Mapping Guidelines for Participatory Rangeland Management in Pastoral and Agro-Pastoral Areas

Compiled by Ben Irwin, Adrian Cullis and Fiona Flintan

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PRIME's approach to mapping

PRIME uses a participatory approach to natural resource management, actively engaging local communities and stakeholders throughout the processes of NRM activities including the identification of key natural resources, mapping their locations and distribution, analyzing community access to those resources, identifying community development priorities, and supporting the implementation of those priorities. During this process, PRIME uses participatory resource mapping exercises as a key tool for understanding natural resource conditions and in facilitating community NRM management planning processes. The mapping exercises help local communities to visualize and understand their surroundings and resource conditions such as resource distribution, and strategize their resource management and utilization practices. It also helps communities and stakeholders to visualize the geographic integration of different project activities which fall under non-NRM project activities in PRIME. Participatory mapping has taken place in all three regions of PRIME intervention: Oromia, Afar and Somali.

Acknowledgements

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The information presented in the guidelines is informed by our engagement with many different agencies and pastoralist communities. In particular, we wish to thank Borana and Garri pastoralist communities and their leaders. Any inaccuracies or misrepresentation made in these guidelines is solely our responsibility. We also thank Helen de Jode for editing the final text and Kelley Lynch who took photographs, collected testimonies from communities in Afar, Borana and Somali regions and prepared the document for publication. These guidelines have been published with the assistance of CARE. They do not necessarily reflect the views of any of the donors involved.

About the authors

Ben Irwin's first experience of working with pastoralists was with the Fulani in the grasslands of north-west Cameroon in 1994-96. Ben has worked in Ethiopia since 1997 and continues to date. Working with SOS Sahel and FARM Africa leading a number of innovative participatory natural resource management projects. These projects included work in rangelands with Borana, Afar, Somali and Bale pastoralist groups. Each project employed participatory learning and action tools, such as resource mapping, to enable formally trained rangeland managers to work with customary rangeland managers — the key to successful rangeland management. Currently Ben works for KPMG-East Africa–International Development Advisory Service, managing the Strategic Climate Institutions Programme 2012 - 16.

Adrian Cullis has lived and worked with pastoral communities in Turkana District, Kenya and Karamoja, Uganda. His work included the pioneering of participatory approaches to livestock development including participatory natural resource management. In 2005 Adrian moved to Ethiopia to join Save the Children US to lead the USAID-funded Pastoral Livelihoods Initiative (PLI1). Adrian subsequently joined the Food and Agriculture Organisation, Ethiopia in 2010 before joining Tufts University in 2014, where he leads the USAID funded Agriculture Knowledge Learning Documentation and Policy (AKLDP) project www.agri-learning-ethiopia.org. The AKLDP supports improved agriculture sector practice and policy to USAID's Feed the Future implementing partners, the Ministry of Agriculture and other stakeholders through analyses, reviews and evaluations and technical support.

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THE STRUCTURE OF THESE GUIDELINES

The purpose of these Mapping Guidelines is to support development practitioners (individuals and organizations) working in the rangelands and sub-humid grasslands of Ethiopia. Specifically, resource mapping can assist with investigating rangeland management systems, negotiating rangeland management plans, and implementing and monitoring progress in Participatory Rangeland Management (PRM). The Mapping Guidelines will provide rangeland management practitioners with a tool to help establish PRM within community, district, zone and regional rangeland management offices across Ethiopia.

At a national level it is also hoped these guidelines will contribute towards efforts aimed at sustainable use of rangeland resources and arresting and reversing rangeland degradation. The Mapping Guidelines are a contribution towards the overall national development goals of improved livestock productivity, greater resilience building and poverty reduction. The principles of participatory mapping, as outlined in these guidelines, may also be valuable in supporting and informing other development planning processes, including infrastructure development, the delivery of services, and complementary non-livestock natural resource-based economies.

These guidelines outline the three stages of a mapping exercise; with information provided on the purpose, methods and planned outcomes of each stage.

- Preparation
- Facilitation
- Validation

Within each of the three stages the guidelines identify a series of separate steps that need to be taken to achieve the outcomes. The book is structured to enable easy access through this step-by-step process. Translated and summarized statements from mapping participants have been included throughout to illustrate some of the key aspects of mapping. In the final section, examples of the practical application of participatory resource mapping within the PRM context are also presented.

FOREWORD

Ethiopia can be broadly divided into highland and lowland areas. The rural highlands support a range of mixed farming systems, while the lowlands support pastoralism, agro-pastoralism and irrigated farming systems. The lowlands cover an estimated 60 per cent of the Ethiopia's land mass and include the north-western lowlands of Tigray, Amhara and Benishangul Gumuz; the north-eastern lowlands of Afar, Somali and parts of Oromia; the southern lowlands of Oromia and parts of SNNPR; and finally the central lowlands of the Rift Valley. They are home to an estimated 12 to 15 million people.

Livestock play a central role in household food production and productivity in both highland and lowland areas of Ethiopia and contribute an estimated 40 to 45 per cent of agriculture GDP. Livestock therefore make an important contribution to poverty reduction, nutrition and resilience building including among poor and very poor rural households. In order to strengthen the role played by livestock in the pastoral and agro-pastoral lowlands, it is necessary to arrest rangeland degradation through improved rangeland management practices and to capture and document good practice rangeland management, including policy, strategy and development programmes at federal, regional, zonal and woreda levels.

The *Mapping Guidelines for Participatory Rangeland Management in Pastoral and Agro-Pastoral Areas* present step-by-step procedures to help practitioners to identify and map key natural resources that will help improve rangeland management practices and programming. The *Guidelines*, which are informed by emerging good practice in different pastoral and agro-pastoral areas of Ethiopia and neighboring countries, provide the readers with guidance on the following: (i) how to prepare for mapping with communities, (ii) how to facilitate the mapping exercises, (iii) how to validate the outputs of mapping exercises with communities and share the results, and (iv) how to design and implement rangeland management programmes. The *Guidelines* also touch on key issues such as grazing management, mobility, settlement, customary institutions, and participatory rangeland management (PRM).

I believe the authors have made a particular effort to make the *Guidelines* user friendly and accessible to a wide group of stakeholders including policy makers, development practitioners and researchers that are engaged in improving rangeland management for increased livestock production and productivity that will help contribute both to household-level resilience and also to national economic development and growth. I therefore recommend the use of the *Guidelines* to all engaged in this work.

Dawit Alemu, PhD

Director, Agricultural Economics, Extension and Gender Research Directorate, Ethiopian Institute of Agricultural Research

Being highly visual and inclusive, mapping can help increase levels of participation in all stages of PRM.

INTRODUCTION

Why is participatory resource mapping important?

The participation process and extensive dialogue that happens through the development of a resource map allows all community members (men, women and youth, as well as people of different wealth groups) an opportunity to work together to develop a visual picture of their landscape, natural resources, settlement and land use systems. When mapping is done well, it can deepen community understanding of different user groups, and promote commitments to managing natural resources better. The development and extension workers, who work with the community representatives to produce a map, will also discover that the process has rapidly increased their understanding of the communities they are involved with.

Resource mapping with communities can be a useful tool for a number of additional activities. Communities retain a wealth of indigenous knowledge related to resources, their use, and their existing management systems. This is knowledge that is invaluable in helping to identify the challenges and opportunities for addressing resource management. Ideally all resource mapping should be carried out within an integrated planning framework that identifies the links between natural resource management, market access and trade, livelihood support, pastoral disaster risk management and peace-building and conflict resolution.[1]

As a baseline for resource management

A resource map clearly identifies the areas and condition of different resources. The map and its supporting documents identify the status of these resources at the time the mapping exercise took place: information that not only informs management planning, but is also the resource baseline from which the success of improved management can be measured.

1 Ethiopia's Country Programming Paper for Ending Drought Emergencies, 2012, produced by Government of Ethiopia.

To enable greater ownership of a resource management plan

If a community is to be involved in implementing a resource management plan, their involvement in the planning process and in decision-making is the foundation of its future sustainability. Developing a resource map with a community is a clear way to achieve a strong sense of ownership. The community will also identify better with the issues in the management plan itself if it is developed from information that they have provided.

As a baseline for planning and preparedness more broadly

Maps can be used for drought cycle management planning, for identifying resource status and decline, for identifying potential problems, and for locating emergency infrastructure and services. Maps can also help in managing resource conflicts: disputes identified as part of the mapping process can be resolved through pre-emptive management and the identification of alternatives.

