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WRI DISCUSSION BRIEF

TOOLS FOR LOCAL-LEVEL RURAL DEVELOPMENT PLANNING

Combining Use of Participatory Rural Appraisal and Geographic Information Systems in Uganda

FRANK R. TURYATUNGA

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Preface

Information technology is rapidly becoming available in Africa, even at local levels. While Geographic Information Systems (GIS) are still used mostly at the national level to map resources and assess social, economic, and environmental conditions, opportunities are growing for these sophisticated systems to be applied in decentralized, participatory planning processes for villages and rural communities. Especially when supported by the use of modern information technologies, such processes promise to finally empower members of the community as full partners in development planning and management of the natural resources on which their livelihoods depend.

In this World Resources Institute Discussion Paper, Frank Turyatunga, a Ugandan forester and geographic specialist, presents the results of his case study of how GIS technology was used in combination with a participatory planning technique known as Participatory Rural Appraisal (PRA) to help villagers in one Ugandan community assess their natural resources and make more informed decisions concerning their management. This case represents only a first step toward a true integration of PRA and GIS at the community level—an endeavor that will only be complete when communities gain sufficient technical capacity to sustain the use of geospatial information for planning and managing their resources. However, Turyatunga has demonstrated through a series of simple experiments that GIS can be used alongside PRA to effectively and efficiently bring the community together in a structured, development planning exercise.

This study was sponsored by the Information Working Group for Africa (IWG), a joint activity of the United States Agency for International Development (USAID) and the World Resources Institute (WRI). Several individuals made invaluable contributions to the project. We would like to thank Paul Bartel, senior information advisor in USAID's Economic Growth, Agriculture, and Trade Bureau, for his interest and support for this project. IWG members Bob Winterbottom, Leif Christoffersen, and André Bassolé provided important input based on their review of plans for the study as well as its initial results. Jesse Ribot, Susan Minnemeyer, David Jhirad, and Norbert Henninger, all from WRI, reviewed early versions of this report and contributed helpful comments. Karen Holmes was the senior writer and editor. Maggie Powell carried out the design and Hyacinth Billings directed the publication process.

The final wording of the report is the sole responsibility of the author.

—Dan Tunstall
Director, Information Program
World Resources Institute

Executive Summary

Many developing countries are engaged in processes to decentralize aspects of public decision-making, with natural resources management often a key sector for decentralization reforms. In a context of increasingly decentralized decision-making processes, the demand for use of participatory methods of managing and using natural resources could rise substantially.

To provide greater insights into the generation, use, and impacts of environmental information in local participatory decision-making, the Information Working Group for Africa (IWG), sponsored by the U.S. Agency for International Development (USAID) and the World Resources Institute (WRI), commissioned a case study of a local participatory decision-making exercise in Uganda. The purpose of this study was to test and evaluate whether two information-gathering techniques: one a relatively advanced technique (Geographic Information Systems, or GIS) and the other a technique already commonly used at the village level (Participatory Rural Appraisal, or PRA) can be combined to help local organizations prepare better rural development plans and make better decisions about managing their resources. The study is grounded in the concept that decentralization processes could benefit from increasing use of participatory methods for managing and using natural resources. For this to occur, however, communities will need to become familiar with gathering environmental information and using information-based decision-support tools, which until now have traditionally been used at higher levels of government, or not at all.

The case study was undertaken in conjunction with a rural development planning exercise held in Nyantonzi parish, Masindi District, Uganda in late 2001. As a first step toward effective local development planning, participants in the exercise set out to develop maps depicting their parish's boundaries and key resources. The process was carried out in three stages. In Stage 1, community members were able to map parish resources (such as water sources, roads, trading centers, schools, etc.) using the PRA approach and starting with only a blank sheet of paper (see Map 1). In Stage 2, community members repeated the exercise, starting with a GIS-generated map depicting only the parish's boundaries. However, this map failed to provide participants with enough prompting information to enable them to locate basic community resources on the map (see Map 2). In Stage 3, participants used a GIS-generated map with prompting attributes (such as rivers, roads, and contours) to map community resources more accurately than in prior stages, and also added resources (such as more water sources and locations of traditional healers) not mapped during earlier stages. The accuracy of these maps was then validated using Global Positioning System (GPS) data.

The maps created in this community planning exercise have been used as guidance for the preparation of Nyantonzi's Parish Development Plan and as input toward a Parish Environment Action Plan for fiscal year 2002-03. The planning exercises and community maps were instrumental in identifying opportunities for conservation projects, and inspired the parish to become involved in pilot activities for ex situ conservation of medicinal plants as well as protection of chimpanzee populations found in its forests.

The Nyantonzi community expressed the need to retain their maps so that they could track future changes in the status of the parish's environmental resources and assess how such changes affect their livelihoods. Unfortunately, the community was not in a position to retain the digital information or maintain the spatial database. Nyantonzi is a very rural parish, with no access to electricity or telecommunications, and there is currently no capacity or infrastructure to handle such information at the parish level. Thus, the resource inventory maps developed by the community have been stored in analog form at

Nyantonzi Parish headquarters. Digital information was shared with the District Planning Unit and the District Environment Office, which have rudimentary capacity to handle such data.

The results of this case study indicate that:

- Locally generated environmental information can be used to strengthen local-level decision-making. The community databases generated in this case study are proving useful for participatory rural development planning.
- PRA data can be collected, organized, and integrated in a GIS environment for better analysis of PRA data, enhanced communication and use in a community planning process.
- It remains unclear whether the integration of PRA and GIS can increase the ability to incorporate locally generated information in national and subnational decision-making. While the case study suggests that such integration is feasible at the parish level, similar social and information techniques must be adopted at higher levels of planning authority.

The case study suggests the following various actions that could be taken by diverse entities to realize the potential of integrated PRA and GIS approaches to participatory, community-based planning in Uganda and elsewhere in Africa.

- Policymakers in Uganda should support additional experimentation with community planning exercises that seek to combine modern digital information technology with participatory social surveys.
- Policymakers, working with the private sector, should provide access to electricity and telecommunications for rural communities to realize the potential of information technologies in development planning.
- Researchers and GIS professionals in Uganda should provide additional results concerning the requirements for successfully integrating GIS and other information technologies with participatory methods of local development planning. Additional case studies like this one are needed to expand these experiences and shed light on best practices.
- Other African governments, with assistance from the international community should promote experimentation with modern information and communications technologies in participatory development planning. Case studies are needed in other African countries to indicate whether the approaches used in Uganda are feasible elsewhere.
- The private sector should cooperate with African national governments to provide needed technology and information services to support participatory local development planning. There is a potentially large market for information services provided to diverse users in African communities at an affordable price.
- Communities should work in concert with nongovernmental organizations and governments to learn more about using these planning tools and to take advantage of synergies in achieving their development goals.

Introduction

Many developing countries, particularly those in Africa, are undertaking some type of reform to decentralize public decision-making. Under decentralization reforms, power is transferred from central government to institutions and actors at lower levels of political and/or administrative authority. The rationale behind decentralization is that these reforms foster increased efficiency and equity in development activities. By virtue of their proximity to the people they serve, democratic local institutions are likely to have access to better information about local conditions and better understanding of local needs and aspirations, and to be more easily held accountable by local populations.[1]

For many reasons, natural resources management is particularly well suited for decentralization and local democratic control (Kamowitz and Ribot 2002).

- Unlike sectors such as health and education, natural resources are a direct source of wealth as well as a target for investment. Thus, natural resources can help finance both development and local governance.
- Because most people in rural areas of developing countries rely on natural resources for their livelihoods, democratic local governance requires popular input in decisions about natural resources management and use.
- Effective management of diverse natural resources with multiple uses requires specific local knowledge and strong communication. Controlling access to natural resources often generates overlapping claims and conflicts that must be settled locally.

At least sixty developing countries are decentralizing some aspects of natural resources management.[2]

In a context of increasingly decentralized decision-making processes, the demand for use of participatory methods of managing and using natural resources could rise considerably. To provide greater insight into the generation, use, and impacts of environmental information in local participatory decision-making, the Information Working Group for Africa (IWG), sponsored by the U.S. Agency for International Development (USAID) and the World Resources Institute (WRI), commissioned a case study of a local participatory decision-making exercise in Uganda.

The purpose of this study was to test and evaluate whether two information-gathering techniques—one a relatively advanced technique (Geographic Information Systems, or GIS) and the other a technique already commonly used at the village level (Participatory Rural Appraisal, or PRA)—can be combined to help local organizations prepare better rural development plans and enhance their ability to make more informed decisions about managing their resources. The study is grounded in the concept that decentralization processes could benefit from increasing use of participatory methods for managing and using natural resources. For this to occur, however, communities will need to become familiar with gathering environmental information and using information-based decision-support tools, which until now have traditionally been used at higher levels of government, or not at all.

