital	Quick to produce		
Easy to sell							
High output price							
High availability of seed		5/1					
Low initial investment, need less capital							
Quick to produce							

[a] Criteria weighting is done by comparing each pair of criteria (1=same, 5=extremely strong). In this example, only 5 criteria are given.

7. Assess the farming system weighting in each of the criterion by comparing each pair of farming system using similar procedure. Put 1/1 if each pair of farming system has similar importance to the criterion, and 1/5 if one of the farming systems is very strongly preferred over the other. The weighting 1/5 in Table 4 below means that in terms of market, paddy was deemed far easier to sell than patchouli.

8. Repeat steps 4-7 for tree species selection using the same table templates (Tables 3 and 4) as those for farming system selection

Example of the results in Sulawesi, Indonesia

The method was tested and applied in Sulawesi, Indonesia. The study, including field work and method applications, was fully supported by AgFor Sulawesi Project funded by the Canadian International Development Agency (CIDA). The results showed that:

Table 4: Farming system weighting using criteria identified by the female group[a].

Farming system option	Paddy	Patchouli	Maize	Rubber	Coconut		
Paddy							
Patchouli	1/5						
Maize							
Rubber							
Coconut							

[a] For each criterion, do comparisons between farming system options for couples as in the previous step.

- Among 20 group discussions held, 19 referred to the dominant annual crop types as sources of cash income. The exception was Tahura Nipa Nipa village, where according to the women's group, vegetables are self-consumed.
- The Sulawesi exercise showed that data segregation through parallel discussion sessions by men and women groups was useful in identifying gender differences in tree and farming system selection within the community.
- The dynamism during each group discussion was marked with lively discussions, which were consistently experienced throughout 20 discussions for each gender group, spread in two provinces, 4 districts in Sulawesi.
- List of criteria and relative importance of criteria as well as preferences within each criterion are quite different between the two gender groups and across geographical locations.

Advantages

- The AHP method can be adopted in a wide range of farms, villages, and areas in Indonesia and other countries. It can capture and quantify the variabilities of gender perspectives.

Limitations

- The assessment of farming systems and trees should be done separately, possibly in sequence. The process of listing farming systems should be conducted sequentially to that of tree species. This sequential process will avoid bias and confusion amongst participants because from the farmers' perspective, there is little difference between trees and farming systems.

Key considerations

- During the discussion, facilitators have to be alert in finding any inconsistencies in the series of pairwise comparisons in completing the tables. In such cases, facilitators need to go back and cross check with the participants.
- Often the discussions and reasoning on why people decide to put a particular weight against the others when there are disagreements among participants are very insightful. These notes should be captured, validated and consulted during the analysis of the results.
- If facilitators find that there are distinct sub-groups that continuously disagree with each other, facilitators should capture this and note the characteristics of the members of the sub-groups.
- Facilitators should carefully explain 'criteria' using simple language, and illustrate it with some concrete examples. Make sure participants understand the meaning of criteria because it is key to the method.

Do's and don'ts

- Do employ a good facilitator to run discussions.
- Do use clear and simple language (if possible use the local dialect).
- Do clarify participants' perspectives to ensure that the data are valid.
- Do be familiar with the farming system, species, landscape, culture, etc., to be able to provide examples and illustrations that are familiar to them.
- Don't allow the discussion to be negatively influenced. Don't permit sensitive or out of context conversations.
- Don't direct participants in answering the questions. Let them think about it and respond with their answers. It is sometimes difficult for them to

enumerate and compare the practices and products as they work in these systems and with these products everyday.

Recommended readings

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Social network analysis for determining gender-differentiated sources of information and tree seedlings

Mieke Bourne, Parmutia Makui, Alice Muller, Anja Gassner

Social network analysis (SNA) is a method used to elicit, visualize, and analyse social relations and networks. It is a suitable tool with which to examine such properties as farmer knowledge transfer (Isaac et al. 2007). SNA can be used to measure the quantity of social capital through the strength of a social network, the gender balance of the entire network, or the network structure. Women and men have different communication networks (Szell and Thurner 2013) and SNA can be used to inform the researcher on these differences, and on how women access information.

This method was used in a Conservation Agriculture with Trees project in Machakos, Kenya.[1] The objective was to determine agricultural information networks for both men and women in the project area to determine their respective needs for tree seedlings supplied through different locations and also to determine the differences in general information flow. The analysis of the tree seedling sources will be explained further as an example in this method guide.

[1] Conservation Agriculture with Trees (CAWT) is a form of evergreen agriculture that combines tree intercropping with the three principles of conservation agriculture. Evergreen Agriculture is a form of intensive farming that integrates trees with annual crops. (evergreenagriculture.net and www.worldagroforestry.org/evergreen_agriculture)

Materials

- Survey tool with specific SNA question
- Netdraw© software (Borgatti 2002) with free download from sites.google.com/site/netdrawsoftware/download to visualize social networks
- Ucinet© (Borgatti et al. 2002), a second program to complete more complex calculations, if needed, with download from sites.google.com/site/ucinetsoftware/home

Steps

1. Prepare a survey tool

The tool should pose specific questions covering the respondents' social networks. Household/respondent information should be collected such as name, age, sex, head of household, size of household, farming systems and other relevant information. Some guidance on survey design can be found in Clark (2006) but in general, SNA questions should include:

- Name of individuals identified in the respondents social network
- Type of relationship
- Strength of relationship (this can be measured in many ways, such as frequency of communication or perceived strength or importance of relationship as per a nominated scale)

Additionally, information on the type and use of the information or product accessed by the respondent can be included.

One consideration when designing questions is whether to use open-ended or close questions. In this example, open-ended questions were used. Responses were grouped subsequently to allow flexibility in the respondents' answers. Closed questions can be used when all possible answers are already known. Table 1 shows responses to the sample question: Who do you buy or receive tree seedlings from?

2. Determine the sample size

There are no set answers regarding sample size for SNA. Size depends on the sampling methods to be used. In this study, farmer groups were targeted and their selection from a list of known groups in the area included a gender criterion along with group function and location so that a variety of gender composition groups were selected (male, female and mixed). From those groups all members were listed and stratified by gender and then randomly selected to ensure that both men and women were included in the sample. This study used an ascending method, which targets persons of interest to determine their ego-networks (Rothenberg 1995) and does not survey people named by respondents. Another

Table 1: Response to sample question: Who do you buy or receive tree seedlings from?

Information requested	Respondent 1	Respondent 2
Name (usually either name of a person, group or nursery)	Group nursery	John
Sex of contact male/ female/ mixed	Female	Male
Relationship with respondent	Group member	Neighbour
Contact phone number	Number of group chair	072246873
Village the person/ organisation is in lives	Kalama	Machakos town
Last time spoke/contacted the person/organisation	Last week	Six months ago

option for sampling is snowball sampling, which involves interviewing people identified in the network. As this study was focused on the respondents' network only, snowball sampling was not needed; in other studies it could provide a more complete network.

3. Preparing the database and cleaning

Survey responses should be entered into a spreadsheet. Consider double data entry so that the data are entered twice and cross checked to ensure high quality data. If the data are entered using a program other than MS Excel it should be exported to Excel for the next steps.