For climate change adaptation/planning

Climate change is still a relatively new issue for communities and development professionals in terms of understanding its challenges and opportunities in a development context. Mapping exercises may be a useful tool when working with communities in planning for climate change adaption. Resource maps can be combined with climate vulnerability analysis, or used as a method for identifying different climate change scenarios with communities. Through a mapping process, communities may be able to assess before and after impacts of climatic variations such as increased temperature and/or changes in rainfall, and the subsequent impact on vegetation growth patterns.

Mapping and ownership of the resource management plan

"During the mapping process we identified rangeland resources that we use during the dry season and wet season. We identified the water points we use and we discussed how we use these resources; we identified people who come from outside our rangelands during drought times and we identified areas beyond our rangeland where we go to search for pasture and water during drought. We spent a lot of time talking about how we can better manage our rangeland resources.

In previous times we had very strong and sustainable rangeland management systems and our rangeland was in good condition. We had been using all of these resources for a very long time. But because of climate change and other factors, our rangeland has shrunk, so now more people and animals are using the resources that are there again and again. And in times of drought, people are coming from neighboring woredas and using our resources — just like we must sometimes use theirs — so our resources are becoming more and more degraded over time.

During the mapping and the validation process one of the things we talked about was how to manage our rangelands like before. Through those discussions, people became aware of the weakening of the customary institutions. They agreed that it is important to take action to strengthen our customary rangeland management institutions again."

—Fatuma Ali, Awash Fentale woreda, Afar

Climate change mapping has not been used extensively to date, but it may be an important tool for the future.

Mapping specifically for participatory rangeland management

These Mapping Guidelines have been specifically designed to complement the 2010 publication *Introductory Guidelines to Participatory Rangeland Management in Pastoral Areas*, which identify mapping as 'a powerful' participatory tool.[2]

Resource mapping is central to the PRM process, beginning with the mapping of rangeland resources by rangeland users in the first PRM investigation stage. Resource maps then become the key tools in the PRM negotiation and implementation stages. In the negotiation stage maps are used to identify key management issues around which a Management Agreement is developed; whilst in the implementation stage they are used for the practical management of rangeland resources and for on-going learning and decision-making.

Readers are encouraged to read the *Introductory Guidelines to Participatory Rangeland Management in Pastoral Areas* prior to undertaking a mapping exercise in the rangeland, even if their overall goal is not rangeland management. These guidelines have been used in Ethiopia since their introduction five years ago. However, they did not go into details about mapping, and its users have suggested that more guidance would be helpful. It is hoped that these Mapping Guidelines can fill this gap.

During all participatory rangeland mapping exercises it is important to recognize that while mapping confirms the identification of key features, and reveals a lot of relevant information on important resources, it is not a precise process. Mapped features may not reflect exact locations and maps will need further work for their use in planning and management activities. With experience, mapping teams can 'ground truth' participatory maps, using them alongside topographic maps, GPS or GIS imagery, to cross check their accuracy prior to digitization.

For continued discussions with local and national government, the digitizing of maps is helpful, particularly with more senior government representatives and policy makers.

There are a number of advantages to digitizing community drawn maps with the participation of the communities that made them. This gives the community greater control, builds capacity, and provides a valuable tool for communities needing a baseline for discussions and negotiations with other stakeholders.

2 Introductory Guidelines to Participatory Rangeland Management in Pastoral Areas, 2010, compiled by Fiona Flintan and Adrian Cullis

Producing a 'map' on the ground enables communities to explain their resource use to those from outside their community.

STAGE ONE: PREPARATION

Step 1: Establish the mapping team
Step 2: Agree terms with the community
Step 3: Visit the area and finalize logistics

Purpose: Good preparation is essential for a mapping exercise to achieve its goals. Ineffective teams, misinformed communities with unrealistic expectations, and poor levels of participation will result in poor quality mapping.

Methods: Establish an effective mapping team; ensure community engagement with mapping objectives; and undertake a thorough analysis of all potential stakeholders.

Outcome: Agreement on the purpose, timing, location and participation for the mapping exercise.

STEP 1

Establish the mapping team

To produce a high quality map it is important that teams of trained and experienced personnel carry out mapping exercises. In pastoral areas at least one team member should have a good knowledge of pastoral production systems. A facilitator who is an experienced field worker and who has conducted mapping previously should be selected to lead the team.

The facilitator

The role of the facilitator is to enable the community to develop a high quality map that reflects all their inputs and which fulfills the objectives of the mapping exercise. The first task of the facilitator will be to clarify the objectives for the mapping exercise with the mapping team before going on to meet with local community elders, visit the area and further clarify the purpose of the mapping exercise with the community. Facilitation requires a specific skill set and a commitment to participatory processes.

Throughout the mapping exercise the facilitator will help the community to identify and present the key information that they want represented in the map. The facilitator will need to ask questions, offer suggestions, ensure everyone who wants to can participate, and give the group encouragement towards ensuring that a high quality map is developed. The facilitator will need to have skills in the following:

- encouraging participants to feel motivated, valued and able to participate
- leading the mapping in such a way that participants feel they jointly own and control the process
- keeping participants focused on the task at hand and the planned scope of the mapping exercise, while not losing opportunities to explore unexpected but relevant subjects
- showing sensitivity to the views/needs of all participants whilst adapting the mapping exercise to accommodate individual needs
- managing power imbalances within the group and ensuring everyone has an opportunity to take part
- encouraging dialogue and debate between the different participants and interest groups, but listening more than talking
- energizing the group or slowing it down as needed

Checklist: Mapping team

Ideally, the mapping team should:

- **be from the area**
- **have a good rapport with the community**
- **understand natural resource management opportunities and threats**
- **understand the social, political and environmental context and history including the interests of different groups**
- **include women, in order to be able to fully take on-board their perception and interests.**

Sometimes team members will be from different agencies or have not worked together before. In this case, it is critical that they come together ahead of the exercise to discuss and agree the main purpose. Members may have slightly different interests in the mapping process and outcome; for example, one may see the objective as identifying dry and wet season grazing areas and another may think the purpose is to develop water points. Discussing and agreeing on the primary purpose of the mapping exercise will enable the team to work effectively with community representatives, and present consistent messages.

- ensuring the mapping exercise commences at the agreed time and is completed within the agreed timeframe, without participants feeling rushed.

The note taker

The facilitator will need to be supported by a note taker whose role it is to document all the community dialogue during the mapping exercise. Accurate and unbiased listening skills will be crucial. The recording of information can be particularly demanding if a number of discussions are going on at the same time, but an experienced note taker can focus on documenting the community's details on critical issues, as well as the diversity of views expressed by men, women, youth and different interest groups. Accurately transcribed conversation can be very useful during the map verification process, as well as for other subsequent activities—such as the drafting of rangeland resource management plans. The note taker will therefore need to have the following skills:

- supporting the facilitator to identify information gaps and to resolve any misunderstandings
- ability to listen when several people speak at once
- recording accurately both the main direction of the discussions as well as particularly interesting quotations and comments
- balancing the need to record detail while at the same time keeping abreast with the pace of the discussions and information flow
- tracking the specific participation of the different groupings—men and women, and different interest groups—and supporting the facilitator to ensure inclusivity and avoid bias
- recognizing participants' body language, 'unspoken' messaging, underlying tensions and disagreements
- supporting the facilitator to identify information gaps and to resolve any misunderstandings
- recording additional details including description of the location, start and finish time and names of all participants
- producing a detailed and accurate report on the mapping process.

The map copier

The map copier will be responsible for copying all the information from the ground based mapping exercise onto a paper copy, ensuring that all the information is captured and the community generated content is not altered. For example, all the symbols selected by the community (stones, twigs, flowers, leaves, etc.) to illustrate the features (water points, roads etc.) should be included on the sketch map in a clearly presented legend. The paper map will need to be 'read' and used by the people who 'drew' it, as well as those not involved in the mapping exercise. The map copier will need to have the following skills:

- appreciation of the community's use of natural materials and the natural resources that they represent
- drawing skills, in order to represent the mapping accurately and to scale on a smaller piece of paper
- collaboration with a GIS expert/others if the information is to be digitized.