The study is not intended to provide a critical review of GIS, its practicality as a tool for decentralized planning in Africa, nor how widely or effectively GIS is likely to be used for community planning exercises. Similarly, an assessment of the barriers to adoption of this technology in a village setting[3] is beyond the scope of this study.

Background

DECENTRALIZATION AND RURAL DEVELOPMENT PLANNING IN UGANDA

Since 1993, Uganda has been devolving much of what had once been central government functions and responsibilities to sub-national entities, principal-

ly districts and other lower-level local governments. The Local Governments Act of Uganda (1997) recognizes the roles of local governments in all stages of decision-making, provides new responsibilities and powers to local governments, and establishes new relationships between local authorities and central government. The law defines one objective of decentralization as empowering people through participatory development "to ensure democratic participation in and control of decision making by the people concerned."

Section 36(3) of the statute requires District Councils (which form the level of planning immediately below the national government, and which currently number 56) to prepare for submission to the National Planning Authority "comprehensive and integrated" development plans incorporating the plans of lower-level local governments (that is, counties and sub-counties, of which there are 159 and 953, respectively). In turn, these local governments are required to prepare plans incorporating the plans of lower councils, including 5,225 parishes and some 44,400 villages. (See Figure 1 on planning levels in Uganda.)

Thus, current decentralization policy in Uganda promotes community-level participatory approaches to support democratic management of public affairs. Decentralization provides a basis for local communities to participate in making decisions on matters concerning them and their livelihoods by establishing elected local authorities. Participatory methods can enhance the ability of these authorities to represent and respond to local needs and aspirations. Because most communities are rural and agrarian and tend to rely heavily on natural resources, local governments can enhance their effectiveness by involving communities in participatory data collection and decision-making concerning natural resources management.

However, lack of capacity to meet imposed overly-complex planning requirements has been an obstacle to implementing decentralization as envisioned in the 1997 local government's law (Government of Uganda 1997). Often, the number of layers and steps are truncated, and planning starts not at the lowest (village) level, but at a higher one (such as the sub-county). The result is that local communities are excluded, their capacity for participatory management is not developed, and the potential of decentralized governance to enhance the relevance, effectiveness, appropriateness, accountability, and transparency of decision-making is not realized.

Within Uganda, there is consensus that decentralization needs to be deepened to reach lower levels (parishes and villages) and enhance their impact on promoting sustainable livelihoods and reducing poverty. The Local Governments Act of 1997 and other Ugandan laws stipulate that higher-level local governments have a duty to mentor lower local governments and councils in planning for rural development and, ultimately, in implementing these plans. The Ministry responsible for local government has also noted a lack of capacity in reports produced by its Inspectorate Division (UNDP/GOU CCF 2003). Various forums organized by both local and central governments have repeatedly recommended the strengthening of lower planning units.

The Government of Uganda has responded to the growing need to support participatory planning practices by instituting the Participatory Development Management Program (PDM). PDM is a building-block approach to decentralized development management, helping to empower local communities (villages) to develop and implement their own plans. Village plans are built into parish plans; parish plans are in turn incorporated in sub-county plans; and sub-county plans are integrated in district-level plans. At each level, self-reliance, openness, inclusiveness, transparency, and accountability are key considerations.

One of the main outputs of the PDM is to establish one-stop public access information centers (telecenters) at the district level or where sufficient communications infrastructure exists at the sub-county level. These centers are to be connected to lower levels of planning authority and are intended to provide the public with information covering all topics vital for effective participatory management of rural development in that particular locale.

TOOLS FOR SUPPORTING PARTICIPATORY MANAGEMENT OF RURAL DEVELOPMENT

Participatory decision-making relies heavily on consensus building. Achieving consensus, however, requires the identification of feasible, participatory processes as well as the accumulation of data and information to support the planning process throughout its various stages, ranging from problem identification, analysis, and priority setting to solution identification, implementation, and monitoring and evaluation.

Participatory Rural Appraisal

Various methods can be employed to construct an information base for rural development planning. In Uganda, the most commonly used methods have been Rapid Rural Appraisal (RRA) and, more recently, Participatory Rural Appraisal (PRA). The use of participatory approaches to information gathering—that is, working with beneficiaries to compile data, information, and knowledge—helps ensure that the resulting plans are (and are perceived to be) valid and responsive to community needs.

PRA is an approach to development planning that involves careful consideration of the views of all members of the affected community and requires that a consensus be reached on community development plans. This approach is founded on two assumptions: 1) local communities' information and knowledge is relevant to development planning but needs to be organized and made accessible; and 2) villages' resources can provide a basis for economic development, but need to be mobilized as useable natural resources.

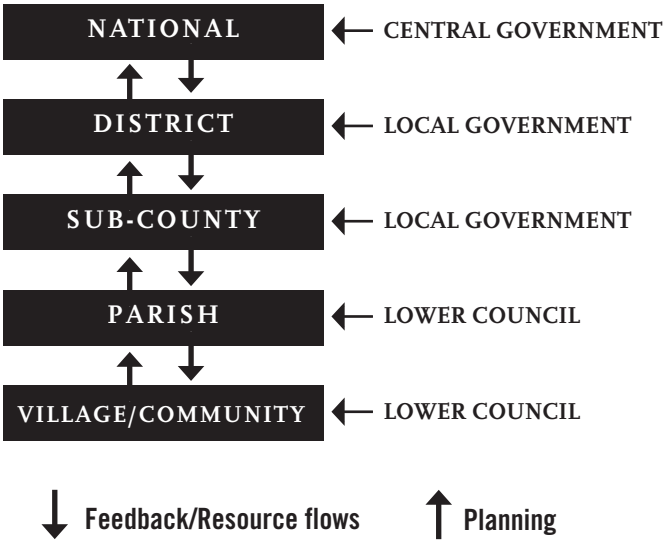
PRA evolved from perceived weaknesses in the Rapid Rural Appraisal (RRA) and *baraza* approaches to development. Dating back to the 1970s, RRA was one of the earliest community-based approaches to participatory planning used in Uganda. Although this approach permitted freer exchange of information between rural people and development researchers than had previously been the case, RRA was, and remains, an extractive exercise in which outsiders gather, analyze and use information to provide communities with externally designed "solutions." *Baraza* is a Swahili word which is loosely translated to mean a forum for experts (or in village terms, elders). Traditionally, *barazas* have been the most popular forum for community planning; however, such meetings often are dominated by influential cliques in the community and tend to produce plans that lack broad-based ownership and accountability.

In response to shortcomings in RRA and *baraza* approaches, PRA differs in several important ways.

- PRA is not necessarily rapid; its concern is empowerment, experience, and knowledge sharing to create consensus and commitment.
- PRA does not extract data and information from the community; rather, it focuses on organizing data in such a way that community groups can manage, analyze, control, monitor, retrieve, and use it.
- PRA leads specifically to a community development plan. It starts with identification of issues and opportunities and proceeds through various stages, including filtration, goal setting, development of performance indicators, development of an implementation plan, and identification of resources to support implementation. PRA methodology has been widely used in Uganda, especially for Sub-County and District Environment Action Planning (see Figure 1).

The PRA approach uses a variety of practical methods to generate essential data for planning and ensure the quality and timeliness of these data. The process is designed to empower the community and give participants—young and old, women and men—a strong sense of recognition and belonging. PRA involves the practice of role playing to present problems and explore potential solutions, including role reversals—in which Group A analyzes and portrays the role of Group B and vice versa—in order to minimize uninformed criticism. It also employs triangulation and cross-checking of data to ensure a sound, appropriate basis for assessments and development decisions. Another unique feature of the PRA

FIGURE 1: PLANNING LEVELS IN UGANDA



process is the use of multidisciplinary teams which, when properly coordinated, ensure the integration of various sectoral interests. By empowering participants and raising their critical self-awareness, PRA encourages a strong sense of product ownership and the use of the participants' best judgment throughout the process.

The most effective development planning often requires openness to new ideas and approaches. PRA enables both practitioners and beneficiaries of development to take on new roles quite different from the ones they have been accustomed to, thus promoting attitudes that enable participants to accept fresh ideas.

Geographic Information Systems

Geographic Information Systems (GIS) is another information tool used to support rural development planning. Many elements that are central to development—such as natural resources, environmental phenomena and processes, and human social and economic institutions—are spatially distinct; that is, they occur in a specific geographic space. Development planning involves gathering information that is linked to particular locations. The use of GIS technology provides planners with the ability to record, analyze, and map information by location.

GIS is defined by the Environmental Systems Research Institute (ESRI) as "a computer system capable of holding and using data describing places on the earth's surface" (EIS-Africa 2001). Three basic functions characterize a GIS: the ability to *store* data, to perform some *analysis* with that data, and to *represent* that data in its geographical location. The components of the system that enable it to perform these functions are a *map*, a *database*, and a *program module*.

