A participatory GIS for community forestry user groups in Nepal
Putting people before the technology

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Gavin Jordan and Bhuban Shrestha

Introduction

There is an increasing interest in the use of Geographic Information Systems (GIS) in a participatory context, with this development either causing alarm or being seen as providing a potentially valuable tool. The key reasons behind this have already been given in issue 33 of *PLA Notes* (Abbot *et al.*, 1998). This article explores some of the benefits and concerns of using GIS as a participatory tool, using a case study to provide real-life context. It is mainly concerned with key issues that have been identified during the work[1].

Background

Community Forestry is one form of 'social' forestry, geared towards the subsistence needs of local communities. Community forestry has more to do with people than trees and this has been reflected in an approach dominated by the social sciences. Participatory techniques have been the primary tool for obtaining community and resource information and participation, empowerment and facilitation of the fundamental objectives of the Forest User Group (FUG) – a village based forest management committee. Increasingly there has been a need for obtaining more quantitative information for forest management purposes. There are a number of reasons for this, such as examining community tenure rights and rights to resources, for conflict resolution purposes, to calculate sustainable yields of forest products and to improve the bargaining position of the FUG when meeting with the Forest Department.

These resource assessment information needs do not replace the need for social information, but extend the range of information that has to be collected, analysed and collated. Much of this information has a spatial component and GIS has been increasingly used for data management and analysis (see Box 1).

A common problem with the use of GIS

District or National level studies often use GIS for mapping socio-economic indicators, commonly called 'indicators of development', although the people targeted for the

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> **Box 1 What is GIS?**
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> A GIS (Geographic Information System) is a tool for enabling mapping and spatial analysis to be performed for a variety of applications, including natural resource management and planning activities. It now refers almost exclusively to computer-based technologies that allow thematic layers of spatial information (such as forest distribution or population densities) to be overlaid, enabling relationships between the layers to be examined. GIS is viewed by some as an exciting development, as it allows spatial relationships for social, economic and natural resource issues, which were previously difficult to incorporate, to be examined. Others feel that GIS's quantitative, systematic, expert-centred and hi-tech approach make it inappropriate for much participatory and developmental work.
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> The key components of a GIS can be divided into a number of discrete technical processes.
> • Data input
> • Data management
> • Data processing
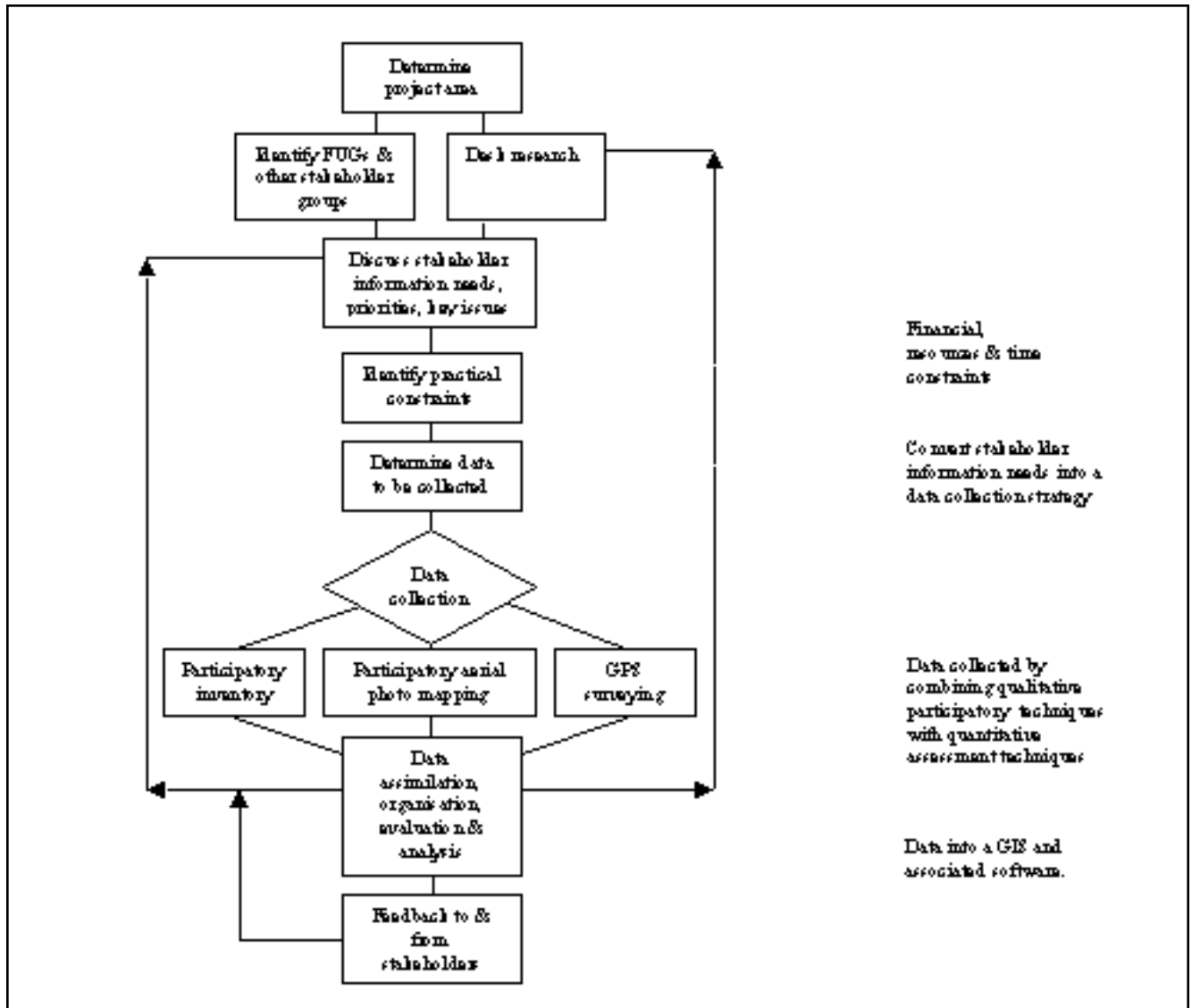> • Analysis and modelling
> • Data output
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> Increasingly, GIS is being viewed as more than just hardware and software and both data and people are now viewed as integral components of the GIS. This has to some extent addressed the concerns regarding GIS outlined above.