Cleaning. To undertake SNA in the NetDraw software, the data needs to be cleaned and well-structured in the Excel worksheet. In particular, ensure:

- All names of respondents and those they identify in their social networks are:
  - Consistent for each unique individual (especially when they appear in both the respondent's list as well as among those people identified in another respondent's social network. If inconsistent, the SNA process will not identify them to be the same person, and as a result the network produced will be more fragmented than in reality)
  - Unique for each individual
  - Consisting of a first name and a surname only (no titles)
  - Enclosed in double quotation marks (e.g. "Mickey Mouse")
- If phone numbers or locations are to be used to clarify name matches, ensure they are in a consistent format.
- Ensure that dates are in a consistent format (day month year – e.g. 4 Oct 2013).

- Relationship data needs to also be consistent (e.g. AEO, EO, extension officer—all to be referred to in the same format). This will allow easy grouping.

Structuring. Setting up the data for import into NetDraw requires two tables: Nodes and Ties. These are created in a spreadsheet using data generated from the survey tool.

Nodes

A node is an individual person in the network. The nodes table (Table 2) contains information about each person in the network (both respondents and the people that they identify). The information should be compiled on an Excel spreadsheet (Table 2).

Table 2: Nodes

Information requested	Respondent 1	Respondent 2
Node	Unique ID (e.g. ID001)	-
Name (person or organisation)	John Mutua	-
Sex	Male	-
Phone number	07846454	-
Age (if a person)	50	-
Location (village, division, etc.)	Machakos	-
Type respondent or person consulted	Respondent	-

Where more than one respondent has consulted the same person, the consulted person will be represented in the table multiple times. Once all the respondents and those they consult have been compiled, these duplicates should be removed to ensure there is only one node per person. Use the consistent names (cross checked with location/ phone number) to remove duplicates.

Ties

Ties refer to the connection between two individuals or nodes. Information about ties can include the strength and type. This information may come directly from the survey results, or be created from the answers given (e.g. a composite indicator may be developed to represent strength). Ties information must be numeric to be used in NetDraw visualisation; however, string data can still be imported for reference.

The following fields are suggestions that could be included in the ties table:

- Name of respondent and consulted person (with name or unique ID number created above)
- Relationship: presence (1) or absence (0)
- Type (e.g. family, government, farmers, etc. These need to be coded to numbers, e.g. Government = 1)
- Strength: could be based on timing of the last contact. For example: <6 months before survey = Frequent (3); 6–12 months before survey = Moderate (2); >1 year before survey = rare (1).
- Purpose: Consultation/seed supply (depends on the question answered). These need to be coded to numbers (e.g. Consultation = 1).
- Order: Number in the order of people identified by the respondent (e.g. first person consulted, second person consulted, etc.). This may be useful for interpreting the strength of the relationship.

In both tables

- The respondents who did NOT consult anyone can be removed from the Ties table. They must remain in the Node table.
- Check that there are no blanks. Fill with hyphens to represent 'no data'.
- Ensure all 'To' and 'From' people in the Ties table match to a single Node.

4. Network Analysis

Analysis can be done in NetDraw (for unimodal networks involving only respondents) or UCINET (for a 2-mode network). It is suggested to prepare the data in UCINET and transfer to NetDraw for visualisation. There are a number of user guides that explain the process of transferring the data, including Clark (2006). A user guide is also available on the NetDraw website at sites.google.com/site/netdrawsoftware/documentation-faqs so this process will not be repeated here.

To enter the data into UCINET a two-mode matrix should be prepared, as shown in Table 3.

1 is used to indicate the source of seedlings corresponding to each respondent (for example, David Mutua gets his seedlings from a group nursery.) Alternatively, you can give a different value for each source of seedlings (for example, 1 = Own nursery, 2 = Group nursery, 3 = Own seedlings, 4 = Individual).

Table 3: Two-mode matrix

	Own nursery	Group nursery	Own seedlings	Individual
John Mutua	1	0	1	1
David Mutua	0	1	0	0

Example of results for the Machakos study

The network shown below is the output from NetDraw. It shows the key individuals (or organizations/groups) and the respondents that identified them as sources of tree seedlings.

The network display shows that the sources of seedlings for both men and women are similar. More information such as which tree seedlings are accessed, the quality of the seedlings, whether the seedlings are planted, and other descriptive data could be added to the network for more detailed analysis. For this example only basic information was used to describe the method clearly.

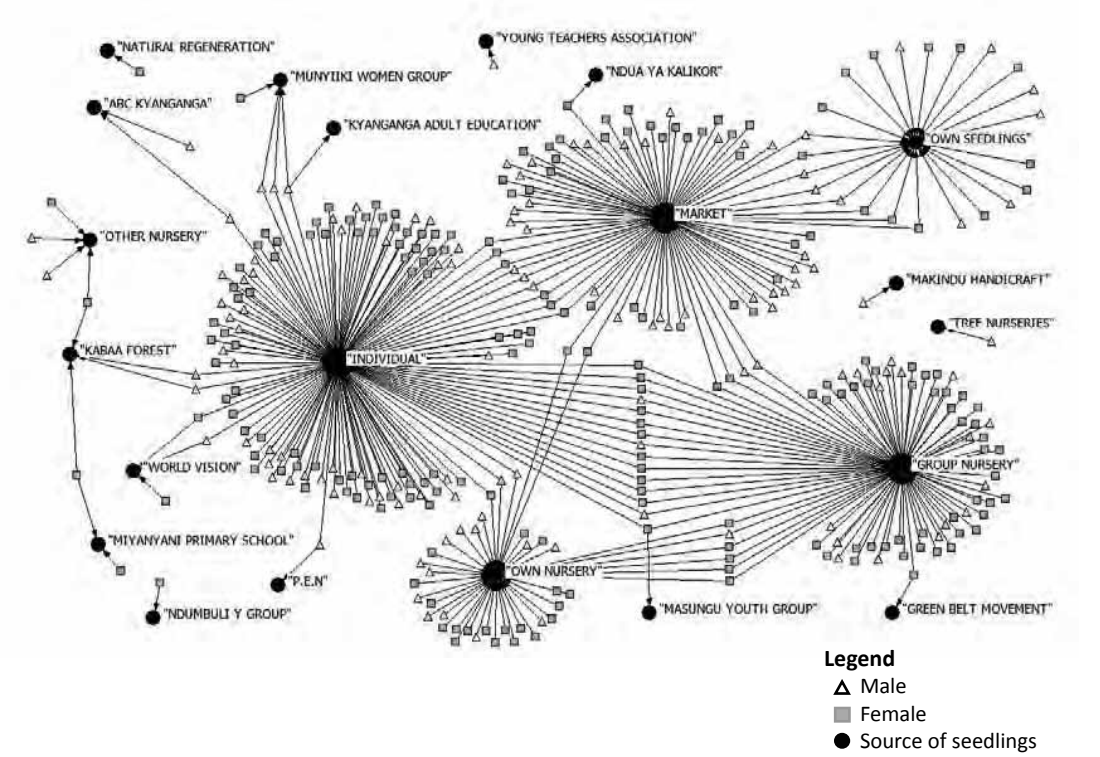

Figure 1: Network showing different tree seedling sources for surveyed respondents. Arrows point to the source of the seedlings.