Uganda has invested in a 1:50,000 scale national GIS database, which contains digital spatial information on such features as administrative boundaries (to parish level), road and rail infrastructure, rivers and lakes, land use/land cover, and topography (contours). Most uses of the Uganda GIS database as a decision-support tool have been in policy-related applications at higher levels of government rather than in community-based participatory planning exercises. However, as decentralization of decision-making and development planning advances, the processes of collecting, analyzing, and using spatially distinct information are now taking place at several levels, from the household level, to local governments and watershed authorities, and to the national and sub-regional level.

Issues Addressed in the Study

Because PRA and GIS are both decision-support tools used in rural development planning (though often applied at different planning levels), it is reasonable to imagine that the two could be combined to enhance information-related functions in community-based planning. This study is intended to evaluate whether and how these two information-gathering techniques can be integrated to help local organizations make better rural development plans and decisions. It addresses several pertinent issues:

Box 1

Participatory Rural Appraisal: Strengths, Weaknesses, and Applications

PRA is a basket of tools that facilitate the processes of building data stocks and undertaking situation analysis. It promotes rapid, progressive learning that is instantaneous and re-awakening. The PRA approach coincides with core values of good governance, including the ability of communities to make conscious, independent decisions and to choose, adapt, and improvise methods for their own well-being. PRA promotes these values by granting every community member the ability to map, model, diagram, rank, score, quantify, appraise, analyze, demonstrate, identify and select priorities, plan, and act. Herein lie the strong fundamentals of community liberation and empowerment.

Proponents claim several notable strengths for PRA as a planning tool (Chambers 2002, 1997, and 1994; Cooke and Kothari 2001):

- It builds local ownership for development activities.
- It strengthens local leadership and community institutions when they identify each other as interdependent partners in the development process.
- It establishes rapport, catalyzes, and facilitates social cohesion by helping participants to watch, listen, and learn from a process with which they can easily identify.
- It develops and enhances group dynamics amongst stakeholders through accommodation of diverse opinions.
- It empowers people to prioritize their development concerns and formulate an appropriate strategy for undertaking planned activities efficiently.
- It recognizes gender concerns and brings all stakeholders together, thus enhancing commitment to and sustainability of the development cause.

PRA has been used in many, diverse applications, including:

- needs assessments
- feasibility studies
- identifying priorities for development activities
- implementing development activities where new information needs to be collected
- monitoring and evaluating development activities
- facilitating the experimental learning cycle (which is the least catered-for element in development management).

Though PRA is currently lauded as the most appropriate participatory planning tool for rural development, the process has some drawbacks:

- It may raise local expectations beyond what is feasible (affordable) if not well managed.
- Setting priorities may worsen internal conflicts in the community, especially when these are not clearly identified.
- Local politicians may not be comfortable with communities that exhibit high levels of independence, although PRA can be used to strengthen local authorities and local democracy as well.
- Outside facilitators may not buy into local needs and their priority concerns.

a. Can information generated locally through participatory processes be used to strengthen local-level decision-making?

b. Can PRA data be collected, organized, and integrated in a GIS environment for ease of analysis, communication, and use?

c. Can the integration of PRA and GIS increase our ability to incorporate locally generated information in national and sub-national levels of decision-making?

The hypothesis guiding this study is that PRA data can be integrated into a GIS environment for purposes of achieving better data and information management and creating more informed plans and decisions.

Box 2
Rapid Rural Appraisal

Rapid Rural Appraisal (RRA) is one of the earliest of the community-based participatory planning efforts, dating back to the 1970s (Chambers 1983). It grew out of the restlessness and frustration experienced by researchers working with questionnaires and statistics to explain development behaviour. Its adoption freed development planners, researchers, and managers from the inflexibility of using only formal surveys, which were not generating the type and quality of information needed.

RRA brought researchers and development practitioners into physical contact with rural people and created a situation that allowed free exchange of information between local community members and outsiders. (Researchers and development practitioners usually were from outside the community in question.) More importantly, the RRA process made it possible for outside researchers to meet women and children overlooked by formal surveys. RRA provided a forum for women and children to contribute to the development planning process, even where they lacked education, literacy, and/or status as opinion leaders.

Where it is still in use, RRA has several strengths:

- It provides for progressive, flexible, exploratory, interactive, and inventive learning.
- It allows for necessary role reversals, learning from and with rural people, and eliciting and using criteria and perceptions to appreciate indigenous technical knowledge.
- It encourages field researchers not to look for more information than is needed, and not to measure what does not need measuring. It also lessens chances of inappropriate simulations because information is first-hand.
- It permits collection of information using different methods, sources, and disciplines from a range of informants in many places.

In spite of these advantages, RRA has remained an extractive, outsider-oriented exercise, in which the knowledge of community groups seems to count only for use by outsiders. The process remains disempowering.

Methods

MAPPING COMMUNITY RESOURCES

An exercise in rural development planning using PRA methods was organized for Nyantonzi parish, Masindi district, Uganda, in collaboration with the Environmental Protection and Economic Development (EPED) Project.[4] EPED was already active in the area, assisting communities with the preparation of Parish Development Plans and Environment Action Plans. The EPED project offered a unique opportunity to introduce alternative planning tools in parallel with existing ones, in a context in which the output would be of immediate and practical benefit to the community.

Members of the study team—consisting of a principal researcher, PRA expert, and GIS expert, all Ugandan—spent 4 days with community members in preparation for the exercise, which lasted 6 days. The team informed the community where and when the exercise would take place, and worked to ensure that community representatives were aware that they were welcome and expected to participate. Also during this preparation phase, the team thoroughly briefed a facilitator, who was required to be a resident of the district and proficient in local languages, and was selected based on experience with PRA methods and knowledge of map drawing. To prepare for the exercise, the study team and facilitator conducted a step-by-step rehearsal, with special emphasis on techniques for guiding community members through the planning process without drawing up the plans for them.

The planning exercise was held between August and December 2001. Participants in the exercise numbered 113 people, including 45 men, 36 women, and 32 youths (male and female). Their ages ranged from 13 to 65 years. Most participants had attained primary-level education, with fewer than 10 percent illiterate. Among the most educated participants were schoolteachers, extension workers, civic leaders, religious leaders, and a small number of local political leaders.

As a first step, the purpose of the exercise was clearly explained to participants in the local language by the facilitator. It was generally agreed that in order to plan for effective rural development, it was necessary to correctly map all the important and strategic resources of the parish. Participants then set out to develop a map depicting their parish boundaries and the key resources. To meet the goals of the exercise, a number of processes were followed to determine the weaknesses and strengths of the methods in relation to the capacity and capability of the community.

The planning exercise was carried out in three stages. The same group (as much as feasible) participated in all three stages. Each stage of the exercise lasted 2 days, beginning around 11:00 AM (farmers needed to tend their gardens first) and ending around 5:00 PM.

Stage 1: Mapping the Community's resources using the PRA approach
The community worked together to map its resources without an existing map. All that was available to work with was a blank sheet of paper and marker pens. The process started with a large blank sheet of paper on which the community members were asked to draw the parish boundary, the land features, and key strategic resources as they perceived them. They proceeded to draw rivers, water sources for domestic use, schools, churches, traditional medicine shops, produce markets, land cover, and other resources within the parish.

Stage 2: Mapping the Community's resources using a GIS-generated map of administrative boundaries
The community started with an empty but accurate map, which was generated in a GIS environment and depicted the Nyantonzi Parish boundaries. Community members were asked to draw features and resources in the map. This stage was meant to assess the degree to which providing a boundary map helped the community members visualize the extent of the parish and position land features and resources more accurately and completely. (Features drawn in Stage 1 were re-drawn in this polygon.)

Box 3
The *Baraza*

A Swahili word meaning a forum for experts or a network of people knowledgeable in certain areas, *baraza* may also be used to refer to a meeting of people whose objective is to achieve a predetermined goal. In Uganda, the *baraza* is usually the most popular forum for planning. Community members gather at an appointed venue and time, and set out to develop plans for their locales. Although this method brings community members together for a common cause and does not require outside facilitation, it is beset with a number of problems.

First, influential cliques in the community tend to dominate these meetings. This often prunes the exercise of objectivity and complicates the issue of ownership of the product of development planning. It can be difficult to determine whether development plans are truly owned by the community or are merely a reflection of the needs of the influential cliques. This method usually lacks genuine popular participation and can be as disempowering as Rapid Rural Appraisal. Finally, accountability is diminished during the implementation of these plans, because popular participation is marginalized and ownership contested.

Stage 3: Mapping the Community's resources in a GIS-generated map with prompting attributes
In this stage, the community started with a map of Nyantonzi parish depicting the parish boundary, contours, and major roads. Community members were asked to draw land features and resources as in Stages 1 and 2.

Through much discussion and consensus building, members of Nyantonzi parish were able to draw the three resource maps. They also added motorable tracks and footpaths. All three maps were then digitized into a GIS for better assessment and comparison using Arc-Info software.