A wide range of different mapping objectives

1. **To identify and categorize key natural resources in a rangeland area.**
2. **To understand 'rangeland productivity hotspots' and their role in the rangeland production and productivity.**
3. **To understand patterns of mobility (livestock and people) both within and outside a rangeland area.**
4. **To understand the condition of the resources and which areas of the rangeland might need some specific protection or management.**
5. **To understand different land uses and use groups in the rangeland management area, and areas where these may be in conflict.**

STEP 2

Agree terms with the community

Before undertaking a mapping exercise the team will need to meet with the participating community several times. Participatory research techniques, such as mapping, help communities to reveal and analyze issues collectively, and lead to community-led solutions. Preparing for the mapping process alongside the community is essential for ensuring objectives and logistical issues are identified and agreed upon. These meetings also provide the mapping team with valuable background information for preparing checklists of questions and identifying key informants who can liaise between the community and the team.

Engaging the community

It is important that the team's initial contact with the community builds the trust and confidence of all stakeholder groups. It is necessary and helpful to engage with both the woreda administration and customary leaders ahead of the mapping, and it is also important to ensure all potential stakeholders are invited into the mapping exercise—irrespective of any concerns expressed by local elites. Meeting with representatives of the woreda helps ensure that they are aware of the planned mapping work and their involvement is well coordinated.

Ensuring that all the different community members that use the area of rangeland are identified and agree to participate can be a complex task. There may be many competing interest groups, pastoralist stakeholders may be widely dispersed (depending on the current season), and there will be logistical and practical issues to consider.

Identifying all of the stakeholder groups

As part of the process of ensuring full stakeholder representation, it is helpful to organize a community meeting to develop a comprehensive list of ethnic, livelihood and wealth groups that live in, make use of, or make decisions about rangeland resources — all of whom will need to be included as stakeholders. It is important that the mapping includes any relevant stakeholders that may be some distance from the planned mapping site, and for which transport will need to be provided. These might include pastoralists who live in neighboring rangelands but who enjoy reciprocal grazing rights. It may also be necessary to consider residents living in nearby settlements that collect

Identifying stakeholders, resources

"In the mapping process, they bring together elders from different parts of the grazing system. Each of them has a good knowledge of the resources in their area and they know and draw the boundaries. Then people from that portion of the grazing system will show where the roads go, where the ponds and water points are—so the details are filled in by people who come from that section of the grazing system. By bringing all of us together to make the map, we get a complete picture. This gives us a better awareness of the distribution and availability of all of our resources. This is important knowledge for us. But it also has another benefit: it allows us to show people both inside and outside our communities what resources we have, what the constraints are, what condition those resources are in and what impact that has on our livelihood."

— Liben Jilo, *Aba Dheeda*, Dida *Dheeda*

firewood and make charcoal in the rangelands so that their interests are recorded. Such residents may well be ex-pastoralists.

In this initial community meeting the mapping team will be able to introduce themselves, and outline their views on the primary and any secondary purpose of the planned mapping exercise. Community members will also introduce themselves, be able to express any concerns and ask questions about the planned mapping. The team should use the opportunity to explore with the community how best to engage both men and women. If in this community men and women meet regularly in meetings there will be no need to organize gender segregated mapping; but if it is clear that women and men feel uncomfortable mapping together or by doing so it might stop one or other group talking and participating, then it will be necessary to organize a separate women-only mapping exercise. Ensuring the participation of potentially marginalized groups, such as women and any observably poorer community members, may require additional effort on the part of the team towards ensuring they are motivated to participate in the planned mapping exercise.

Done well, mapping can help build bridges and reconcile different interest groups; whereas mapping that is done poorly and excludes certain interest groups can exacerbate tensions and result in conflict between different stakeholder groups. In some locations it may be important for the team to consider whether interest groups are ready to sit together to conduct a mapping exercise. Some preparatory work may have to be done separately with different stakeholders to allow different ethnic/clan/interest groups to share their perceptions before bringing them together for a joint mapping process and presentation of divergent views.

Mapping with men and women — together or separately?

Some mapping teams prefer to involve men and women in a joint mapping exercise, while others prefer to work with men and women separately. There is no right way to do this and the 'better way' is to be clear about the objectives of the mapping. For example, if the primary purpose of the mapping is about large-scale livestock movement women may be less interested in attending as their focus of interest may be more related to sources of water, firewood and grazing for young stock.

At a more practical level, when men and women in some communities are asked to work together, men can dominate and women are marginalized with the result that their knowledge, ideas and views are lost. Therefore, one way forward may be for men and women to map separately and then to come together to share maps and in this way share thinking and views on essential natural resources. Such an exercise can provide the mapping team with rich insights into different gender perspectives.

Agreeing on the participants

Having agreed the participating stakeholder groups, and whether it is best to map jointly or separately with men and women, it can then be decided how many representatives of different stakeholder groups will be invited to participate in the mapping exercise. While it is important mapping groups are not too small — resulting in a limited breadth of views being exchanged — it has also been found that too large a group can overwhelm the facilitation capacity of the mapping team; and invariably in such circumstances, one or two participants will tend to dominate. An experienced mapping team will generally be able to facilitate a high quality mapping exercise with between 20 and 25 stakeholders. If the team is less experienced, limiting the number of participants to between 12 and 15 is recommended.

In addition to identifying and agreeing the stakeholder participants, it is necessary to discuss and agree the planned role for the woreda administration. Experience suggests that some of the best maps are produced where woreda representatives attend as observers; or where they can be consulted from time-to-time, but do not directly involve themselves in the practical mapping exercise. When they are present the mapping team must be aware that sensitive issues, such as the illegal tree cutting and making of charcoal, are likely to be under-reported. It will therefore be important that the mapping team clarifies to the participants that they are only participating as representatives of a stakeholder group, and that the government representatives present cannot hold them personally accountable for any reported illegal resource use.

The importance of women's participation in mapping exercises

Participation in the mapping process has opened the door for previously marginalized groups including women and youth to make their voices heard. It was not always this way, as Ayetu Akikida, a pastoralist woman from Borana explains: "Previously, when a woman had a grievance or something to tell the elders, she was not allowed to come to the meeting under the shade. Somebody would be sent to her at a distance and he would take the information from her and come back and tell the elders. No matter how old we were, we were 'crying like children' because we had no other way to get our voices heard. A few years ago we started being invited to join the mapping and other meetings. Now we are sitting with the elders and we are on the same platform. Now I don't cry. I come and tell them what is wrong. We were like children. Now we have become mature adults."

Including women in the mapping process has proved very important, explains Abdi Iwal, technical advisor and mapping facilitator for CARE in Somali Region. "When you do the mapping you have to talk with both the women and the men. The men will only tell you about community level issues. It is the women who know the real story about the gaps at the household level. Here at Erer Gotha, for example, the women said their priority areas are sanitation and income generating activities, particularly cash crop [fruit and vegetable] cooperatives. They spoke very strongly about not having access to markets. They said: 'The market is very far away. We lack a vehicle to get there. So while the men are talking about constructing lined irrigation canals in our farmland, even if we improve our yield, we don't have access to markets, so what would we do with all of the extra produce? We are already selling it at a cheap price just to get rid of it.'

"During the mapping the other problem the women mentioned is water. In the dry season water is scarce for livestock and humans. Most of the rivers are only seasonal. They said that usually they have to drink surface water, but it is not clean. They put clean water high on the list of their priorities. The men didn't even mention this as a problem."

Working closely with the community throughout the preparation phase is key to ensuring a successful mapping exercise.

STEP 3

Visit the area and finalize logistics

It is important that the team both drives and walks through the area intended for the mapping well in advance. This will allow the team to see the issues likely to be raised by the community first-hand, including the condition of the rangelands and their livestock, evidence of rangeland fragmentation, settlement patterns, examples of kebele-level service provision — schools, health centers, veterinary posts and private veterinary pharmacies. During such visits it can be helpful to travel with customary leaders who can brief the team on trends and changes in recent years, and the historical context.

If the longer-term aim of the mapping is to assist local institutions to introduce Participatory Rangeland Management, the visit offers an opportunity for the team to provide community members with an overview of the approach and lessons learned in pastoral communities in Ethiopia. It may be possible to either invite a pastoral leader from a community that has adopted parts or all of the PRM approach to visit the new target community, or to facilitate a visit from community members to one that is already practicing the approach. Taking time to ensure that several community members are introduced to and understand the potential value of PRM is a valuable investment, even if it takes several weeks to accomplish.