5. Perform a statistical analysis to add value to the visual map network. Table 4 shows that both men and women use similar sources for tree seedlings.

6. Perform a chi-square test to determine if males and females were distributed differently across the sources of seedlings. In this case, the result demonstrated that there is no significant difference between where men and women access tree seedlings. These results indicate that the same supply centres should be supported to ensure both men and women have equitable access to tree seedlings.

Table 4: Percentages showing the sources of seedlings by gender

	GROUP RESPONSE						
	Individual	Group nursery	Market	Own nursery	Own seedlings	Other	Two sources
Male	28.6	12.8	22.5	9.8	4.5	10.5	11.3
Female	32.9	19.4	13.9	8.8	5.1	5.6	14.3

Advantages

- SNA gives an excellent visualisation of the gendered social networks and information flows relating to a particular topic or in general.
- SNA can be used along with other tools such as focus group discussions and more detailed household level surveys to develop a richer picture of the society.

Limitations

- One limitation is the depth of the results, which may not provide detailed information such as the reason the connection exists, how effective the connection is for transmitting information, or the influence of that information flow on behaviour. To counteract this, the respondent should be asked questions relating to the topic and the connection as part of the survey tool.

- The responses may be influenced by the enumerator because responses are personal, and respondents may not wish to disclose information.
- Researchers need to be able to access experts in SNA.

Key considerations

- Important considerations for data collection include enumerator experience and other attributes such as age and qualifications that may have impact on the answers provided by the respondent (there is a study currently under way to determine the influence of enumerators and survey tools on responses). Enumerators should be well trained on how to ask these types of questions and probe without leading the respondent. Probing is essential to ensure all social network connections are identified for each respondent.
- SNA can be used for a wide range of gendered network analysis and visualisation. While the example provided is quite simple, more complex analysis can be completed and is encouraged so as not to produce an over-simplified reflection of the social interactions.
- Analysis of gendered network densities, important people in the networks, the connectivity and perceived value of information as expressed in tie width are all possible in SNA.
- When conducting SNA, thought should be given to the social structure and whether the network reflects the existing power structures and how the tool can be used to bring out inequities as well as consider larger societal power structures.
- Other free software packages of varying capabilities are available for SNA such as NodeXL.

Do's and don'ts

- Do collect information on the attributes of actors such as age and sex.
- Do clearly define the goal of the survey before undertaking data collection.
- Don't fail to ensure that the enumerators collecting the data understand the questions.

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Eliciting gender preferences for REDD+ initiatives through structured decision making

Mamta Vardhan

Public participation in decision making in a wide variety of environmental management contexts has increased substantially over the past decades. However, meaningful involvement in a decision-making process requires not only an invitation to participate but also a forum for careful deliberation and a mechanism for incorporating the results into technical analyses (Gregory et al. 2012). The structured decision-making (SDM) approach addresses these concerns by placing a two-pronged emphasis on structured deliberation as well as incorporating results into analyses.

The participation of forest-dependent stakeholder groups in developing reducing emissions from deforestation and degradation (REDD+) initiatives is an essential pre-condition for fair and effective implementation of REDD+ programs. At the same time, the need for procedures and methods that allow for active participation of stakeholders, especially forest-dependent groups, is a key concern for REDD+ program planners. The national REDD+ program in Vietnam is exploring various participatory methods and processes that allow for the participation of forest-dependent communities in REDD+ planning. A bottom-up SDM approach was used to understand gender preferences for a REDD+ initiative in northern Vietnam. Twelve SDM workshops were organized in four villages in the core and buffer areas of Ba Be National Park, Ba Be district, Bac Kan province, to elicit local communities' objectives and preferences as regards program design (bottom-up versus top-down), types of benefits (cash versus in-kind), institutional mechanisms for benefit distribution (group versus individual) and monitoring arrangements (top-down versus participatory).

The SDM approach

SDM is a collaborative and facilitated application of group deliberation methods for solving environmental management problems. SDM is based on the idea that good decisions are based on an in-depth understanding of both values (what's important) and consequences (what's likely to happen) if a particular course

of action is adopted (Gregory et al. 2012). While SDM has mostly been used to aid public decision making in western contexts, Arvai and Post (2012) reported its use in the development of a risk management framework involving affected stakeholders in decisions about point-of-use water treatment techniques in rural Tanzania.

The SDM requires that the following five questions be answered:

- **Framing the decision context:** What are the contextual elements of the decision situation?
- **Defining key objectives:** How do people think they will be affected by the proposed action and what objectives matter most to stakeholders? What performance measures will be used to evaluate alternatives?
- **Developing alternatives:** What are alternative actions or strategies?
- **Identifying consequences:** What are the expected consequences of these alternatives?
- **Clarifying tradeoffs:** What are the key trade-offs among the consequences?

Materials

- Flip charts
- Markers

Steps

1. In each sample village, organize three to four workshops separately with various stakeholder groups who use or manage forests. These could be groups of

men, women, village leaders, herders, poor households, etc. Invite 10 participants for each workshop. In the Vietnamese example discussed, the villages were largely homogenous so the participants were selected based on gender and socio-economic status.

2. At the start of each workshop, explain its purpose. Also explain the decision context (in the example discussed it was explained that participants were invited to voice their views on an upcoming forest management program). After this introduction, focus on eliciting participants' values and concerns—expressed as objectives—as they relate to the given decision context (in this case, forest management programs). Write these objectives on the flip chart for everyone to see and read.

Ask the participants why each objective is important to them. If a participant answers that something is important for its own sake, identify it as an ends objective. If participants answer that something is important because it leads to another objective, it is a means objective. This step in a SDM process is helpful for two reasons. First, identifying ends objectives helps decision makers understand key concerns that participants care about, such as environmental health and water quality. Second, a focus on means objectives provides important insights into how stakeholders envision that the ends objectives may be achieved (e.g. protecting forests may ensure water quality) (Table 1).

Table 1: Means-ends objectives: an example from Bac Kan, Vietnam

Ends objective	Means objective	Performance measures
Protect ecosystem services (water flows, erosion control)	Protect forests and prevent forest loss	• Availability of desired species in forest/private lands • Improved water quality • Low incidence of floods
Poverty alleviation and community wellbeing	• Develop locally acceptable cash and non-cash incentives for REDD+ • Develop alternative sources of income • Develop irrigation channels	• Improved household incomes • REDD+ incentives equitably distributed • Availability of timber & fuelwood
Democratic governance	Promote local participation in REDD+ design, implementation & monitoring	• Village participation in REDD+ meetings • Participatory monitoring of forest management

3. Identify performance measures for as many means objectives as participants feel knowledgeable about. Performance measures are important in understanding

how the proposed programs may be tracked. An easy way to explain the concept of performance measure to participants is by asking them 'How would they know if a particular objective is being met?' For instance, 'How would (participants) assess that a project is democratic?' and they could answer (as in the example) that having opportunities for local people to participate makes a project democratic. Asking questions in this manner would help elicit a list of locally relevant performance measures.