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development process are entirely unaware of these indicators. Indicators are used for policy planning to identify both development priorities and geographic regions of activity. Therefore the 'developmental' role of GIS is often one of disempowerment of local people, involving a very low level of participation. It encourages the separation of the planning process from the people affected. There is little or no discussion with the FUGs and other villagers regarding what information would be useful to them and what information a GIS could provide. The GIS information is not *meant* for them. It is for the policy makers, planners and researchers.

The most charitable way of looking at this lack of participation associated with the traditional use of GIS in development work is to view GIS as enabling decision makers to correctly evaluate the required development input. But this is *putting the technology before the*

Figure 1 A systematic methodology for a community forestry participatory GIS

Determine project area

Identify FUGs & other stakeholder groups

Desk research

Discuss stakeholder information needs, priorities, key issues

Identify practical constraints

Determine data to be collected

Data collection

Participatory inventory

Participatory aerial photo mapping

GPS surveying

Data assimilation, organisation, evaluation & analysis

Feedback to & from stakeholders

Financial resources & time constraints

Convert stakeholder information needs into a data collection strategy

Data collected by combining qualitative participatory techniques with quantitative assessment techniques

Data into a GIS and associated software.

people. There is little or no consultative process with communities. Their needs have not been identified and the information gathered does not reflect their requirements. The old top-down development paradigm is being actively encouraged. An observation made nearly a decade ago for developmental work in sub-Saharan Africa still holds true today; most GIS applications are driven by a desire to demonstrate the technological capability rather than a desire for real life problem solving.

From the above, it can be seen that the main problem of using GIS for 'participatory' work is the way that the technology has been used. GIS has not been viewed as a tool in a participatory process, but as a technology in its own right, looking for an application. This illustrates one of the key principles of participatory GIS: to evaluate at an early stage what GIS *adds* to the participatory process.

The study

Participatory GIS in the field of community forest management is still in its infancy and many issues still need identifying and evaluating[2]. Therefore a study was initiated in Nepal, with the aims of assessing the applicability and relevance of a Participatory GIS in this context. Initially, it was felt that a technical evaluation of GIS and the associated means of data collection were the most pressing needs. However, as the study progressed, it became apparent that a more process orientated approach was necessary. The focus shifted towards examining a systematic approach for participatory forest management. This combined the collection of quantitative, objective information and qualitative, subjective information in a way that was beneficial for the FUG.

2 Abbot *et al.*, Participatory GIS: opportunity or oxymoron, pp27-34, *PLA Notes 33*, list some key outstanding questions for participatory GIS.

The methodology employed is outlined in Figure 1. It is interdisciplinary in its approach, combining the use of social science participatory techniques with geomatics technology and participatory assessment procedures. The methodology is at the interface between social approaches to community forestry and more traditional quantitative techniques to resource assessment. This is important owing to the increasingly demanding and diverse information needs for community forestry in Nepal. A greater emphasis has been placed on the means of collecting and disseminating information than the technical design of the GIS database, as it is believed that a Participatory GIS is fundamentally dependent on obtaining community needs, perceptions and ideas.

The above methodological framework was tested with five FUGs from October 1997 to May 1998. Owing to the participatory nature of the work, the exact methodology varied between FUGs, although the approach outlined above was followed. The initial participatory session with the FUG examined their specific requirements. These included:
• maps of the community forest for boundary dispute issues;
• inventory information to assist in planning sustained yield harvesting for commercial purposes;
• the sustained yield of fodder (grass, leaves and shrubs for stall-fed livestock);
• when they could start removing fuelwood; and,
• the general condition of their forest.