A final pre-mapping task is to discuss and identify with the participants an appropriate site for the mapping exercise, and to choose a date and time. Getting the date right is important. In the dry season community members are likely to be dispersed or simply too busy. One or two months after a good rainy season can be a good time for mapping as the demands of livestock herding and collecting water are at their lowest, and milk production is typically at its peak. Irrespective of the season, it is important that the mapping is well organized and that the exercise is time-bound. It will be necessary to ensure that the preferred time for the exercise does not clash with women's household commitments and that women are able to participate fully.

An appropriate location, selected by community members, may be a shade tree where community discussions and meetings typically take place, or they may select another location. Understanding the reasons behind the choice of location is important, and may shed light on the perceived value given to the mapping exercise. Participants are likely to be less distracted where the site is some distance from homesteads and livestock water points. Together with their hosts, the mapping team should arrange for water and/or other refreshments to be provided for the participants.

It is useful to visit the planned site where the mapping exercise will be carried out so the team can confirm that the site is quiet, free from intrusion and adequately shaded.

The effective organization of all logistics, including mapping materials, venue arrangements, transport, etc., cannot be underestimated for achieving a successful mapping exercise.

STAGE TWO: FACILITATION

Step 1: Produce a rangeland resource map
Step 2: Add more details to the map
Step 3: Complete the mapping exercise

Purpose: Good facilitation by the mapping team is essential if the participants are to thoroughly engage with the mapping process.

Methods: Undertake a highly participatory resource mapping process using local materials to show the location of resources on a ground-based map; hold a detailed discussion on resource issues using targeted questioning and effective listening; cross check all details while the community is present.

Outcome: A community drawn map with extensive accompanying notes on the discussion process.

Locating a key landmark that everyone knows is a good starting point in mapping.

STEP 1

Produce a rangeland resource map

In a pastoralist context an elder will often open the meeting with a traditional blessing. The mapping team will then need to briefly remind the participants of the primary purpose of the mapping and ask the participants to clarify what they understand the purpose to be, particularly if it has been some time since the planning meeting and if some of the participants were not in attendance.

Starting the mapping

The mapping team should ask the community participants to gather together some materials for the mapping from the surrounding area. These could include stones, leaves, grass and ash from a fire. The facilitator might initiate participation by asking the participants to mark key landscape features such as mountains, rivers, roads and other infrastructure with stones or leaves.

It may be useful to start by asking participants to identify a key central landmark (i.e. the village near which the mapping exercise is taking place) and to then map the other key features relative to this. This will help the participants to orientate themselves and scale-down landscape features to the mapping site. If the participants find this task difficult, the facilitator can prompt the group by suggesting, for example, that they use ash to represent the course of a river or a line drawn in the earth to trace a road.

Following identification of the reference features, the participants should then be able to map other key resources (such as wet and dry season pasture, mobility routes, mineral licks and cropping areas), as well as all other important livelihood resources in line with the stated objectives of the mapping exercise.

Mapping materials

The community participants may need encouragement initially to use twigs, stones, pebbles, leaves, ashes, charcoal, string and even animal dung to represent rangeland resources. Once they have started however, experience has shown that they will quickly take control of the mapping and be inventive with the use of materials that are locally available. Where locally

available materials are in short supply, the mapping team can help supplement materials with stationery items such as string, chalk dust, bits of plastic, paper and card. In previous mapping exercises community participants have used wood ash from a fire to mark out roads and rivers, dry grass and green grass has been used to represent dry and wet season pastures, and stones have been used to represent hills and mountain ranges.

Once the participants begin to engage with the mapping, the facilitator can slowly step back, whilst continuing to provide support and encouragement. For example, the facilitator might ask that the participants add settlements and roads, and in this way make it easier for the map to be digitized later in line with existing maps. With the key information visualized, the facilitator can then ask the participants to highlight the different rangeland resources that different pastoral groups use on a daily, monthly and seasonal basis. In order to ensure that resource use by each of the user groups is represented appropriately, it may be helpful for the facilitator to ask each of the resource user groups to map the resources they use in turn. For example, the facilitator may prompt pastoral women to identify dry season resource usage, or ask the men about where pastoralists with large camel herds move their animals to in the wet season.

Representing shared resource use

"In the mapping exercise, we organized into groups by our respective kebeles. Previously the woreda (district) did a mapping exercise with us where we mapped potential farmland, basic social services, and rangelands in the area, but among the things that is different in today's mapping exercise, is that we are also considering communities beyond our woreda. Before we mapped only our community. But those communities in the surrounding communities outside our woreda were not taken into account, nor was the fact that we share many of the same resources and that there are people moving in and out of one another's' rangeland systems—we share some of our dry season grazing areas, our social services. That is how this mapping was different. We can see the link.

"Maybe the results of this mapping exercise will turn out to be different. Having put those other communities on the map will help them know how we are living and will give those communities the idea of what we are doing here in our rangeland system and how we are doing it and so next time they come to use our resources, they may ask for a consultation and communicate with us about when they are coming. That would allow us to better manage our rangeland system."

—Abdullahi Ali Musa

Mapping: Directly on paper or on the ground?

With many non-government and other organizations now undertaking the mapping process in pastoralist communities, variations on the approach have been introduced, including working with the community to create a map directly on paper. Stones and grass and other natural materials may still be used to convey water points, wet and dry season grazing areas, etc. but pens are used to mark many if not most items on the map. While this has advantages for the facilitators—the map can be more detailed, symbols are easier to mark and remember, and it avoids the need to transfer the map to paper when the exercise is finished—it is worth noting that putting the map directly onto paper may not suit the pastoralists who are doing the mapping. "We understand the topography better when we put it on the ground," says *Aba Dheeda* Liben Jilo. "Pen and paper are more for the literate people. Most of us are not literate, but that doesn't mean we don't know our environment. For us it is easier to make it on the ground using our sticks and local materials—soil, ash, flowers, grass, fruits. But once we leave, that map will be lost, so there has to be somebody who has the skill to copy it onto paper."

From such questions the mapping team can glean important information about how pastoralists view and value different rangeland resources; which groups use which resources; the seasonality of resource use; and livestock preference for different areas in different seasons etc.

Mapping tips

It is helpful to encourage participants to standardize their use of materials as symbols. For example, if the participants start to use twigs to represent woodlands, then as far as possible twigs of different trees should be used to represent different types of trees and woodland resources. Similarly, if grass is used to represent pasture, then different types of grass can represent different types of grassland. Not only does this make map copying easier, it has also been found to help the participants to add more detailed information throughout the mapping exercise. When the map is complete it is important that the use of symbols is accurately recorded in the map legend. This will make the map easier to use in future discussions, for example as part of the negotiation and implementation processes in the PRM, as well as during digitization.

Taking care with boundaries

Experienced mapping teams confirm that pastoralists are increasingly sensitive about boundaries, in part because their access to and control over rangeland resources is increasingly challenged. For example, in many pastoral areas smallholder farmers and investors are moving into prime grassland areas to cultivate cash-crop cereals or other crops such as sugar cane. Along other boundaries ethnic groups clash for

The value of mapping to participants

"From yesterday's mapping I understood many things. I understood the system in which my community and I are moving around. I now clearly understand our potential wet and dry grazing areas, the conflict areas, and key resources; the map also helped me to have a clear picture of all of our basic livelihood resources. I realized that we have many resources within the system. I did not think of all of these things as resources previously. I also came to understand the problems. For example, we identified the places within each area for tomato diseases, and other things. It is good to understand the basic livelihood resources within the system as well as our problems and challenges. I had not thought of it this way before."

—Mohammed Jama

control of water and pasture resources. Learning from these experiences, the mapping team will need to be particularly sensitive to participants' concerns expressed over boundaries. It is important for the facilitator to ensure that the participants represent any shared resource use in order to be able to appreciate and accurately reflect the demands on rangeland resources in a given area.

Experience suggests that if possible the participants should be discouraged from starting the mapping with an administrative boundary, such as that of a woreda or kebele. Invariably the stakeholders represented will have a breadth of seasonal rights to rangeland resources over a wide area and, it is most likely that part of these resources will lie outside of the administrative boundary. The drawing of a boundary can result in reciprocal resource use rights not being considered.

Participants should be encouraged to map the full scope of resources that they regularly access and use, both within and outside a woreda or kebele. Instead of asking participants to map resources within an area, the question about where various boundaries may lie can be asked at the end of the mapping process. However, if a boundary is drawn at the beginning of the mapping process, it will be important for the facilitator to ensure that there is a discussion on reciprocal rights across boundaries. At a later stage a discussion should be carried out with neighboring communities to agree on boundaries.