4. To develop alternative REDD+ program designs, ask participants to identify possible attributes. Three attributes identified for a forest management program in the Vietnamese example were: program design (top-down versus bottom-up), choice of incentives (cash versus in-kind), and monitoring arrangements (top-down versus participatory). These were identified based on people's knowledge and experience with previous programs of forest management. What is important at this step is to remind the participants that program attributes (and therefore corresponding alternatives) should be chosen based on their ability to contribute to achieving the objectives identified in step 2. This will result in the creation of an objective by alternative matrix.

5. Ask participants to rank the resulting alternative REDD+ design with a focus on its ability to meet key objectives using a simple, 3-point rating scale, where:

1 = does not satisfy the objective
2 = partially satisfies the objective
3 = completely satisfies the objective

Write the rating for the alternative program design on the flip chart for participants to see and judge the alternative program designs.

6. Ask participants to create a second set of alternative program design by changing/eliminating the attributes that did not satisfy key objectives in the first round. Ask participants to rate the resulting alternative.

7. Continue rating the program and developing new alternatives until participants are satisfied with an alternative program design that satisfies their objectives.

8. Elicit feedback from participants on the process of facilitation and discussion.

Example of results from Bac Kan

1. Across workshops in Bac Kan, the key objectives identified by both men and women participants were protection of forests for ecosystem services (water flow, erosion control) as well as subsistence needs (fuelwood, timber for house construction). Poverty alleviation, community well-being and democratic governance also featured among the objectives identified by participants. Women identified non-cash incentives like seeds, agricultural inputs and infrastructure such as irrigation channels and schoolrooms as important means objectives that ensure community well-being. Men, on the other hand, emphasized cash incentives as an important means objective to achieve the objective of poverty alleviation.

2. Table 2 presents an alternative REDD+ program and its various attributes as identified by the workshop participants. In column 2, alternative 1 received higher ratings from men as it satisfied poverty alleviation, a key ends objective for them. Women, on the other hand, were not satisfied with alternative 1, because even though it provided substantial cash income and addressed poverty alleviation,

Table 2: Gender preferences of REDD+ program attributes

Attributes	Alternative 1: Ranked favorably by men	Alternative 2: Ranked favorably by women	REDD+ compliant program
Mode of program design	Bottom-up, collaborative	Bottom-up, collaborative	Bottom-up, collaborative
Incentives	Cash (1.5 million VND)	Cash (1.5 million VND ha^{-1} $year^{-1}$)	Cash (1.5 million VND ha^{-1} $year^{-1}$)
	Seeds, fertilizers; community dev't. project: improve drainage channels	Seeds, fertilizers; community dev't. project: improve drainage channels	Seeds, fertilizers; community dev't. project: improve drainage channels
Institutional mechanism for benefit distribution	Park management to the forest patrol group leader	Park management to the forest patrol group leader	Park management to the forest patrol group leader
Forest uses permitted	None	Subsistence forest use permitted	Subsistence uses permitted
Management	Forest patrol groups, managed by group leaders	Forest patrol groups, managed by group leaders	Forest patrol groups, managed by group leaders
Monitoring	Jointly by park management and villagers	Jointly by park management and villagers	Jointly by park management and villagers
Conditionality of benefits	Enforced	Enforced	Enforced

it did not provide for subsistence forest uses. The women were thus confronted with a real-life trade-off where they had to make a choice between higher cash incomes versus complete restrictions on subsistence forest use. Women's and men's groups reflected on their objectives (in this case achieving cash incomes and subsistence forest use) and found that the attribute 'restriction on forest use' does not satisfy their objective. The deliberation on this tradeoff resulted in the women's and men's groups choosing an alternative REDD+ program design, one that provided for subsistence use of forests by surrounding communities. Column 3 presents key attributes of a locally acceptable REDD+ program design.

Advantages

- SDM provides a sensible decision-making process for groups working on controversial environmental problems characterized by diverse stakeholders and difficult tradeoffs.
- SDM is unique in its emphasis on developing better alternatives that match participants' objectives rather than simply evaluating existing alternatives. This allows for creativity in generation of alternatives that satisfy participants' objectives.
- The open-ended nature of the deliberation process allows participants to voice their concerns freely.
- The iterative deliberation and rankings create clarity and transparency about program design and benefits.
- An SDM approach aids and informs decision makers rather than prescribes a preferred solution.

Key considerations

- Outcomes of SDM are affected by both politics and uncertainty surrounding the issue.
- As is the case in other participatory methods, the success of SDM depends on the expertise of the facilitator.

References

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Recommended readings

Gregory R, Failing L, Harstone M, Long G, McDaniels T, Ohlson D. 2012. Structured decision making: a practical guide to environmental management choices. Wiley-Blackwell.

Gender, land use and role-play games

Grace B Villamor

In land use role-playing games (RPGs), players assume roles or characters and take control of their real-life roles/characters in a fictional setting. The RPG approach was used to observe and document the behaviour of men and women toward land use decision-making in rubber agroforest landscapes in Sumatra, Indonesia. Behaviour patterns toward alternative land use options and new investment opportunities such as oil palm or rubber monoculture plantations were explored.

The game, which can be played by women-only, male-only, or mixed group, was used to answer the following key questions:

- How do men and women differ in land use perspectives?
- How do men and women differ in their land use decisions where competing agents are promoting either conversion or conservation?
- How are land use decisions made?

Moreover, the RPG method can be used to validate the results generated by the Agent-Based Model discussed in the next paper.

Materials

- A land use game board with a 5 cm x 5 cm grid
- Colour-coded cards
- Score sheets
- Play money (with local currency)
- Stickers
- Pins
- Marker pens
- Video recorder

Players

The game requires a maximum of 30 persons separated into four groups. Three of the groups represent villagers and the fourth group represents external agents.

Steps

The steps outlined below were based on the RPGs conducted in Indonesia.

Before the game

1. Set up three land use game boards with 5 cm x 5 cm grids marked with at least three land cover types.[1] Each game board represents a watershed or landscape comprised of a village (V), a unit of rice field (R), 9 units of rubber agroforest (RAF) and 14 units of forest (F). Each of these land units provides the following annual incomes (F$[2]):

- Rice fields = F$10/year
- RAF = F$4/year
- Forest = F$1/year
- Logged forest = negotiable payment, F$0/year thereafter
- Village settlement = F$15/year
- Oil plantation = F$8/year (after an initial 1-year period)
- Green rubber = F$2/plot /year

2. Assign 5-7 members for each game board or group (male group, female group, and mixed group) who will act as villagers. The rest of the players will act as external agents.[3] Once the groups are formed, hold separate briefings with the villagers group and external agents group. Provide instructions on the mechanics of the RPG and explain the roles that the villagers and external agents have to play. Make sure that the villagers' group will not hear the instructions given to external agents.

[1] Key land use types depend on elevation, soil type, and other factors. Adjust your study site accordingly.