VALIDATION OF MAPPING ACCURACY

In order to assess the spatial accuracy of the map features drawn by the community members, some of these features were again mapped using a differential Global Positioning System (GPS). This included fea-

tures accessible by foot or four-wheel drive vehicle including roads, water sources, produce markets, traditional medicine shops, churches, and schools. An OmniStar DGPS, which uses differential signals broadcast from satellites in real time and is accurate to 1 meter, was used.

In order to map roads, a GPS antenna was mounted on a four-wheel drive automobile. A GPS recording unit inside the car was set to record a point every 5 meters (in two different map projections, i.e., WGS 84 and UTM) as the car moved along the roads. For point features, such as wells and traditional medicine shops, recordings were taken and added to the GPS file. The GPS files were later downloaded to a computer. The points collected were converted into shapefiles (a file format used by ArcView GIS), which were then edited and cleaned for inclusion in the Nyantonzi maps.

Results

The results of this exercise indicated that community members were capable of both constructing and reading maps. Although some participants had never before used a map, as a group they were able to identify the key resources in their parish and to use landmarks to locate these resources.

- Stage 1 was a relatively easy exercise, in which participants were able to start with only a blank sheet of paper and map the key parish resources they encounter on a daily basis. (See Map 1.) The resources mapped included water sources, roads and motorable tracks, trading centers, schools, churches, mosques, health units, the locations of traditional healers and shops selling traditional medicines, produce markets, land cover, and others.

  It was immediately evident that all the information being presented was accurate or had a bearing on obtaining accurate information. This stage in the exercise also demonstrated strong community cohesion and positive group dynamics. However, the participants had some difficulties in drawing the boundaries of the parish.

- Accuracy in scaling was difficult to achieve, as was precision in pinning down the actual location of features. For example, while the community members knew where the boundaries of their parish were, they could not place them on the map. Most of the roads they drew tended to be straight, though in reality these roads are not straight. The whole concept of map extent (spatial visualization of features in terms of location and size) was challenging for participants.

- Participants tended to provide too much detail, overcrowding the maps and making them difficult to read. For example, main trading centers were placed too close to each other, resulting in bunching as other features were added to the map. Lack of consensus on the exact location of certain community resources sometimes resulted in multiple representation.

- Community members had difficulty indicating key terrain features, such as contours.

- It took a relatively long time for the group to forge consensus. Consensus is important because a group like this is unable to proceed unless there is agreement on key issues.

- The accuracy of distances between mapped features as drawn by community members was often contentious and generated a lot of debate among participants. Mapping resources on elevated surfaces was found to be one of the most challenging aspects of the exercise for participants. The extent of hills was often exaggerated and locations changed a number of times.

Despite these difficulties, community members were able to map key parish resources and work well with the map they developed themselves.

- Stage 2 was more difficult for participants than Stage 1. The empty, GIS-generated map failed to provide community members with enough prompting to enable them to locate basic community resources on the map. (See Map 2.) Although the boundaries of the polygon (parish boundary) were accurate, the map contained no reference points other than the compass direction. This

made the task of locating parish resources quite difficult for some community members.

For a number of participants, this was the first time they were able to view their parish map. Because of the lack of reference points, community members were not sure where to locate resources within the confined space of the empty boundaries. Some even debated whether the shape of their parish was as depicted in the empty map. This confusion interfered with group cohesion and consensus building. Community members felt that the empty polygon boxed them into a form of artificial consensus, inhibiting participation and disempowering some participants, especially non-compass readers. The latter became alienated and suspicious of the process, expressing comments to the effect that those who had not gone to school and learned to read maps were being deliberately excluded from the planning process.

Moreover, the empty polygon did not provide sufficient prompting to guide even the "village mapping experts" in locating all the required community resources on the map. Participants were left guessing about the accuracy of their product; their comments suggested that they felt unable to defend the map if put to the task and thus were hesitant to assume ownership of it.

At the end of this stage, participants felt that it was easier and more rewarding to draw their own resource map, however inaccurate, without the benefit of GIS-generated boundaries.

- In Stage 3, participants used a GIS-generated map with prompting attributes, such as rivers, roads, and contours. (See Map 3.) From the outset, the attributes and physical features presented in the GIS-generated map helped community members to orient themselves, and they found the map accurate and user-friendly. The inclusion of roads, rivers and streams, and contours locating hills and other raised areas provided helpful prompts. These prompts also seemed to help overcome some difficulties experienced in earlier stages of the exercise, such as the participants' tendency to exaggerate features and overcrowd the map.

  Surprisingly, community members found the parish boundary helpful in this version of the map, because it could now be related to other features. It was much easier for them, for example, to start mapping resources from the point a road enters the parish from a neighboring one and proceed along its route. Participants readily located community resources and mapped their locations more accurately in this stage than in prior ones. (See Map 4.) Moreover, participants added resources not mapped during the earlier stages, including more water sources and locations of traditional healers.

Discussions following the mapping exercise indicated that participants believed that a community's knowledge of elementary map reading could be an important asset for planning and information management. It was interesting to note that they appreciated that their parish could be mapped and therefore known.

Efforts to validate the accuracy of maps prepared by the community members showed that the location of features mapped by participants using a GIS-generated map with prompting attributes closely matched those plotted using a GPS. (See Maps 5 and 6.) This demonstrated that community members not only know how to read maps, but also can easily locate features with satisfactory precision if provided with boundary maps containing adequate landmarks to guide mapping of key community resources.

HOW THE MAPS HAVE BEEN USED

The maps created in this community planning exercise have been used as guidance for the preparation of Nyantonzi's Parish Development Plan and a Parish Environment Action Plan for fiscal year 2002–2003. The maps have also been used to constitute a baseline database for community planning that will continue to be useful in the future.

Ideally, a case study such as this would compare the development plans prepared by Nyantonzi Parish with those of similar parishes in an effort to observe differences in the methods with which these plans were produced and to assess the extent to which

these differences might be attributed to villagers' participation in the community mapping exercise. Unfortunately, information on such differences in development planning outcomes between Nyantonzi and other, similar parishes was not available for this study.

It is known, however, that these recent planning exercises were responsible for highlighting opportunities for conservation projects involving plant and animal resources found in Nyantonzi parish. As a direct result of the planning exercises, the parish is currently involved in pilot activities for *ex situ* conservation of medicinal plants and protection of chimpanzee populations found in its forests. Some individual landowners are being assisted by non-governmental organizations (NGOs) in the preparation of proposals on carbon trading.

The Nyantonzi community expressed the need to retain their maps so that they could track future changes in the status of the parish's environmental resources and assess how such changes affect their livelihoods. Unfortunately, the community was not in a position to retain the digital information or maintain the spatial database. Nyantonzi is a very rural parish, with no access to electricity or telecommunications, and there is currently no capacity or infrastructure to handle such information at the parish level. Thus, the resource inventory maps developed by the community have been stored in analog form at Nyantonzi Parish headquarters. Digital information was shared with the District Planning Unit and the District Environment Office, which have rudimentary capacity to handle such data.

Discussion of Findings

CREATING COMMUNITY DATABASES

Although PRA methods have been used in rural development planning for some time in Uganda, data and information continue to be lacking at the community level. Information gathered during each planning cycle is lost and subsequent planning activities have to start from scratch and repeat basic data gathering. Because communities have thus far not been able to retain information about their key strategic resources, "outside" technocrats have determined how analysis will be conducted, leaving local communities in a relatively passive role (Bakebwa 2001). This dynamic has limited the ability of the intended beneficiaries of rural development to develop information on trends, and thus has denied them the benefit of important hindsight, which is key to planning for the future.

Community access to complete resource inventories should facilitate participatory analysis and lead to better planning. If inventories are kept in mapped form by the rural community, future planning activities will require only small investments to update the information as needed. A community database created through a participatory methodology such as that undertaken in this case study should be maintained, making planning easier and less time-consuming. The creation of community databases can trigger a process that supports planning at all levels.

It must be emphasized that this planning exercise was limited to the Nyantonzi community, with mapping done only within their parish. Unfortunately, the community has no jurisdiction over resources beyond its boundaries and therefore cannot plan for their use. Additionally, many of the important natural resources, such as forests, rivers, lakes, and wetlands, fall under the jurisdiction of central government.

POTENTIAL IMPACT OF ACCURATE MAPPING ON EQUITY CONSIDERATIONS

Accurate mapping of community resources can support rural development planning in various ways, as it saves time and ensures future usability of databases. The Nyantonzi study has also shown the potential impact of mapping of resources in addressing equity issues in rural development.

Under the current decentralized system of governance in Uganda, small administrative units such as parishes are beginning to receive financial resources intended to assist local communities in implementing Parish Development Plans. These plans must clearly reflect community needs, in harmony with overall district and national priorities. The paramount

development priority in Uganda is poverty eradication; development activities aimed at this overarching objective include primary health care, safe drinking water, universal primary education, and the modernization of agriculture, to name but a few issues.