Note taking

Throughout the exercise the note taker should follow all the discussions, noting comments of interest and where possible recording the flow of the dialogue. In this way it will be possible for the mapping team to identify details that might otherwise go un-recorded. In particular it is important to identify when there is disagreement and to record the different points of view about the map, including which group of users has which set of views.

Knowing when to break and to stop

It is essential to monitor participation levels, and for the facilitator to respond to a reduced level of interaction by adopting more inclusive questioning, or by organizing a break for refreshments. The mapping exercise should not continue for too long, with participants becoming tired and disconnected. If the mapping team is of the view that additional important information is outstanding, it might be preferable to halt the mapping work and agree a future date when the exercise can be completed.

Transforming maps into action

Having brought community members together and assisted them in working towards a common understanding of their resources, the mapping process can provide an excellent opportunity for taking the process further.

"Today everyone who is involved in the mapping here at Erer Gotha is saying that their main challenges are deforestation and lack of resource management (dry and wet grazing areas) within the grazing systems. They say that the root of the problem is that their communities lack awareness, and with more people, more households and more livestock using the resources, there is a problem," says Abdi Iwal, technical advisor and mapping facilitator for CARE in Somali Region.

"So after we finish the map we work with the participants to make a list of what they believe is needed and then we work with them to break it down, creating an action plan for each sub-grazing unit that notes which parts of the plan each party will do and how to make it sustainable.

"However, sustainability ultimately rests most strongly on another critical part of every action plan: strengthening the customary institutions for governance of their resources. So we asked the participants to describe how they managed things historically. They said that they used to rotationally graze the rangeland. We asked how they manage things currently and they said that the previous system is not even possible now with the explosion of farmlands, population and settlements. As we finished, everyone agreed to find the top clan leaders for each of the sub-unit areas and, though they may not be here today, be sure they come to our next meeting — because what we started here today, will result in the formation of a rangeland council that will include key people from the community, the clan and the government. Now, as the participants go back to their communities, they will talk with the others about the map and about resource governance. They will help them understand the issues and they will mobilize them."

Good questions can prompt the community to add important details and information to the map.

STEP 2

Add more details to the map

The participatory map drawn on the ground can be the starting point for a much broader and more detailed discussion about resource use. Seeing their landscape before them helps encourage community members to talk more and to create further useful maps.

Focusing further

Depending upon the agreed objectives of the mapping exercise, it may be helpful to add further details to the resource map. For example, it may be that service providers are interested in learning where best to site services — markets, health posts, schools or livestock drinking ponds. Alternatively, the mapping exercise may be seeking to collect information on 'rangeland productivity hot spots', and safeguarding rangeland resources for future generations. If so, adding more detail might focus on mapping rangeland resources of medium and high quality; including 'key' patches of grassland which have historically been kept for dry season and drought grazing reserves. Resource Trend Analysis (see box) can also be used to discover how resource use and availability are changing over time.

Questions that may be useful in seeking more detailed information

- **Where are the good grazing areas in the wet season and where are the good grazing areas in the dry season/drought?**
- **Are the grazing areas that you have mapped different from those used 20 years ago? If so, where are these grazing areas and what has happened to them?**
- **Are the good grazing areas in times of drought suitable for all livestock species?**
- **Which grazing areas are absolutely essential to your livestock production system and which pastoralists are allowed/able to use them?**
- **Which are the grazing areas where your community is most likely to lose livestock to livestock theft?**
- **Which grazing areas would you like to see safeguarded for livestock grazing for future generations?**

Mobility mapping

Mobility maps show where and when people and livestock travel. Mobility mapping has been found to be an extremely useful tool in understanding how the rangelands and livestock are managed in pastoral areas. Once a first resource map has been completed, the facilitator can ask participants to provide information

Questions that may be useful in seeking more information on mobility

- **Where do you travel, and with which livestock for grazing or browse in different seasons?**
- **When you trek your animals to different sites, who is it that travels with which animals?**
- **What resources are you using and for what purpose? Where else do you travel to collect or use other natural resources?**
- **Do other people from outside your community also trek livestock to these same areas? When they do how is agreement negotiated?**
- **Do other people also collect or use other natural resources in the areas where you go to or use the same resources?**

on their seasonal livestock movements and seasonal use of rangeland resources. Participants can provide information on trekking routes using stick-drawn lines or sprinkling lines of ash or different colored soils. Inevitably trekking routes will vary year-by-year in response to local conditions—rainfall, disease and conflict—but preferred routes can be identified. If the first resource map is likely to become too cluttered with this information, it is better to make a second and even a third map in order that this important information is collected and mapped.

Examples of mobility maps from other areas have been found to be particularly useful in stimulating discussion between different pastoral groups; in particular where elders are present, as they may well have travelled the migratory routes shown. Example maps have also been used to facilitate discussions on traditional and emerging grazing systems, barriers to trekking, and suggested future zoning to safeguard trekking routes and rangeland resource hot spots.

Mapping, mobility and government

"In supporting the community, it is important for us, the government officials, to help them use their land effectively. With the map in place, their mobility will be well organized and well managed. If they need to move somewhere, they will plan in advance where to go and how long they will stay. To manage this they have selected some key persons like clan leaders, youth leaders and women who are responsible for facilitating this discussion among community members. This collaborative planning helps the community and it also, indirectly, helps those of us in the government.

"You see, if during mobility we think there might be conflict between those moving and the hosting community, whether with Afar or other groups, the government can support the process by getting involved and working to create a forum for negotiation. We might say 'That community will come to this area, so please host them … their situation is very difficult, so there should not be conflict between you….'"

—Mesele Yilma, Advisor to the Head of the Woreda, Awash Fentale Woreda

Mobility maps can be drawn for single or multiple ethnic groups, for certain groups of households, or at the single household level. Within a household, mobility maps can be also drawn for different family members and for different livestock species, thereby providing valuable information on mobile pastoralist livestock management.

Mobility information might include:

- dates and seasons of travel
- frequency of travel
- routes used
- distance and destinations
- primary and secondary purposes
- gender disaggregated movements.

Resource trend analysis is a valuable complementary tool to mapping.

Resource trend analysis

"The map put all of our resources in one place so we understood the distribution of those resources very clearly. We also learned how our resources have changed through time by doing the resource trend analysis. It reminded me, about what our resources used to look like, for example, during the Haile Selassie era, and how our livestock used to be, how everything used to be.

"We could see that although many things like markets and access to water have improved, other things are not doing so well. It reminded me that our rangeland was performing really well during the Haile Selassie era. And when I thought about it in that way, and compared that time and now in my mind, it shocked me. But it also clearly indicates the problems and where they are coming from. I could see the challenges we face beyond the natural challenges like drought and heat stress. It also helped me to understand what challenges are coming — and how we are responsible for land degradation, deforestation and cutting the trees without management.

"We cannot change everything, like heat stress, for example, but there are other things, like deforestation, that we can address as a community. We can protect and manage our trees and our rangelands. I understand now how resources are diminishing throughout the system and how the challenges we face are exacerbating one another. That is what interested me most."

—Abdullahi Ali Musa

Photographs of the finished map are an important record for the mapping report.

STEP 3

Complete the mapping exercise

Once the mapping team and the participants have agreed that the primary resource map and any other more detailed maps have been completed, it is important, before closing, for the team members to undertake several activities:

Facilitator

Thank the participants for the time that they have committed and for the information that they have provided. The facilitator should offer the participants a final opportunity to ask any outstanding questions and to outline the next steps in which a copy of the final map will be returned to them. A date for a further meeting at which the mapping participants can present their maps to their wider community should be organized.

Note taker

Check that the notes are complete and clear, and if not to spend the necessary time with individual participants filling in information gaps, clarifying place names and other details.

Map copier

Take photographs of the maps to capture all the information, and for use in finalizing the field drawings. Taking a photo from above by standing on top of a vehicle parked nearby can be useful. During the exercise the map copier will have transcribed the details of the maps onto paper (Preferably A3 paper). The map copier will need to finalize the map legend to show clearly the materials used as symbols by the community members during the mapping exercise. The accuracy and detail with which the ground-based map is copied to paper will determine its usability in the future.