[2] Fictional currency.

[3] The number and types of external agents depends on contexts of the study area.

3. Briefing the players.
It is important for players to understand their roles, and to perform such roles seriously even in a fictional setting. In Vietnam, since the study site was new for the research team, an introductory guide was prepared that allowed a discussion about previous experiences of players in real-life land use decision-making. This was deemed important to prepare the players psychologically for the game.

Discuss the roles of external agents and villagers separately.

A. Village groups
A group of 5-7 members originating from the same commune or watershed (per elevation level) is a good group size for the study.

- Allocate 2-5 minutes to explain to villagers the following: number of plots of each land use, the value of each land use per year, and their target to increase the income as much as possible.
- Explain the game board structure (5x5 cm grid) and assume that the board is an image of their village's land uses. Ask them to freely arrange their plots in any position in the game board.
- Keep reminding the villagers that everyone in the village owns all the lands, therefore they should discuss and make decisions together.
- Tell them that with current land uses, their income can only feed the family, while they also need more income for their children's education. They have the opportunity to change or maintain their current land uses. Their decision will affect their future income.
- The score sheets are given prior to the game with the initial plots of land uses. For each year, they are required to record any change for each land use. It can be maintained, decreased or increased. All land uses have their own values per plot. If they convert annual crops to production forests, the total value of annual crops will decrease and the total value of production forests will increase. Also, they may get some money for the conversion decision. These changes should be recorded in the score sheets.
- After the first round (1 year), give the group 5 minutes to calculate their income in that particular year. Let them observe the result of the other groups, so they can improve their strategies in subsequent years.

B. External agents
At least two competing external agents of land use change (i.e. those promoting conservation and those promoting conversion) should be portrayed. Ask the players to portray familiar roles. If they are acquainted with real-life agents, so much the better. Provide a one-time budget to the external agents. In the real world, external agents promoting conservation do not have sufficient budget to keep the villagers from changing their land use. They usually hand out stickers to recognize villagers who retain their land conservation. Provide colour-coded stickers for each external agent or add symbols to each sticker for easy recognition.

- Explain the overall purpose of the game. Let the players select the role they want to play from the list and roles described below. Distribute their play money and score sheets. Tell them that their mission is to meet their target (described below) with a limited budget.
- Tell the agents that they must visit the village one at a time during the first three rounds of the game. They can visit the villages several times within the allocated negotiation time or round (around 15 minutes). For the 4th to 6th rounds, 2 or more external agents may visit one village at the same time. The agents will haggle for the villagers' acceptance of their offer. The game master will manage the time.

External agents, their roles and targets

- **Logging company agent.** This player represents a pulp wood and paper company that wants to make a deal with the villagers to convert natural to logged forest and s/he offers an attractive price.
- **Oil palm company agent.** This player promises to convert any type of land to oil palm and gives a negotiable net benefit in the third time period after conversion. The target is to convert at least 30 units of land in the catchment—otherwise the company could go bankrupt.
- '**Save-the-tiger' NGO representative.** This player offers negotiable rewards to villages that still own at least 10 plots of continuous forest cover. A minimum of 30 units of intact forest must be maintained at all times within the watershed to prevent local extinction of the tiger.
- **Watershed protection board representative.** This player offers recognition for intact forest. The target is that all villages in the valley make a clear commitment to protect their water resources.
- **'Green' rubber company representative.** This player wants sustainable rubber production. The goal is to support the village with rubber agroforest farms with a watershed protection program. This player supports the tiger conservation efforts.

Once the role descriptions are clearly understood, explain the score sheet for each agent (see tables).

Table 1: Sample 'Save the Tiger' agent score sheet

Number of forests or agroforests protected[a]	Year						
	0	1	2	3	4	5	6
Forest Protected							
Rubber agroforestry							
Total							

[a] Target: 10 units of forest protected per village, or 8 units of forest and 6 units of RAF per village

Table 2: Sample oil palm company score sheet

Number of plots converted[a]	Year						
	0	1	2	3	4	5	6
Number of plots							
F$/plot							

[a] Target: 40 plots

Table 3: Sample villagers' score sheet

Land use type	Annual income	Number of plots						Income					
		Y0	Y1	Y2	Y3	Y4	Y5	Y0	Y1	Y2	Y3	Y4	Y5
Forest	1	14	14	14	14	12	12	14	14	14	14	12	12
Logged forest	0	0	0	0	0	0	0	0	0	0	0	0	0
Agroforest	4	9	9	9	9	9	9	36	36	36	36	43	21
Rice field	10	1	1	1	1	1	1	10	10	10	10	10	10
Village	15	1	1	1	1	1	1	15	15	15	15	15	15
Burnt area	-	-	-	-	-	2	2	-	-	-	-	0	0
Total		**25**	**25**	**25**	**25**	**25**	**25**	**75**	**75**	**85**	**85**	**90**	**58**
Required income	-	-	-	-	-	-	-	75	75	75	90	90	90
No. of stickers	-	-	-	-	-	-	-	-	-	-	-	-	-
Sticker value	-	-	-	-	-	-	-	-	-	-	-	-	-

During the game

Documentation and facilitation

- Assign at least one observer per group to observe, assist the group in filling in the score sheet, and photograph the land use game board at each round.
- Facilitator/observer in a group takes note of the group's conversation during the negotiations and takes a photo of the game board after each round. Count the number of stickers negotiated per round.
- Place the video recorder in a strategic location to capture the movement of the groups. Provide an audio recorder for each group, if possible.
- Assign one game master to oversee the whole game. Announce the start and end of each round, and emphasize the key stresses at years 3, 4 and 5. The game master should make sure that all agents correctly calculate their targets. If possible, choose a game master who has good facilitation skills and knows the local language.
- If budget allows, assign another facilitator to assist the game master in checking how the external agents meet their goals or whether they have to adjust the roles to meet targets of each agent. The co-facilitator should also serve as a banker.
- Provide colour-coded land use type cards to easily refer to land uses on the game board.

Guide questions when observing an RPG

- How is the land use game board designed? Where is the village or settlement area located? What land use type surrounds the village?
- When the villagers decide to change land use, which land use is most targeted for change?
- Who dominates the discussion with external agents?
- Do you observe a pattern of fragmentation? Clustering? How is land allocated?
- Who are active and responsive to external agents? Who generates the highest income? Who has the tendency to breach contracts with external agents?

4. The game master explains the initial condition of the villages to all players. The assumption is that due to the physical constraints of their land, the villagers could not expand its rice fields or village area. The population at year zero is 75. If they want to live comfortably, they have to increase their income. Allow the village players to design their land use game boards according to their perceived landscape using the prepared land use type cards. Now the land use game board is ready. Do a pretest by allowing the external agents to randomly visit the village groups and negotiate. Let the negotiations last for 15 minutes per round. Depending on the negotiations with the group, an external agent can visit as much as s/he wants to convince the villagers within the given time. When the game mechanics are clearly understood by all the players, start the 'real' game.