However, deciding where in the parish the development will be located is always contentious. Elected political leaders routinely tend to "pull" development as close as possible to their own villages.[5] Accurately mapping the location of existing social amenities and identifying areas that appear to be poorly served helps the community collectively decide where resources should be spent. In this way, the community is able to address the issue of equitable distribution without much argument, because the accurately drawn map tells the story and circumvents exploitation by self-seeking political leaders. According to community members, the ability to win equity debates is the most important value that GIS mapping brings to the rural development planning process.

Accurate mapping of natural resources could also help communities negotiate more effectively with resource managers. For instance, communities adjacent to forests may be given priority in the awarding of forest concessions. Having more complete and accurate information on the location and extent of such resources would make communities better able to determine their claims on the available concessions.

Accurately drawn community resource maps are good baselines against which future comparisons can be made. The Nyantonzi community expressed the need to retain their resource maps so that they can track future changes and assess how these affect their livelihoods. Retaining maps to compare in the future will become more important as the practice of environmental protection begins to take hold in these communities.

Communities planning to approach development partners are now aware that they have to prepare a convincing case in order to obtain the support they desire. GIS can assist with providing and communicating ways to demonstrate the basis for selecting certain areas for priority development. Parishes with strong development plans attract more funding, especially from non-governmental organizations (NGOs) and community-based organizations (CBOs). Use of GIS in community mapping will also:

- Provide excellent opportunities for updating plans. This is now done annually at the beginning of the fiscal year when parish communities have to produce new development plans.
- Strengthen ownership, accountability, participatory monitoring, and social dynamics. With community mapping, everyone is involved in making decisions on an equal basis, a situation that was not possible when plans were made by government staff on behalf of the communities.
- Facilitate participation, because less time is spent on argument and more on consensus building and analysis. This is clearly visible when community members come together in a plenary session and quickly agree on selection of priorities. (Initially, participants meet separately by gender and age, and later present their reports to a joint session. This approach provides an opportunity for everyone to contribute.) The recent preparation of a Parish Environment Action Plan by Nyantonzi illustrates how comfortable community members have become in employing this method in development planning.

EXPANDING USE OF GIS IN AFRICA

This case study of integrating GIS and PRA methods in rural development planning was made possible largely because Uganda invested in developing a national GIS database. Developing this database cost the country well over US$600,000 in the early 1990s.

Though originally developed to help identify biomass-stressed areas and guide public investment in afforestation, the Ugandan GIS database is versatile and flexible and has since been used for a variety of applications. These include biodiversity mapping, crop suitability zoning, delineation of enumeration

zones for the national census, protected areas planning, distribution of priority issues in District Environment Action Plans, health issues mapping (malaria, HIV/AIDS, river blindness), wetlands management, and forest and woodland management.

Exploring further uses of this database will help increase its return on investment and ensure its sustainability, which in turn will help ensure continuous service to the various categories of GIS users. It is debatable whether investment in such a database can be justified for rural development planning alone. However, with the expanding use of GIS in Africa and the fresh interest in accurate, timely spatial information, countries are set to invest in such systems and databases.

GIS-based approaches have clear advantages for mapping applications in rural development planning. Aerial photographs are very expensive for both national- and local-level applications and are not made easily available to local communities. Although use of GIS will require building local capacity for information management, this capacity-building can take the form of a hands-on approach initially with a facilitator once the necessary investments have been made at the national level. Eventually, trained community members will be responsible for local capacity building. Unfortunately, local training is currently a low investment priority and is not continuous.

FUTURE OPPORTUNITIES FOR USE OF GIS-BASED TOOLS IN UGANDA

The opportunities for use of GIS tools in Uganda are vast and growing. These opportunities revolve around the necessity for local governments to prepare strong development plans which document broad-based participation and use of accurate, up-to-date information, in order to attract financial inflows from the central government.

For instance, Poverty Action Funds (PAF) will only be disbursed to lower planning levels on condition that these units have good plans, an accountability system, and a monitoring and evaluation framework. Uses of these funds include:

- Construction of classroom blocks
- Public health activities such as health education, immunization, maternal care, HIV/AIDS activities, control of malaria, and environmental sanitation
- Maintenance of hospitals
- Agricultural extension services
- Rural road maintenance
- Rural water development
- Universal primary education
- Capacity building and capital development
- Equalization grants (to cover deficits in certain activities that local governments must finance from their own local revenues)
- Donor funds for various activities

However, the key programs that will benefit from adding a spatial dimension to rural development planning (and therefore qualify for assistance from central government) include:

a. Poverty Eradication Action Plans. Here poverty mapping and the spatial presentation of the location and extent of poverty reduction interventions are important requirements.

b. Health. Mappable aspects include immunization coverage, maternal health care centers, HIV/AIDS testing and counseling centers, and distribution of safe water sources.

c. Programme for the Modernization of Agriculture (PMA). Relevant information is required on crop distribution, location of input supply centers, extension service coverage, and marketing infrastructure (such as buying centers, roads, location of public markets, etc.).

d. Universal Primary Education (UPE). One of the most important government programs, UPE requires information on distribution of schools, and an indication of the number of school-age children enrolled in school.

e. Local Government Development Program (LGDP). The LGDP is the national framework for devolving the development budget, including multi-donor financial support, to local governments. Funds under LGDP support capacity building and capital development at all levels.

Conclusions and Recommendations

GIS and other modern information technologies are increasingly applied to planning and decision-making at all levels of authority in Uganda. These experiences plus the results from this case study also inform the following conclusions and recommendations.

CONCLUSIONS

Concerning the questions posed at the outset of this study, we conclude that:

1. **Yes, information generated locally through participatory processes can be used to strengthen local-level decision-making.** The community databases generated in this case study from integrated use of PRA and GIS approaches are proving useful for participatory rural development planning. Community participants were able to generate accurate maps of key community resources, use these maps in development planning, and successfully attract funding for new community development initiatives. The results of this case study indicate that expanding the integrated use of GIS and PRA to additional communities that are familiar with participatory planning methods is likely to yield similar benefits.

   Moreover, combining PRA and GIS approaches could have important positive impacts on equity and efficiency in rural development planning. The integrated use of these two tools addresses a fundamental constraint faced by African communities in undertaking rural development planning: the lack of accurate time-series data and information. The results of this case study show that community access to accurate, GIS-based resource maps can promote increased equity by guiding development to areas of the community with the greatest need rather than those with the most political pull. Retaining the databases and maps should also increase efficiency and reduce costs at many different planning levels, by eliminating the need to recapture the same data at the start of each planning cycle.

2. **Yes, PRA data can be collected, organized, and integrated in a GIS environment for ease of analysis, communication, and use.** The experiences documented in this Ugandan case study demonstrate that it is feasible to bring the two approaches together, so that the science of digitized spatial information is blended with popular social surveys. The case study describes an approach that was successfully used to introduce maps generated by outside experts without confusing participants, thus countering the criticism often heard that participatory social surveys are only "outsiders confusing local communities without any useful results from the process."[6] The tools of PRA and GIS can work together to help develop information systems and forge stronger bonds between the discipline of information management and the social purpose that such information is meant to serve.

3. **It remains unclear whether the integration of PRA and GIS can increase our ability to incorporate locally generated information in national and sub-national levels of decision-making.** Realizing the benefits of decentralization requires the integration of participatory methods and modern information technologies at all levels of planning authority. While the Nyantonzi case study suggests that integrating PRA and GIS at the parish level is feasible, this integration will mean little unless similar social and information techniques are also adopted at higher levels of planning authority. If integrated planning from village to nation is to be successful, the information will need to be developed and shared across scales.

   Increased awareness is needed within African countries of the potential benefits of integrating PRA and GIS approaches in local development planning. The challenge remains for African countries to see the advantage of investing in large-scale national spatial databases that lend themselves to

relatively easy use by local communities. This requires first and foremost the understanding that benefits accrue from planning from an informed position, with data that are generated, used, and owned by those it is supposed to serve.

RECOMMENDATIONS

The results of this case study suggest various actions that could be taken by diverse entities to realize the potential of integrated PRA and GIS approaches to enhance participatory, community-based development planning in Uganda and throughout Africa.

1. Policymakers in Uganda should support additional experimentation with community planning exercises that seek to combine modern digital information technology with participatory social surveys. Such efforts will be predicated on continued effort by the Ugandan government to develop and maintain core national spatial databases, including fine-scale maps of land cover, roads, population, etc. Sub-national governments in Uganda should continue to establish information centres, preferably with GIS capability, to assist in capturing, processing, storing, retrieving, analyzing, and disseminating information.

2. Researchers and GIS professionals in Uganda should generate and provide additional evidence and experience about the requirements for successfully integrating GIS and other information and communication technologies with participatory methods for local development planning. In particular, more case studies like this one are needed to expand experiences and shed light on best practices.

3. Other African governments, with assistance from the international community, should promote experimentation with modern information and communication technologies in participatory development planning. Case studies like this one are needed in other African countries to indicate whether the approaches used in this Ugandan case study are feasible elsewhere.