Details that must be on the map

- **Legend**
- **Date that the map was created**
- **Place where the map was created**
- **Names of the mapping team**
- **Names of the community members involved in the mapping exercise**
- **Compass north (though north should be labeled on the map the orientation/placing of the map should not be changed i.e. north does not need to be at the top.)**

STAGE THREE: VALIDATION

Step 1: Present the map to the community for validation
Step 2: Write the rangeland mapping report
Step 3: Disseminate the validated map and report

Purpose: The community that prepared the map needs to verify and assert ownership of the version transferred onto paper and authorize its wider dissemination.

Methods: Provide copies of the map to the mapping participants for them to present it within a community feedback meeting; prepare a detailed report on the mapping process and the resource issues discussed; provide final approved copies of the map and the report to the community and all relevant government and non-government stakeholders.

Outcome: An accurate and verified rangeland resource map and accompanying report that the community recognizes as their intellectual property.

STEP 1

Present the map to the community for validation

Before the map can be disseminated and used, the mapping participants need to present a paper version of the map to their community for verification. This process should take place a few days after the mapping process, giving them time to reflect on the mapping.

As a first task the mapping group should be given an A3 or larger paper version of the map so that they have a first opportunity to comment on it and make changes. This will be the first time that they will have seen their mapping process transferred onto paper, and it will look different to the ground-based version that they remember. This step will therefore need time and patience, and should be led by the map copier, with the facilitator playing an active supporting role.

Once the mapping group has approved the paper map, they can then share it with their wider community. It is important that the mapping participants themselves, rather than the mapping team, present their map to the wider community and other stakeholders. The participants in the mapping group should be encouraged to organize and lead a community meeting to present the rangeland map as an important step in full community ownership. Discussion of the map at this meeting will also be far more dynamic if presented by the mapping group. The mapping team should attend the meeting as observers, and take notes of any adjusted and/or additional map information, and any important issues that arise.

The validation process should then continue out to the wider community and other stakeholders, through a process that involves members of the mapping group travelling with the mapping team. Together they should present the map to different community groups and to the woreda administration. The note taker should record comments that are made by both the community and woreda representatives to include in the mapping report. It is important that the map is presented to the entire community as part of the sharing process. It is also important that it is shared with marginalized and special interest groups, and with people outside the

Who owns the map information?

During the mapping process an agreement will have been reached with the community on the specific future uses of the maps by the mapping team and other development agent colleagues. It is important to recognize that the information has been gathered with the community's permission and any use of this should also be with their agreement, despite the fact that it has been produced as a result of a facilitated exercise. Planned future uses of the map for information, coordination and advocacy purposes will need to be discussed and agreed with the community. Particular care should be given to agreeing planned use of maps for advocacy purposes. If necessary the mapping team should organize follow-up meetings with community members to seek their support and approval for any alternative uses.

mapped area who have may rights to natural resource management within it. The map presenters should encourage comment and discussion on the content of the map, with the feedback resulting in adjustment and refinement to the map. This whole validation process could take at least a month.

Once the map has been presented to all the stakeholders in the wider community, the comments received from all the different groupings and communities should then be discussed by the mapping group and a final adjusted map produced for validation by the community.

In the unlikely event that major inaccuracies are uncovered, it is recommended that a sub-group meet to reconcile any outstanding issues. It is recommended these meetings be held at the specific rangeland location under dispute. When such site visits are made, opinions and points of view of disagreeing parties should be well documented, in order that the information can be shared later.

The mapping group should then work with the mapping team to finalize a hand drawn map that they agree can be photocopied and laminated for distribution. Spending sufficient time on the validation process is important as this will ensure the community ownership needed for the map to be useful in the future.

Taking it further: Selecting the right people for rangeland management

"During the discussion today it was clear to me that the community really understands how their pastureland has been shrinking over time. And now, with the map they can see very clearly that they are remaining with only some small pockets of land. As a result of this—and also due to the initiative of the (PRIME) project—they have started to plan how to strengthen their customary institutions.

"In the discussion, as people gave more attention to this, the participants were selecting people who were not present here, not part of this discussion, but who are very important to mobilizing people and moving them to be part of the rangeland management council.

"Previously, in any project, when they started selecting people for tasks, the projects did not give that process great attention like they are doing now. They just selected people. There might have been someone who is not a part of the meeting, but who is very important to these issues, but he is not included. This time the project and the people are more focused. They understand that this intervention is very important for them because vast lands have already been taken from them and made into farmland, so they understand very well that they need to give great attention to this.

"And as long as strengthening the customary institutions [to manage the rangelands] is in the interest of the community, there is no hesitation from the government side to support them and to be part of their process. We will provide anything they need and respect their decisions."

—Mesele Yilma, Advisor to the Head of the Woreda, Awash Fentale Woreda

STEP 2

Write the rangeland mapping report

The rangeland resource map can be used as a community approved stand-alone reference document, but its value in subsequent negotiations and resource-based agreements will be enhanced by a written report. The report should provide additional details on the primary purpose of the map, information on the discussion that accompanied the mapping, photographs of the mapping exercise, and a list of participants. The note taker should produce this report as soon as possible after the mapping exercise and community feedback process.

Format for the rangeland mapping report

The note taker should produce the rangeland mapping report as soon as possible after the mapping exercise and the community feedback process are complete. The report should be written using the following format:

1 Title page

- ❑ date of report
- ❑ author
- ❑ contact details

2 Acknowledgements

- ❑ This should include a statement that clarifies that this report was written on behalf of the [named] community, and the key individuals who made this report possible.

3 Introduction

- ❑ This should include details of why the participatory mapping exercise was undertaken, why the community was selected, which organizations were involved, etc.

4 Field site details

- ❑ date of the mapping exercise
- ❑ name of community where it took place
- ❑ location of the community (zone, region, woreda, kebele)
- ❑ main type of livelihood system
- ❑ names of all participants and their gender
- ❑ names of the mapping team and their associated roles and responsibilities

5 The primary and any secondary purpose of the mapping exercise

Where the mapping has more than one purpose, it is important this information is presented accordingly. For example, this information may be presented as follows:

- ❑ *primary purpose: To identify and categorize key rangeland resources for improved production*
- ❑ *secondary purpose: To map key productivity hotspots and associated seasonal livestock movements into and out of those key hotspots.*

6 Copy of the Map

- ❑ Be sure to include a copy of the map (at least A3 size) and a photograph of the original ground-based map that was made by the participants.

7 Notes of the discussions that accompanied the mapping

This information may be presented as follows:

- ❑ During the mapping exercise the participants made the following comments... (be sure to note the point in the mapping exercise at which the comments were made so that the relevant context is provided)
- ❑ It is suggested that this section of the report is structured according to theme so that it is not just a collection of comments. Themes could be specific resource constraints/issues that the community has identified.

8 Notes on Disputes

This section of the report should document:

- ❑ any disputes or disagreements that arose from the mapping exercise
- ❑ how they were resolved.

9 Notes on levels of participation

This should be a short reflective section that notes:

- ❑ the selection process of the participants (i.e. the stakeholder process that identified all the relevant communities and other participants)
- ❑ levels of participation i.e. whether the mapping team regarded the process as successful.

10 Conclusions and next steps

- ❑ The conclusions—a section detailing the outcomes revealed by the mapping process, perhaps key issues that the community decided they wanted to address in some way.
- ❑ Proposed next steps (such as engagement with government support or interaction needed with neighboring communities) with an associated time-line.

STEP 3

Disseminate the validated map and the report

For the map to be useful, copies need to be made widely available. As well as providing copies to the community, it should also be given to the kebele office, the woreda office, and one to each major community. If possible, copies should also be given to the CBOs, NGOs and development organizations that work in the area covered by the map.

Making the map available

At least three copies of the final rangeland resource map (at least A3 size or larger) should be returned to the community, together with copies of the mapping report. If possible the map and report should be in the local language. It is recommended the maps be laminated so that they can be used repeatedly in community meetings without deterioration. It is important that the hand-over is to senior community leaders or leaders of rangeland management institutions. A copy of the report and the map will need to be made available to the relevant government offices at the woreda level. Ideally each of the participants in the mapping exercise should also receive a copy of the map.

Following agreement from the mapping participants and local community leaders, copies of the map and report can then be made available to:

- local and regional government offices responsible for land use planning, natural resource management, and pastoral development
- other NGOs and civil society organizations operating in the area
- local and national dryland research institutes etc.

Digitizing the map

Once the final laminated, hand drawn, validated version of the map has been produced and disseminated, a decision can then be made with the community on whether or not the map should be digitized. The mapping team should explain that a digitized map could be more easily compared to other maps, such as topographic maps. A digitized map may also be understood and recognized as a more formal dataset by the senior government staff that the community may wish to inform and influence.