5. Let the villagers and external agents update their targets using the score sheets and game boards after each round. Preferably play up to 6 rounds. At year 3, announce a natural population increase of 20%, and an income target of F$90. At year 4, a natural forest fire occurs during which two blocks of forest are burnt and no income (F$0) is produced. At year 5, the rubber price drops by 50%.

After the game

6. At the end of the game, evaluate (e.g. through questionnaire) or discuss the experiences of the players.

7. Provide a reflection/evaluation sheet to obtain feedback on what they liked and what influenced their decisions.

Example of results from RPG application in Jambi Province, Sumatra, Indonesia

Women from both the upland and lowland villages who played the RPG approached land use change in a more dynamic way than men from the same villages, reacting more positively to external investors proposing logging or oil palm conversion. Contrary to expectations and gender stereotypes, the increased involvement of women in landscape-level decision-making may serve to increase

emissions from deforestation and forest degradation in the area, thus posing further challenges to emission reduction efforts.

Advantages

- RPG overcomes the main obstacle of data collection in traditional household surveys: the lack of trust between the interviewer and the interviewee that often results in imprecise and inaccurate information.
- The method helps capture behaviour patterns when natural calamities or population growth affect conditions in the target villages or landscapes.

Limitations

- Since RPG is a participatory process, the question of power relations remains to be considered.
- We do not know whether the players are acting to please the researcher in the area. To address this issue, do replications.

Key considerations

Study site/game settings

- Familiarize yourself with the following context-specific study site information
  - land use pattern (preferably for the last 10 years)
  - basic and major land use composition, including land value or income
  - key drivers and actors of land use change (e.g. demographic, economic and natural causes)
- Identify at least two major land use types with active land transition (i.e. forest, agroforest)
  - conduct informant interviews in the study site to identify the key actors of active land transition
- Identify emerging issues and challenges in the area
  - proposed policy/market instruments (e.g. payment for ecosystem services schemes, development plans)
  - management strategies and associated challenges (e.g. forest protection zoning)
- Villagers within the group must be familiar with one another and with the watershed or commune. The group will jointly design a land use game board that accurately represents their landscape or household farm, and then jointly decide how to respond to external agents. In some African contexts, a village may represent a plot or homestead. However, in the game it doesn't matter if some land uses such as forests are individually owned or shared property. The

game emphasizes the decision-making process in a group setting.

- In introducing the game, inform the players about the main purpose of conducting the game. Preparation of a list of questions on how decision-making is made in relation to land use is recommended.
- Village groups must be oriented with their roles in separate locations away from the group of external agents.

Do's and don'ts

- Do a women-only against men-only game or a mixed male-female game.
- To observe the behaviour of the different players thoroughly, the researcher may assume the role of an observer.
- Do adjust the game mechanics according to the context of the study site.
- Do not treat women-only or men-only groups as homogenous entities; rather consider different ages, villages, marital status and education level.
- For the facilitators and observers, do not interfere when external agents are negotiating with the villagers unless to answer questions related to the mechanics of the game.

Recommended readings

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Analyzing gendered patterns of tree cover transition through agent-based modelling

Grace B Villamor

Agent-based models (ABMs) are widely used to explore and understand social phenomena such as migration, group formation, and interaction with the environment. ABM can be applied and used for policy analysis and planning, participatory modeling, explaining spatial patterns of land use or settlement, testing social science concepts, and explaining land use functions. The ABM method enables researchers to analyse complex systems arising from local interaction of system entities. In Indonesia, we applied ABM to explore gender-segregated decision-making to understand tree cover transition in a temporal and spatially explicit way (Figure 1).[1]

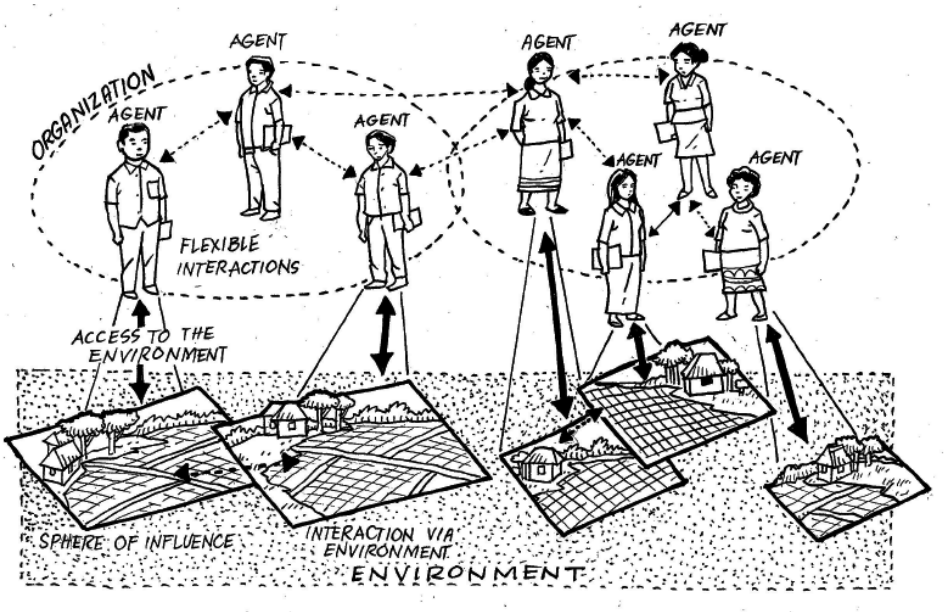

Figure 1: Gender-segregated interactions can drive changes in the way land is used.

[1] Empirical land use ABM requires a considerable amount of data for household agents and environmental processes (see Smajgl et al. 2011 for specific parameters).

The rubber agroforests in Jambi province in Indonesia provide livelihoods to the local community as well as ecosystem services such as carbon sequestration, biodiversity and landscape beauty. However, due to low rubber production from agroforests, farmers are now considering converting their agroforests to highly profitable monoculture crops like rubber and oil palm. Through ABM, we examined the relative values of appreciation of tree cover and associated ecosystem services according to the ecological knowledge of men and women in the area.

Study team

- A modeler with knowledge of object-oriented language is required.
- Facilitator
- Documenter

Materials

Computer loaded with:

- NetLogo 5.1 software (free download at http://ccl.northwestern.edu/netlogo/)[2]
- Gender-disaggregated household data (i.e. time series and cross-sectional information)[3]
- Data on crop production, forest inventories, and vegetation assessment
- Major commodity prices
- Maps: administrative maps, soil map, digital elevation map, land use maps (preferably time series)

Steps

The steps in ABM follows the modeling cycle presented in Figure 2.