4. The private sector should cooperate with African national governments to provide needed technology and information services to support participatory local development planning. There is a potentially large market for information services provided to diverse users in African communities at an affordable price. Business shares with government the responsibility and the opportunity to reduce the technology divide between urban and rural areas in Africa.

5. Communities should work in concert with NGOs and governments to learn more about using these planning tools and to take advantage of the greatest synergy in achieving their development goals. They stand to benefit from using the best available tools to select the best available options for sustainable local development as well as to identify and understand how broader development and environmental trends influence decisions made at the community level.

ENDNOTES

1. Ribot 2002.
2. Agarwal 2001, as cited in Ribot 2002.
3. Among these barriers are: the lack of electricity in many Ugandan communities to power the computers needed to use GIS mapping technologies; the high costs of computer hardware and software, especially relative to local incomes; relatively low education level of residents in many communities; lack of familiarity with computers, geography, and mapping; the need to involve experts from outside the community to direct GIS database development; and the need to store digital data at a remote site, making it routinely unavailable to the community.
4. EPED Project was a USAID-funded Project operating in Masindi and Nakasongola districts of Uganda. Its main objective was to integrate environmental protection and economic development at the rural level. It operated in these areas between 1996 and 2002.
5. Bakebwa 2001.
6. Bakebwa 2001.

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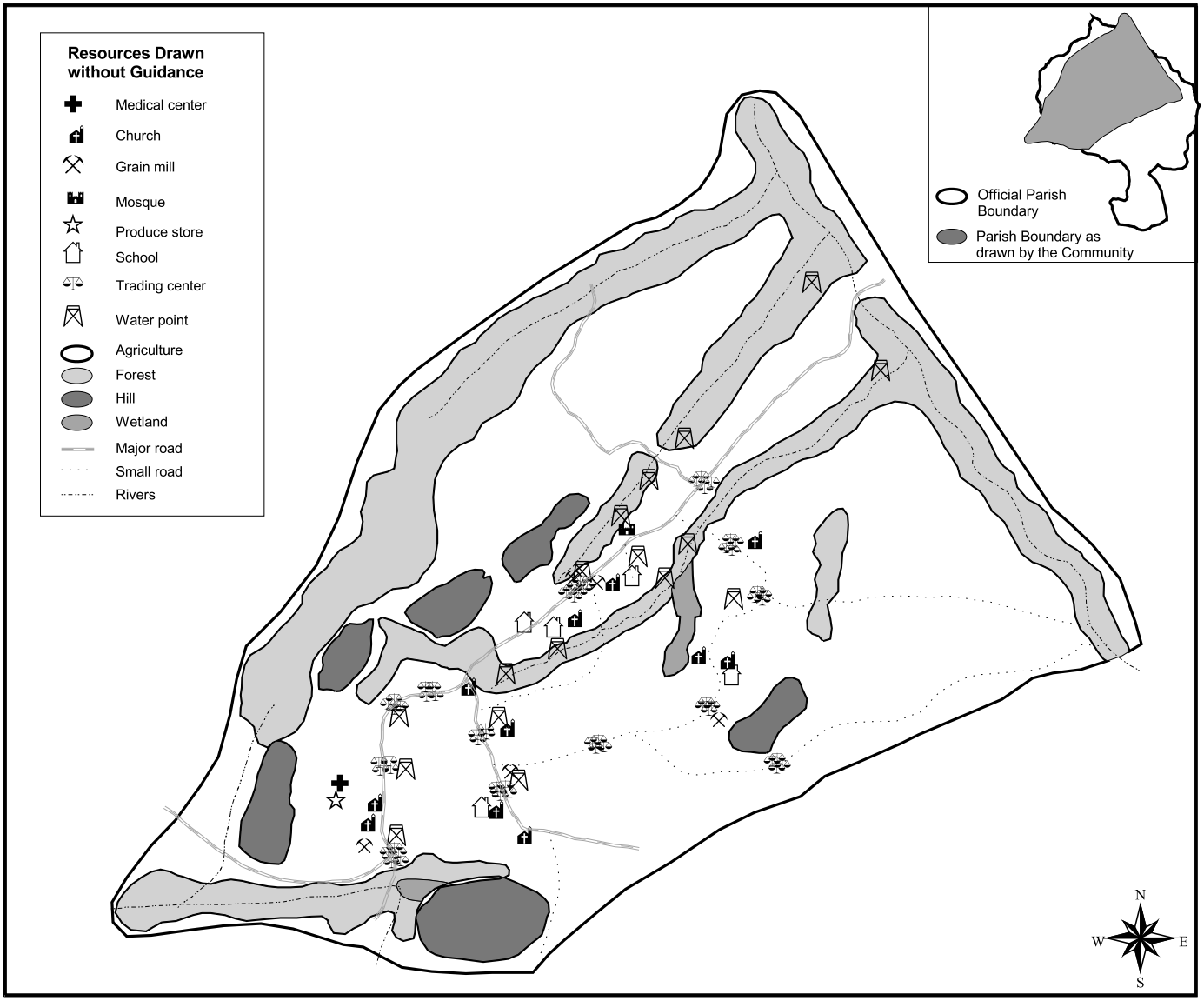
Map 1

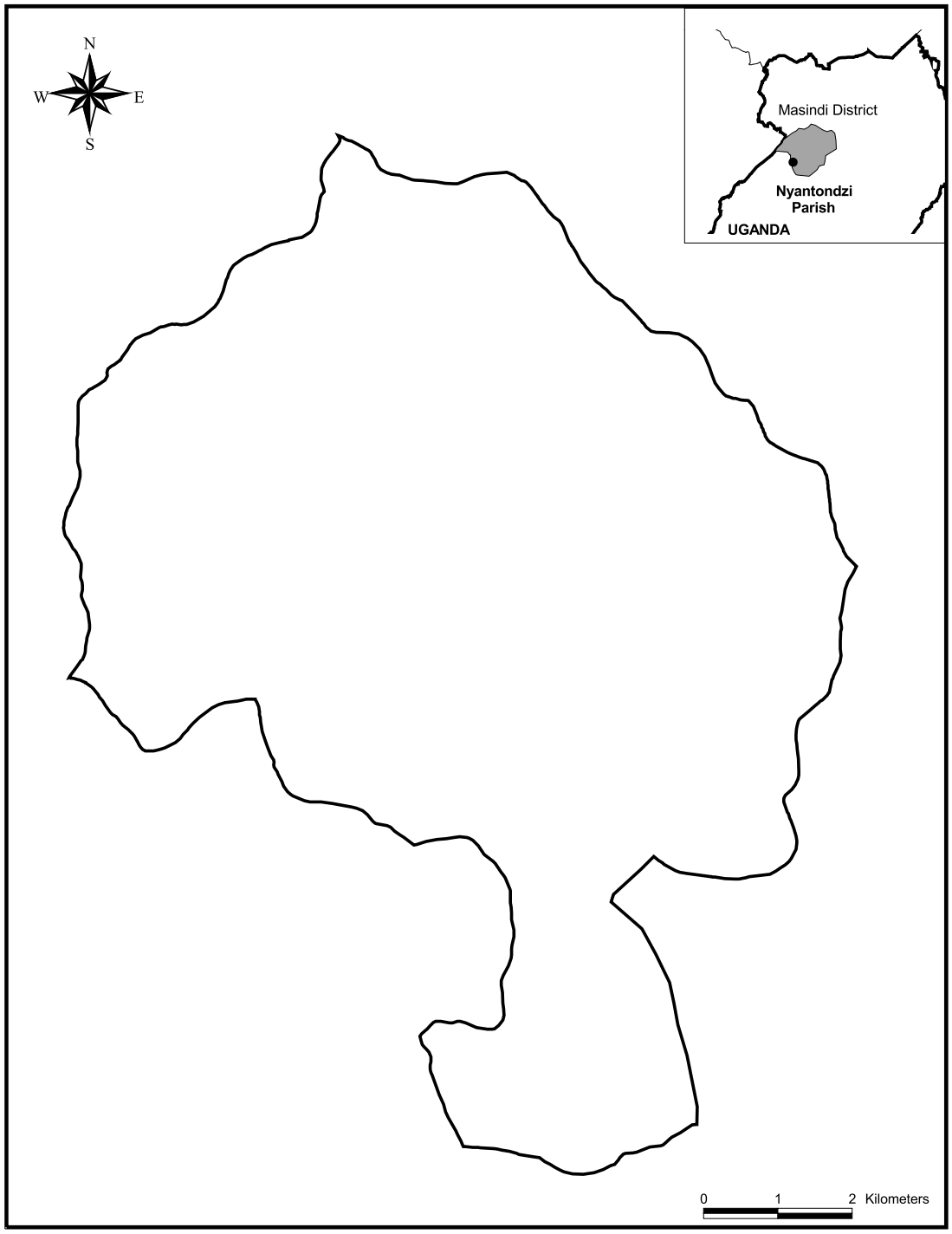
NYANTONZI PARISH RESOURCE MAP, AS DRAWN BY COMMUNITY MEMBERS USING A PRA APPROACH ONLY



Map drawn by participants in Stage 1 of the Nyantonzi Parish community resource mapping exercise, using a PRA approach only. Villagers were given a blank sheet of paper and asked to draw the location of resources in their parish as well as the parish boundary. The inset thumbnail image shows the official parish boundary (in black) as compared with the parish boundary as drawn by community members (in grey).