Mapping participants work together to validate a digitized map of their rangeland.

If the map is to be digitized then a draft should be shared with the mapping group to agree the interpretation and accuracy. It is important that the printed digitized map is presented on a wall or table so that the whole of the mapping group are able to make adjustments or corrections. The final digitized map can then be shared with the wider community stakeholders.

The group may find digitized maps more difficult to understand than hand drawn paper maps. The two map types can be displayed next to each other to make comparisons easier. Care should be taken to ensure that the digitized map does not end up replacing the hand drawn paper-copied map, as this can take the ownership of the map information away from the community.

New opportunities for enhancing the power of participatory mapping

Developments in Open-source Software (OSS), advanced visualizations (including Digital Earth technologies), mobile data capture, cloud storage and Open Data philosophies are now enhancing the power of participatory mapping. Used effectively, these techniques have the potential to combine community-held knowledge with more formal government planning processes. Digitization enforces a structure on the mapping information: it is digitally stored and managed, it enables visualizations, and it can be integrated with other sources of information thereby enhancing communication at governance levels.

Capturing information into a digital platform also allows several groups to contribute independently to the same collective map; adding information concerning the areas they are particularly interested in and easily comprehending one another's contributions. This process allows cumulative improvements to be made to the level of detail of the map and the extent of its coverage, as well as effective crosschecking. The fact that contributions can be made independently also facilitates the reconciliation of divergent interests and prompts more informed dialogue.

Work carried out by county and districts governments in northern Kenya and Tanzania, with technical support from IIED and the GeoData Institute, University of Southampton (UK), has shown how community maps can feed into government processes using digitization. After verification of community maps, a rapid three - dimensional (3D) exploration of the high-resolution satellite imagery in Google Earth (GE) was used. To orientate participants the GE was projected onto a large wall with the original paper perception maps hung next to them. Participants were able to navigate the imagery effectively and to indicate key resources. Features were then digitized in Java Open Street Map Editor (JOSM) 5, a 2D Open Street Map data editing tool, using agreed icons for point features, lines or polygons. This highly interactive process of geo-referencing local knowledge to a coordinate reference system allowed resource maps to be produced to any scale, and in real-time, with the community. (Hill, C. et al 2015)

The Kenya and Tanzania experience confirmed that when 'community knowledge' is captured in a geo-referenced manner with accurate data on distances, surface area, direction, etc., it increases the legitimacy of participatory maps with local government. The maps produced became more usable as they could be interfaced with other maps, thereby increasing the opportunity of community knowledge to inform local government decision-making on a more sustainable basis. Secondly, it allowed critical data to be used in planning. For example, communities were asked to define and rank the characteristics that for them represented a "good" water point e.g. reliability of finding water in the dry season, number of livestock by type that can be watered (discharge), ease of access and level of potential conflict (governance issues), potability for people and animals, and location with respect to pastures. By embedding this data at each water point—along with other data on type of water point, when built, whether functional and the associated governance system—it becomes possible to produce maps for a set of questions whose answers can help with planning; such as dry season water points that are functional with a specific watering capacity, or all boreholes with low reliability or that are not functional. A third potential benefit of geo-referencing is that communities may soon be able to up-date key data (e.g. status of water points, availability of pasture) on a real-time basis through crowd-sourcing techniques. Digital mapping can also pose problems however—the danger of fixing boundaries and elite capture— and therefore requires a stronger governance framework as well as agreed protocols on such things as what symbols to use to represent a borehole and who/how to manage the data collection, updating and use. (Ced Hesse Personal Communication, 2015).

TURNING MAPPING INTO ACTION

These guidelines have been developed based on ten years' experience working with communities in southern Oromia region and southwest Somali region of Ethiopia, as well as in neighboring countries in the Horn of Africa—work which has been funded by a great many organizations. To demonstrate the practical uses of mapping for the purposes of this book, recent testimonies were collected from communities in Afar, Borana and Somali regions. These communities are working with USAID's PRIME project and represent a 'snap shot' in the latest and live use of mapping for PRM.

ERER-GOTA, ERER WOREDA, SITTI ZONE, SOMALI REGION

Mapping for improved grazing management

"In the time of my father and grandfathers, pastoralists classified the land into wet and dry season grazing areas," says Mohamed Jama, Chairman of Erer-Gota's newly established rangeland management council. "It was a good system, but then it was abandoned. People were selfish. They said I want to go here to graze my animals or I want to go there — even if it was not the appropriate time or place. They might even migrate into neighboring Oromia territory looking for pasture, which sometimes caused conflict. And then when the dry season came, everybody would compete for the same pasture land. As a result, those areas suffered from over-grazing and trampling. Now they are bare land; they are deforested and the grass cannot regenerate."

Just eight months after his community completed a resource mapping exercise (in June 2014) — an activity that marked the beginning of the community's intensive work with the PRIME project — the situation in Erer-Gota had changed dramatically. As a result of what they learned through the mapping process and the trainings, they were once again, as Mohamed says, "managing our resources properly. The rangeland council in collaboration with the elders and clan leaders set aside areas of the rangeland that were to be used very specifically," he explains. "One area for the wet season and another for the dry season. And each of these grazing areas was divided into a number of parts, for example, this dryland grazing area had a first part and a second part. After using the first part, we made sure everybody left the area and went to the second part so overgrazing wouldn't happen."

The shift to more controlled grazing patterns was not immediately accepted by everyone, but Mohamed and the other members of the rangeland management council worked to make community members in their areas aware of the changes, to explain why they are necessary and to invite people to cooperate.

Today the results of their efforts are clear to everyone: "Now that we have allocated our resources and learned how to properly manage them, we can find the pasture and water we need right here in our own kebele. People are happy that they don't have to move so far with their animals, and because we no longer cross the border to the Oromia side looking for pasture and water, the potential for conflict is less. This has been the great profit of this process."

HALAYDEGE, AMIBARA WOREDA, ZONE 3, AFAR

Mapping to reclaim the rangelands

When asked about the challenges the rangeland in Amibara woreda has faced in recent years, Halaydege elder and community leader Ahmed Birigo, 98, holds up his hand. "There are five main challenges," he says, counting them out finger by finger as he speaks. "First, there has been a decrease in the amount of rainfall. Second, there has been an expansion of farm land. Third, there has been a change in the way we use our resources: previously, if outsiders came to use resources in our territory there was a negotiation that happened, but now, the government leaders say 'all land is for the government and the community,' which means that anyone can come to our area and use the resources — and this has really contributed to the degradation of our rangeland. Fourth, the number of livestock on the rangeland keeps increasing: each household may have fewer animals than before, but the total number of livestock within the community has increased. And fifth is the spread of *Prosopis juliflora*." Though last on his list, the spread of this invasive shrub was at the top of his community's list when they completed their resource map in 2013.

In Afar and in many other parts of lowland Ethiopia, the invasion of pastoral rangelands by *Prosopis juliflora* is having a massive impact on an already shrinking resource base—so much so that it is ranked among the leading threats to traditional land use, exceeded only by drought and conflict.[1] By the time Ahmed first encountered it in his area in the early 1990s, the thorny shrub — reportedly introduced in the late1970s or early 1980s (European calendar) as part of the Derg's "green campaign" — had begun its unchecked spread.

The shrub's hardy seeds are spread by cattle and other animals that consume the seed pods and spread them in their dung. Once established, they grow rapidly. The grass beneath the shrubs dies, and as they multiply they form dense, impassible thickets that are very difficult to remove, as the plant can regenerate from the roots. "To get rid of it you have to dig it out so that you get all of the roots out and then you have to burn it," explains Ahmed. "It is very difficult for small communities to do all of this time consuming and labor-intensive work by themselves, especially on a large scale."

Though Ahmed and his community were keenly aware that *Prosopis* was largely responsible for a shortage of pasture in their area — forcing most of the community to re-locate during certain times of the year — it was the mapping process that brought the extent of the problem into focus. "When all of us had added our information to the map, we could see very clearly the coverage of *Prosopis* and compare that to the available pasture," says Ahmed. "We knew then that we had to find a way to better manage our rangeland, because even in this big woreda there were only a few grazing areas left.

"Working with the (PRIME) project staff, we discussed our resources — what is available to us, what is endangered — and then we prioritized the ways in which the project should work with our community. Using the map we selected several priority areas that were covered by *Prosopis* but were important for our livestock and we asked them to help us clear them.