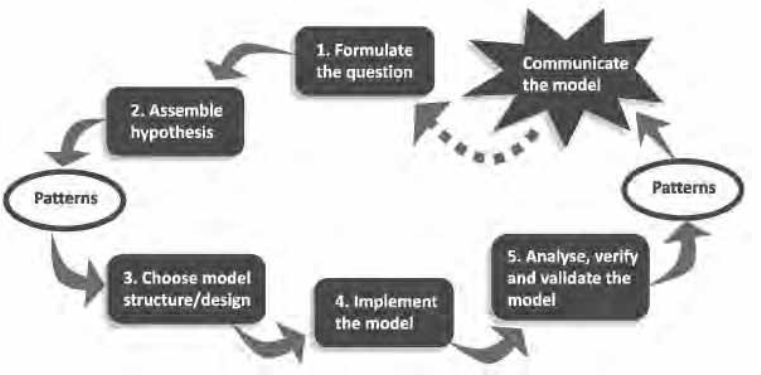

Figure 2: Modeling cycle (adapted from Railsback and Grimm 2010)

[2] Other ABM environmental platforms are also available (see Gilbert 2008 for criteria for selecting appropriate platforms).

[3] To make the model spatially explicit, take GPS readings of households and farming plots.

1. **Formulate the question.** Start with a very clear research question. For example, 'How do differences in men and women's choices and decisions over land use affect the dynamics of tree cover transition?'

2. **Assemble hypotheses to define ABM processes and structure.** This step explores key questions: What factors have a strong influence on the phenomena or interest? Are these factors independent or interacting? Are they affected by other important factors? An extensive literature review on tree cover transition or land use change, including sectoral causes of the change, is therefore required to determine patterns of behaviour. The use of land use role playing games (RPGs) can generate behavioural patterns (see Gender, land use and role-play games paper) that can be compared with the results of the ABM.

3. **Decide on the model design and details.** A standard documentation protocol (i.e. overview, design and details) is already available to convey the entire modeling process (Grimm et al. 2010). The basics that should be prepared are the following:

- **Agents:** Identify the agent types and other objects along with their attributes.
- **Environment:** Define the environment the agents will locate and interact with.
- **Agent methods:** Specify the methods by which agent attributes are updated in response to either agent-to-agent interactions or agent interactions with the environment.
- **Agent interactions:** Add the methods that control which agents interact, when and how they interact during the simulation.

4. **Implementation of model.** This is the most technical part of the modeling cycle. Mathematics and computer programs (NetLogo is recommended) are used to translate verbal model descriptions into animated objects. In the context of tree cover transitions, a computer program called Land Use Dynamic Simulator (LUDAS) has been applied in Vietnam (VN-LUDAS; Le et al. 2008) and Indonesia (LB-LUDAS; Villamor 2012). Statistical analysis (e.g. logistical regression) is commonly used to develop land-use choices, while other researchers use a decision tree.

5. **Analyse, test and revise the model.** This stage, which involves analysing and interpreting the model output is the most time-consuming. First, verify the results and then validate by comparing the patterns of behaviour generated by ABM with the results of RPG. Once some patterns coincide or support your hypothesis or the results of RPG, begin documenting the results, including the details of the modeling processes. When new issues or disagreements arise, reiteration (including necessary model adjustments) is required to ensure that the modeling exercise is scientifically acceptable or valid.

6. **Communicate the model.** Results from the simulation can be useful in

explaining and understanding the possible effects of introduced interventions or future scenarios.

Example of results from ABM application in Sumatra, Indonesia

Using the characteristics and decision-making behaviour of male-dominated households in three villages in Jambi province, the model simulated the payments for ecosystem services (PES) scenario through the eco-certification scheme of rubber agroforestry in the area.

Although only 30-40% of households successfully adopted PES, the adoption led to the decision to maintain rubber agroforests for a period of 20 years, which increased species richness while reducing carbon emissions.

Moreover, the simulation showed an increase in farmers' income of 60% from rubber agroforests. This is because the labour required to maintain rubber agroforests is less compared to that of other land uses (e.g. rubber and oil palm plantations). As such, farmers are able to use their free time in collecting non-timber forest products, which they sell for income.

Advantages

- The tool incorporates decision-making processes of human agents and ecological processes in the system; and
- It can capture socio-ecological interactions at the local level resulting to emergent property at the macro level.

Limitations

Limitations include issues of validation of agents' behaviour (Heckbert et al. 2010), weak representation of human decision-making, and missing confounding variables (Villamor et al. 2012). To address these limitations, validation using RPG is recommended (see previous paper). Also, note that empirical ABM is a data-hungry model.

Key considerations

Data

- Sufficient background information of the area is needed, especially about temporal land use change, actors and sectoral causes/drivers of land

transitions. In the ABM application in Indonesia, data on rubber agroforest plots of different ages, crop yield, and carbon densities of each land-use type were collected to generate sub-models for crop production, carbon emissions, and natural succession processes.
- An intensive gender-disaggregated household survey should be conducted preferably with 20-30% sample of the household population.
- An up-to-date land use map is preferred. The choice of resolution (i.e. 10 m^2, 30 m^2 or 1 hectare) depends on the research question and interactions being modeled. In the case of Indonesia, a 30 m^2 resolution was used.
- A framework is available for determining the parameters of agent behaviour (Smajgl et al. 2011).

Programming

- The researcher must have a clear conceptual framework of the relationship or interactions in order to design the model. The conceptual framework enables the modeler to envision the possible simulation procedure. A modeler with basic knowledge of the NetLogo programming is an advantage.
- Work closely with the modeler at every stage of the modeling cycle.

Scenario testing

- Composition of households (i.e. women-only, male-only, mixed gender) decision-making agents should be parameterized and tested.

Do's and don'ts

- Do use existing models relevant to your research question.
- Do keep the model as simple as possible for easy implementation and analysis.
- Don't cram too much information into the first model version; instead, use a step-wise approach by adding new information on every simulation.

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Bio-sketch of writeshop participants

Noviana Khususiyah is a socioeconomist and livelihood specialist assigned to ICRAF's Southeast Asia Regional office. She is experienced in research methods such as surveys and participatory rural appraisal. Novi hails from Indonesia.

Devashree Nayak, an Indian national, is a research associate at ICRAF's Regional Office for South Asia based in Delhi. She works on climate change mitigation and sustainable natural resource management through agroforestry systems to enhance smallholder livelihoods. Deeva's particular focus is on the problems of women and the landless.

Charlie Mbosso is a socioeconomist working under Tree Products and Markets programme at ICRAF's West and Central Africa Region. Her area of interest is value chain development, collective action, linkages with actors, gender, and postharvest techniques. Charlie is from Cameroon.

Sammy Carsan is a scientist in agricultural sustainability working at ICRAF headquarters in Nairobi. Sammy has worked on African smallholder systems for over 10 years and is an expert on tree domestication approaches used to diversify farming systems, reduce risks and build farmer resilience. Sammy, a Kenyan national, holds a PhD in education from the University of the Free State, South Africa, with specialization in agricultural sustainability.

Grace Villamor is a senior researcher with the Center for Development Research at the University of Bonn, Germany, where she is pursuing postdoctoral research with ICRAF. Grace hails from Laguna province, Philippines. Her special focus is on studying complex landscapes and gender using a modelling approach.

Isidra Bagares is based at ICRAF's research site in Claveria, Misamis Oriental Province, Philippines. She is a researcher working on forest tenure and property rights, gender, watershed evaluation, and conservation agriculture production systems. Sid, a Filipina, comes from Bukidnon province. She holds a Master in Public Affairs in Strategic Planning and Public Policy.