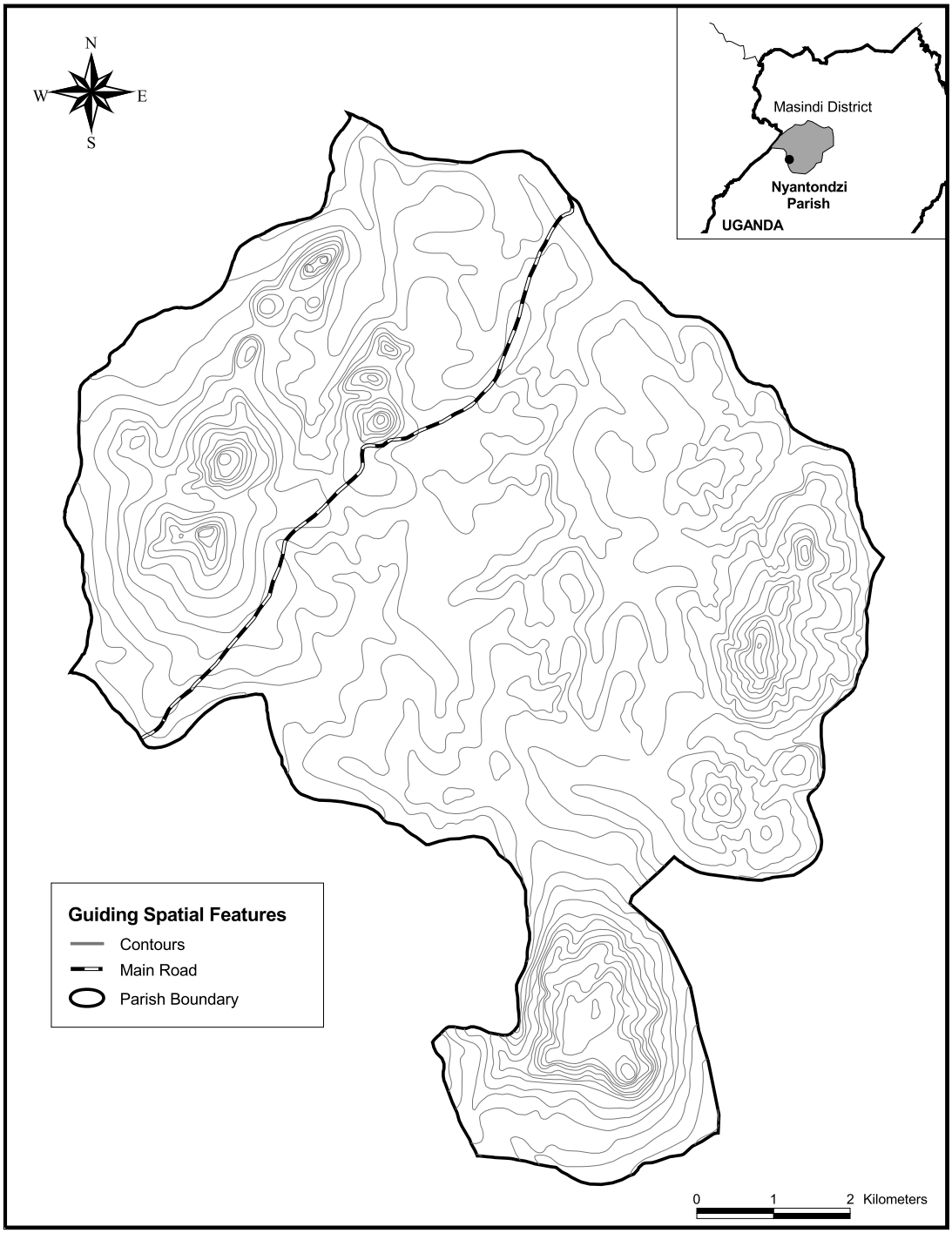
Map 2

NYANTONZI PARISH, OFFICIAL PARISH BOUNDARY MAP



Official boundary map of Nyantonzi Parish, used in Stage 2 of the community resource mapping exercise. Villagers found it difficult to visualize this boundary as the area in which they lived. With no reference points other than compass direction, villagers had trouble accurately identifying the location of community resources, such as rivers, water sources, schools, churches, markets, etc.

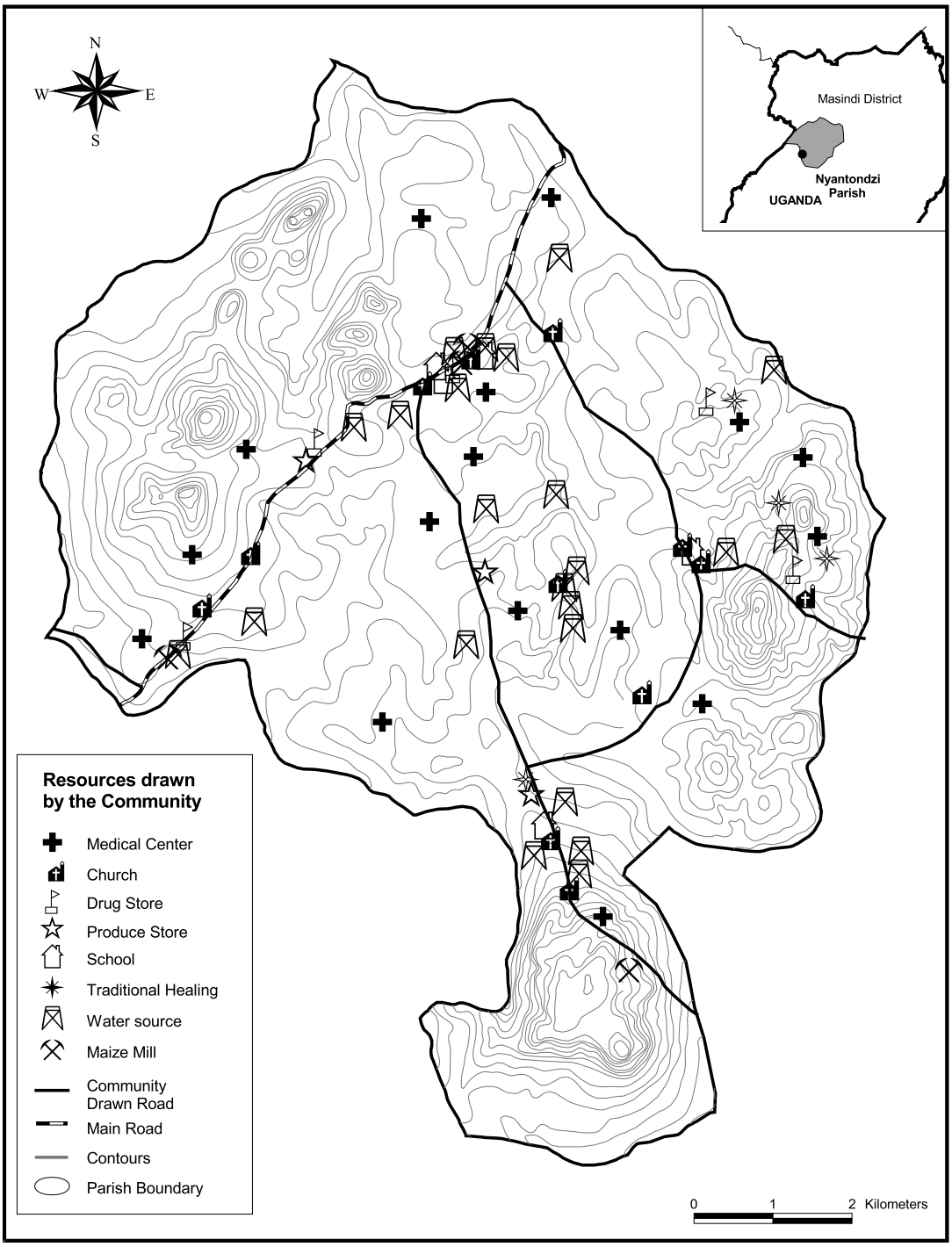
Map 3
NYANTONZI PARISH, BOUNDARY MAP WITH GIS-GENERATED SPATIAL FEATURES *(Contours and Roads)*



Official boundary map of Nyantonzi Parish, including spatial features such as contours and roads, used in Stage 3 of the community resource mapping exercise.