"The project people started working with us, giving us training on both rangeland management and *Prosopis* clearing. They talked to us about the different work that NGOs have done to clear *Prosopis* and agreed to provide two bulldozers that would work to clear the land for three days. From our side we agreed to mobilize the community to join the clearing task, pulling up the smaller trees and burning them. We also agreed to take responsibility for keeping the land cleared.

"This was something we had missed in the past. A number of years ago, 70 hectares were cleared and there was no agreement or consensus in the community about how to manage the cleared land. That land is now covered again by *Prosopis*.

"This time, with all of the training we have received, we understand that to be successful, we must have strong management plans. We have decided that each family will monitor a section of the land and if *Prosopis* returns there, they will be responsible for clearing it — so even though our use is communal, the monitoring will be individual. Monitoring all of this will fall to the *fimataba* and others from the customary system — so strengtheming them is another important part of our plans.

"With so few rangelands left, if we don't keep this land clear of *Prosopis*, we will face a serious threat to our livelihood. This time we can't afford to fail."

A bulldozer clears the rangeland near the community of Halaydege, in Amibara woreda, Afar of prosopis juliflora by pulling it up from the roots "We could not have cleared in two months what the (PRIME) project's loaders did in three days," says community elder Ahmed Birigo. "Now it is our responsibility to be sure the rangeland is not re-invaded."

1 http://www.nrel.colostate.edu/projects/csu-ethiopia/documents/NewsFeed_Wakie_Final.pdf

DIDA YABELLO, YABELLO WOREDA, BORENA ZONE, OROMIA REGION

Recognizing a resource through mapping

Kura Abakabo is a member of the Yabello women's aloe cooperative and an elder on the the Haro Bake rangeland management committee. She says that, through the mapping process (first undertaken by SOS Sahel in 2008 and then again by the PRIME project in 2014) they learned a great deal about the resources available in their grazing system, some of which they did not even recognize as resources.

"The forest is one example," she says. "Previously people were just cutting, destroying, and burning the trees to make charcoal. But now that we recognize that this is one of our important resources, we have taken steps to manage and protect it. The rangeland management committee has decided that people are no longer allowed to cut the trees in the forest, and that nobody is allowed to make charcoal around here.

"Another example of a resource we only learned about during the mapping is this aloe [*aloe calidophilla*]," she says. "Before the first mapping, people thought it was just another plant that was taking over our grassland. Actually, we were making plans to destroy it, but then SOS Sahel came and did the resource mapping with us. When we told them about these plants and our plans to get rid of them they came to take a look at them. They said , 'Oh no, no, no. This is a valuable resource. We can set up a cooperative and this aloe will become a source of income for you.'

"Now we are a cooperative of 100 members. Almost all of us are women, and we have gone very far with this. We have a one hectare aloe farm and a shelter for making and drying the soap we make from this resource — and we are selling a lot of it."

BORU GALGALLO'S VILLAGE, YABELLO WOREDA, BORENA ZONE, OROMIA REGION

Prioritizing reserved areas through mapping

"A couple of years ago I had to walk long distances every day looking for grass to feed our calves," says Gutu Boru (above, in blue). "I remember one day I went out. It was the dry season. At that time we had 35 calves, so I needed to collect a lot of grass. I looked all day, but I didn't find any. Late that afternoon, when I returned home empty-handed. My husband really shouted at me, 'You've been in the bush all day and you don't have any grass? The calves are dying.' It was a bitter experience.

"But you can learn a lot from your experiences and your problems. Later, when I was invited to take part in the mapping (undertaken in 2014, under the PRIME project), I talked about what had happened. This situation was a problem not just for me, but for all of the women in my community. As a result, we decided one of our priorities was to set up a reserve grazing area (*kalo*) that would provide us with access to grass during the most difficult part of the dry season."

Gutu's neighbor, Jillo Haro, explains that during the mapping exercise, after the community had identified their wet and dry season grazing areas on the map, they decided on areas that could be made into *kalos*. The grass in these enclosures would be strictly reserved for the critical season, when it would be used to feed the calves, the weak animals and milking cows that cannot travel far from their settlements during that time.

"There were times when I used to regularly walk 10-15 km a day looking for grass for the calves," Jillo says. "When I got home I was hungry and tired: the calves were hungry, the children were hungry. Today I no longer have to travel far at all. Having access to grass near my home means I now have more time to cook for my children, more time to fetch water and do other activities like washing the clothes and collecting firewood.

"The other benefit is that, now that the lactating animals are eating more grass, they are producing more milk. During the dry season they go out and eat some grass nearby during the day, and then we give them more grass in the evening when they come back. Because of this extra feeding, we now get more milk from them. This means our children get more milk — and when children drink milk they grow faster. It also means that we have milk left over to sell. And thanks to that extra income, we are no longer forced to sell our animals in order to survive."

DARUSALAAM VILLAGE, LIBAN WOREDA, GUJI ZONE, OROMIA REGION

Rearranging settlements to reflect new realities

"Not so long ago our community was facing some serious challenges," says Sheikh Abdirahman Ibrahim, an elder from Darusalaam village in Oromia and member of his grazing system's rangeland management council. "The population has increased, and settlements had been built everywhere. This was causing a real problem for our livestock: it was hard for them to move — whether it was to grazing areas, water points or markets — everywhere they went they ended up in a village."

Sheikh Abdirahman explains that during the resource mapping process, first undertaken in 2006 (under PLI I), the participants identified constrained livestock mobility as the main factor contributing to the degradation of the rangeland — and made a plan to address it by re-thinking their community's settlement patterns.

Mapping conducted as part of PRM or a planning process can enable a community to strengthen their customary resource governance system. In this location the community wanted to improve access to the rangeland resources needed for their livestock production system, mainly pasture and water resources. Mobile pastoralist communities are frequently split with part of the household remaining in a semi-permanent location. Rethinking settlement arrangement can help prevent/address rangeland fragmentation caused by inappropriate settlement patterns, and continuously expanding crop farming, which can create potential conflicts within a community.

"Rearranging settlement patterns is not something new," says Sheikh Abdirahman. "Our ancestors did this too. As a pastoralist, you have to arrange your settlement to fit with the grazing. All of us move with our livestock and we should not get in the way of our neighbors, nor should the pasture be negatively impacted."

After completing the mapping exercise, Sheikh Abdirahman and the other participants went back to their communities. "We showed them the map and we talked with them about our plan to set aside places for grazing, places for farming, places for watering. We told them that in order to do this we needed to bring all of the scattered settlements into three larger groups. Not only would this leave more of our land open for grazing and farming, it would also allow us to build a large enclosure for the community to use during the dry season.

"Most of the community members agreed with the plan. They understood that moving to one location benefits everyone in the community equally. And because they know our traditions, the idea did not represent something foreign. It was just a matter of bringing people back to the original mindset and building on practices that existed before. There were still a few people who resisted, but we talked with them until they were convinced."

Regular meetings at the *dheeda*, *reera* and *ardaa* levels that included both project staff and key officials from the administration kept the plans moving ahead and ensured the community had the government's approval and support.

To further promote the plan the elders, including Sheikh Abdirahman, decided to lead by example: "We elders, those in charge of the *dheeda*, starting with those at the top, moved our own houses and livestock to the selected area first.

"Today, most of our original plan has been achieved," he says, "and people are happy with the results. There is more land open for grazing; and now people from all over come to see our beautiful 1000 hectare enclosure. In addition to grass for the dry season, it also provides some income: we have put beehives inside the enclosure because there is now 'bee forage' there and we are also earning some income by selling excess grass to neighboring communities. All of this is an outgrowth of the work that started with the mapping."

(Above) Darusalaam village. (Below) Sheikh Abdirahman, just back from a meeting of elders from the *dheeda* level rangeland management council, informs members of his community about what was discussed.

ADDITIONAL RESOURCES

Publications

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PGIS/CTA (2010) *Participatory 3D Modelling: Guiding Principles and Applications*. Internet: http://pgis.cta.int/en/resources/p3dm-handbook.html

Websites

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Institute of Development Studies ELDIS: www.eldis.org

International Institute for Environment and Development: www.iied.org/participatory-learning-action

International Institute for Sustainable Development: www.iisd.org

Mapping for rights: www.mappingforrghts.org/participatory_mapping

Participatory Geographic Information Systems: http://pgis.cta.int/en


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