Delia Catacutan is an ICRAF senior social scientist and country representative based in Hanoi, Vietnam. Delia works with men and women farmers in understanding their own contexts and exploring multiple options that address their needs. Delia is a citizen of the Philippines.

Janudianto works for ICRAF Indonesia as Agroforestry Management Specialist. Janu's focus is on working with communities. He aspires to further his knowledge in agriculture through social science research. Janu is from Indonesia.

Su Yufang is a social scientist working at ICRAF's East Asia Node in Kunming, China, where her current research focuses on local adaptation to climate change, forest governance and rural energy. For several years, Su has been applying gender analysis and perspective into her research.

Alice Muchugi works with ICRAF's Genetic Resource Unit as Genebank Manager. A Kenyan national with a PhD in Population Genetics, she focuses on research on use and conservation in agroforestry with a special interest on underutilised indigenous trees. Alice strives to see a forested world with women reaping benefits from agroforestry.

Mamta Vardhan is an environmental social scientist from India with a solid experience in community-based natural resource management. She holds a PhD in Environmental Policy and is currently a Killam Postdoctoral Fellow with the Department of Resource Economics and Environmental Sociology at the University of Alberta, Canada. Mamta is passionate about applied research that can enhance the lives of rural communities on the ground.

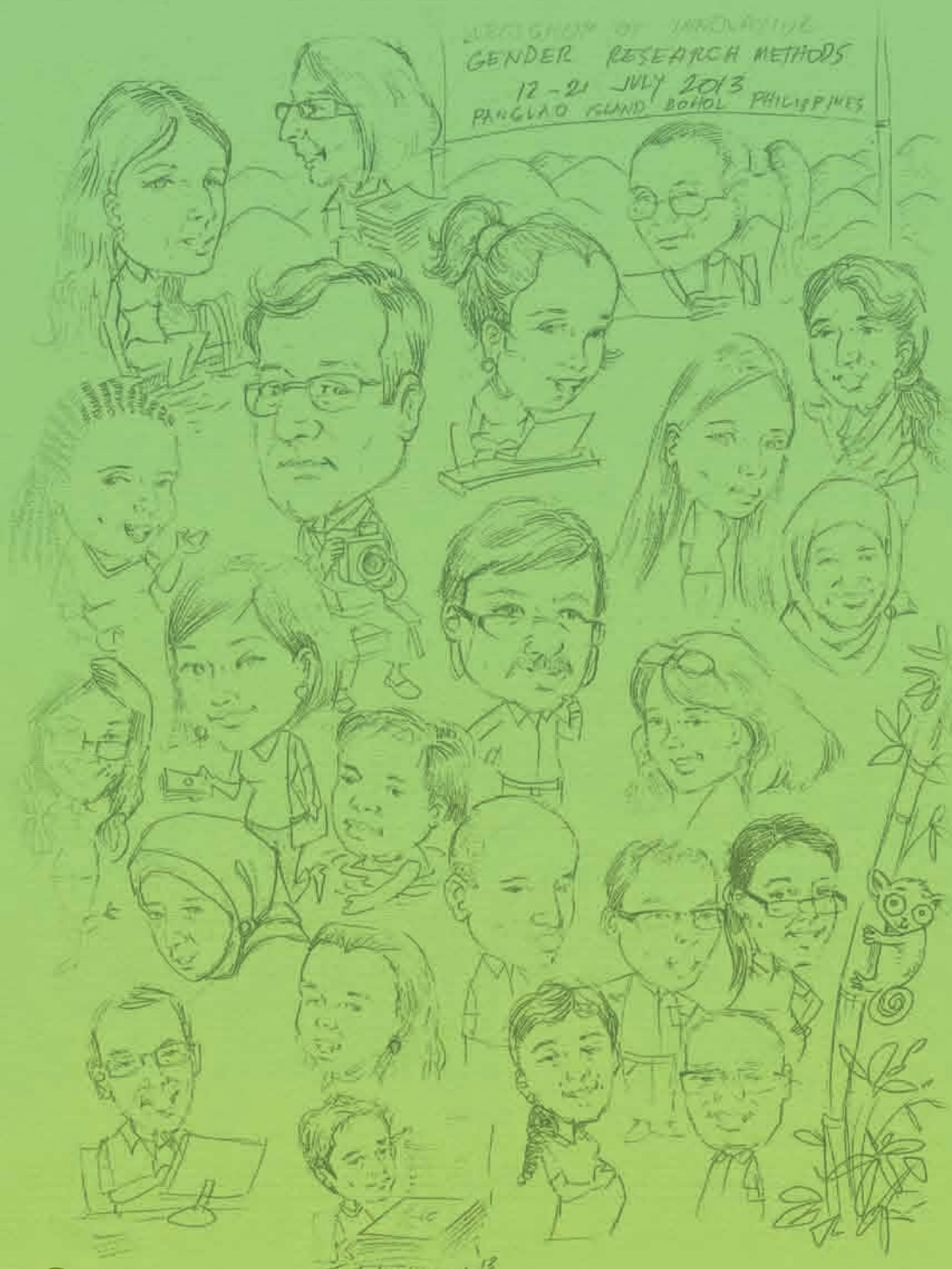
Evelyne Kiptot is a social scientist at ICRAF headquarters in Nairobi. A Kenyan national with a PhD in Social Science, Evelyne's research focuses on extension methods. She loves working with smallholder farmers to see them improve their livelihoods through agroforestry.

Elok Mulyoutami, an Indonesian national, holds an MSc in rural sociology. She is a research officer on local ecological knowledge and gender with ICRAF's Southeast Asia Regional Office. In addition to her professional work, Elok is a musician, a poet and an artist.

Mieke Sophia Bourne is a capacity development facilitator at ICRAF's East Africa regional office in Nairobi. Mieke is passionate about empowering men and women farmers to improve their livelihoods while protecting their environment through collective action and appropriate advisory models. Mieke, an Australian, earned her Bachelor of Science degree in environmental science from Murdoch University, Western Australia.

Caroline Piñon is a researcher with ICRAF Philippines working on the policy and institutional concepts of agroforestry with smallholder farmers in the Philippines. She has a bachelor's degree on Development Studies from the University of the Philippines Manila, and obtained her master's degree on Environmental Management from the Flinders University of South Australia. Even as she is passionate about work, for Caroline taking care of her family is her most meaningful and fulfilling job.

Ujjwal Pradhan is ICRAF's Regional Coordinator for Southeast Asia. A Nepalese national, Ujjwal studied poverty and comparative sustainability in the hills of his native country and elsewhere. He describes himself as a 'global environmental nomad searching for roots, relevance and rural transformation.' An accomplished scientist, Ujjwal also pursues the arts through drama and poetry.



World Agroforestry Centre

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CGIAR

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry

The CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA) is a collaborative program that aims to enhance the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms. CIFOR leads CRP-FTA in partnership with Bioversity International, CIRAD, the International Center for Tropical Agriculture and the World Agroforestry Centre.

In Equal Measure: A user guide to gender analysis in agroforestry

ICRAF