Map 4

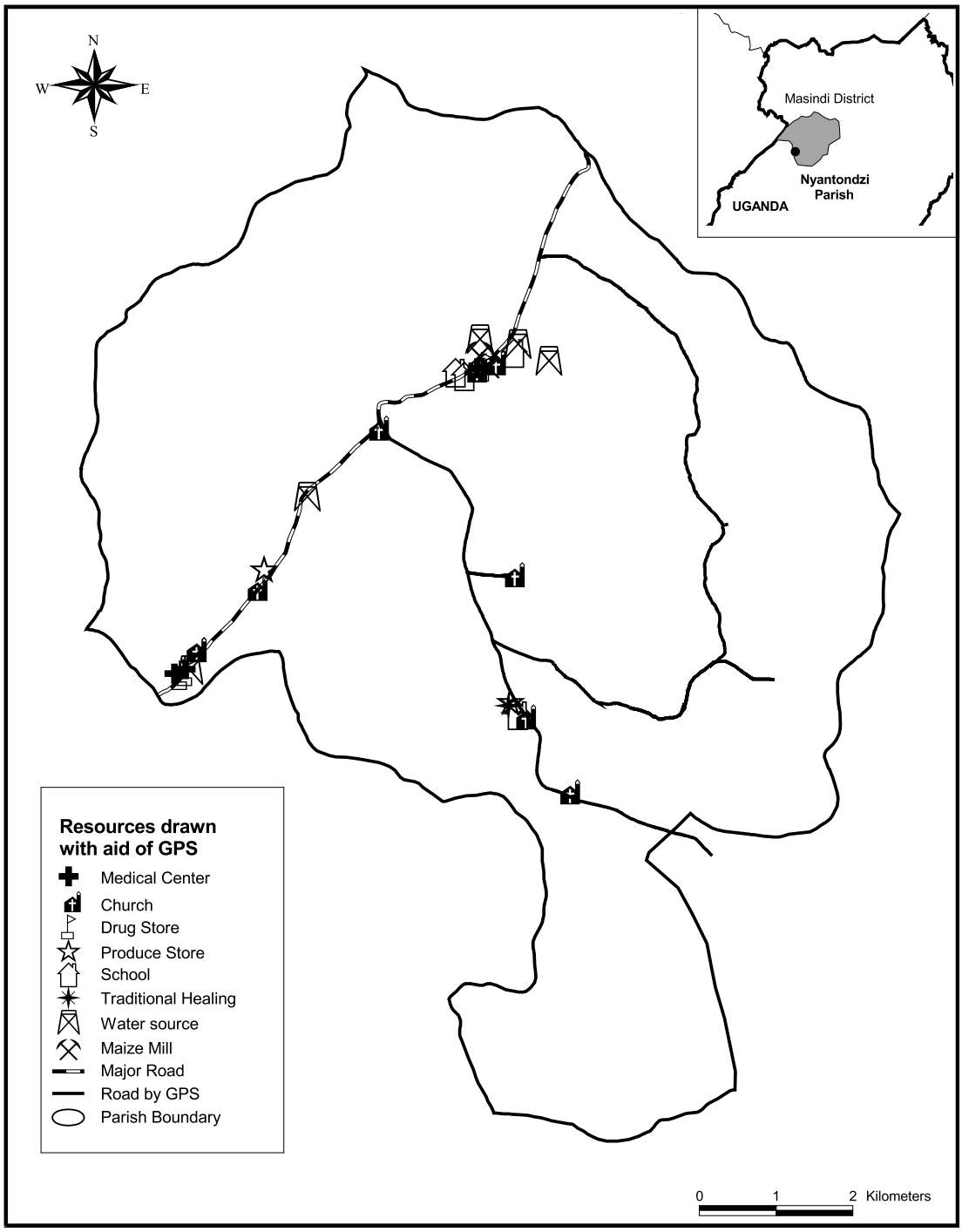
NYANTONZI PARISH RESOURCE MAP, AS DRAWN BY COMMUNITY MEMBERS USING GIS-GENERATED BOUNDARY MAP SHOWING ROADS AND CONTOURS



Map drawn by participants in Stage 3 of the Nyantonzi Parish community resource mapping exercise, using Map 3 as guidance. The depiction of contours and roads in this GIS-generated map helped participants relate the parish boundaries to physical features. Villagers readily located community resources and mapped their locations more accurately than in prior stages of the exercise. They also added resources not mapped at earlier stages of the exercise, including more water sources and locations of traditional healers.

Map 5

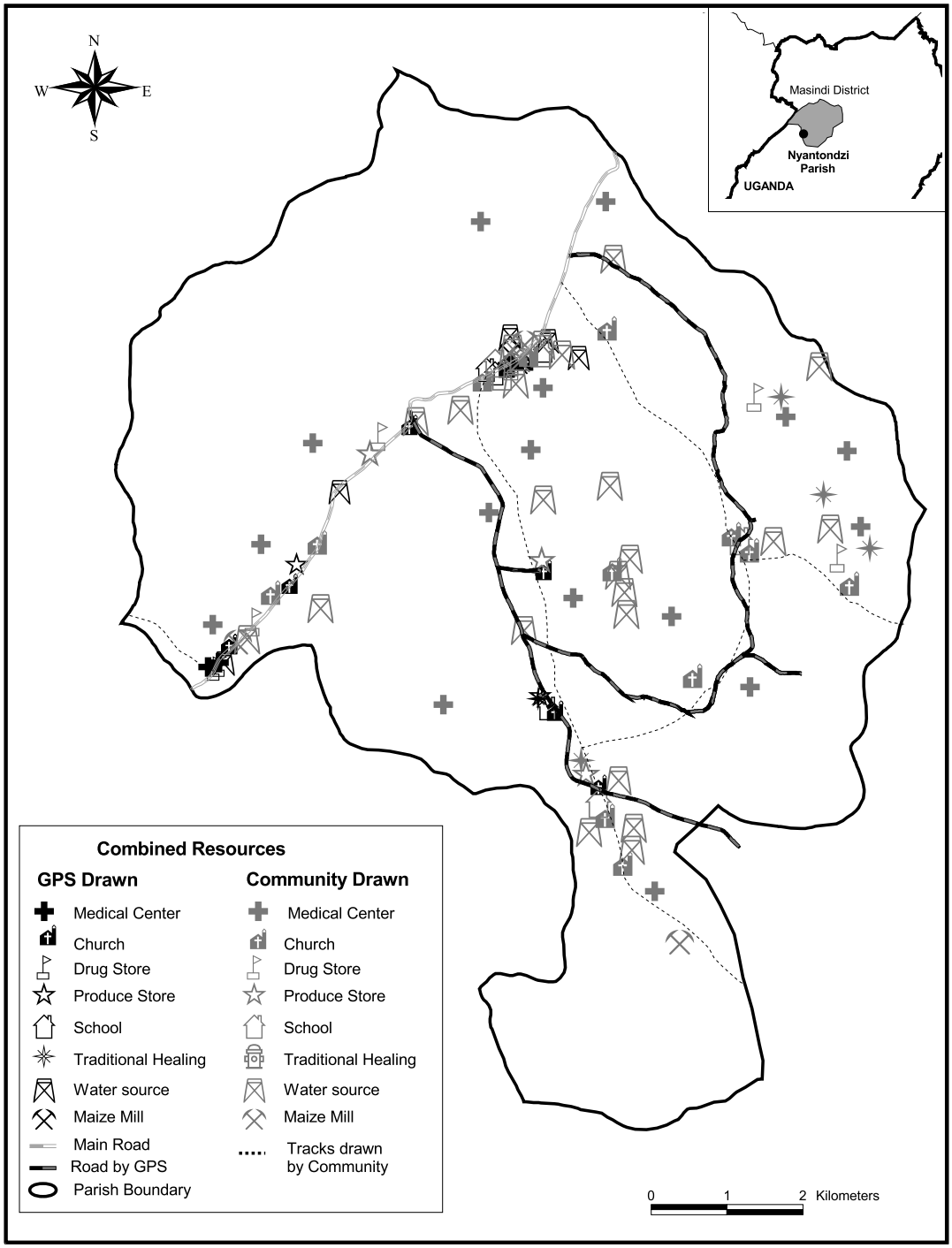
NYANTONZI PARISH, WITH COMMUNITY RESOURCES MAPPED USING GPS (GLOBAL POSITIONING SYSTEM)



Map depicting community resources as located by a GPS (Global Positioning System). This map was prepared in order to assess the spatial accuracy of map features as drawn by villagers. Data on some easily accessed features was downloaded from the GPS unit into a GIS system and mapped. Many features identified by the villagers were not easily accessible, however, and were not mapped.

Map 6

NYANTONZI PARISH, COMPARISON OF COMMUNITY RESOURCES AS MAPPED BY COMMUNITY MEMBERS VERSUS MAPPING BY GPS (GLOBAL POSITIONING SYSTEM)



Map comparing the locations of resources as mapped by community members versus mapping using a GPS (Global Positioning System). The results of this comparison indicate that community members can locate features with satisfactory precision if provided with boundary maps containing adequate landmarks to guide mapping of key community resources.

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