The information requirements were usually a combination of basic spatial information and management information; FUGs asked how best to manage their resource. This is where a combination of quantitative and qualitative information is essential. It is impossible to offer useful management advice without understanding the FUGs' requirements and usage patterns. Once the information needs of the FUG were established, the data collection process was developed. This was based around a participatory forest resource assessment. The resource assessment procedure contained one or more of the following elements: a participatory photo mapping session, a participatory inventory (always conducted) and a Global Positioning Systems (GPS)[3] survey of internal and external boundaries. Of these methods, perhaps the least known is participatory photo-mapping. This is similar in philosophy to Participatory Resource Mapping (PRM), but uses a large scale aerial photograph as a participatory tool. This has the participatory advantages of PRM, but greatly increases the spatial accuracy of information obtained.

Once the information was gathered, it was organised using a GIS and other basic software. Descriptive information obtained from the participatory research, such as indigenous management, FUG requirements and problems, was recorded. Inventory information was entered into a database and the spatial information was entered into a GIS (IDRISI, a low cost GIS with minimal hardware requirements). For a given FUG the GIS has:
• a geo-referenced boundary of the community forest, with the area of the forest (something that is in itself often unavailable for community forests);
• internal community designated boundaries;
• associated basic information, such as key species;
• the sustained yield;
• recommended management practices;
• community uses; and,
• the importance of spatial areas of the resource for the community.

For the FUGs, images and management information can be used to form the basis of a visual report/management plan which the FUG committee can use for its forest management. Initial work indicates that FUGs regard the maps as a tool that can help them in their negotiations with the Forestry Department. The FUGs asked to have the inventory information converted into basic management information, which allows them to participate in discussions with the forest ranger and the District Forest Officer (DFO).

This feedback is of critical importance: a Participatory GIS is there for its users, the participants. Some FUGs have been very satisfied with its role, but the evaluation process is not yet complete. It should be noted that although the initial evaluation was based on the ability to produce and organise data for FUG use, this is only one benefit. The participatory work involved in community consultation, obtaining resource information and the feedback meetings gave the FUG a sense of ownership and involvement with the process. This acted as an agent of empowerment, raising community expectations of what the FUG and individuals could achieve. These 'social' processes are felt to be of great importance and should not be ignored by concentrating solely on the technical performance of the Participatory GIS.

Participatory GIS as a process
Whilst a Participatory GIS can produce information that is useful for the FUG, it can be viewed as extractive in nature, rather than achieving the PRA goal of utilising local peoples' analytical capabilities as well as their knowledge base (Chambers, 1994). This may seem academic, but it is important to note that any technology which requires data to be taken away for analysis rather than encouraging people to undertake their own investigations and analysis limits participation to some extent. This ties in with the consideration of whether GIS

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3 GPS involves using a handheld receiver for surveying purposes. The receiver determines its exact position by obtaining positional information from a network of satellites. This allows rapid, accurate and relatively low cost surveying to be performed. The receivers range in price from $150 – 4000.

is appropriate technology for participatory development work, where access to GIS is severely limited. Does the use of GIS encourage an alienation between participants and their information? Does it remove them from much of the decision-making process? If GIS is viewed as software and hardware, this could be a valid interpretation. But it is felt that a Participatory GIS should be a *process*; it starts with the public participation procedure and intrinsically involves feedback to, and from, the FUG. Decision-making should not be made centrally; the Participatory GIS should be a decision support tool for the FUG, providing information they can use for their management decisions. Although the software and decision analysis processes are outside the sphere of access of the FUGs, with associated problems (Harris *et al.*, 1995), it can be argued that the decision making process can be brought back to the FUG. This is a central issue in making a GIS genuinely people orientated.

Representing village level reality
There can be a loss of detail when entering descriptive information obtained by participatory methods into a GIS. Qualitative information is not easily entered into a GIS and the rich social, economic and environmental fabric of resource management at a village level is impossible to replicate. A people-orientated GIS must have a capability for storing some of this descriptive information. This may not just be as textual and diagrammatic information; multimedia offers a variety of interesting ways to represent this more realistically. But it is important to realise that all the information will still not be obtained. What is necessary is to involve local people and incorporate their knowledge and decision making into the Participatory GIS. The task is not to capture and replicate all the village information, but to organise and present pertinent information that was not previously available, using the technological capability of GIS, to assist the FUG in their decision making.

The need for participation
It is felt that a fundamental requirement for the use of Participatory GIS is having the emphasis on participation. This has been mentioned in the introduction, but this work illustrated the importance of this. GIS is a useful tool for enabling the participation and empowerment of FUGs, through providing them with increased information for decision making, but only if it is geared to their needs. The technical performance of the GIS, spatial accuracy and quality of output are all secondary to the need for a participatory approach. This can easily be forgotten, particularly as this is a reversal of the traditional GIS priorities.

Conclusions
The use of GIS enhanced the participatory process in this work. It allowed quantitative and qualitative information to be combined, to provide resource management information that was both relevant to the communities' needs and detailed enough to determine sustainable yields. Whether a participatory GIS is going to benefit the participatory process needs to be examined at an early stage.

GIS has a somewhat justified poor reputation as a tool used in participatory development. A classic use of GIS is to map some arbitrary socio-economic indicator obtained from unreliable census information and use this to plan intervention strategies. But this is due to the misuse of GIS, not the tool itself. All the discussion points converge with the need to view a Participatory GIS as a systems-based process. The focus needs to be on participation. Major advantages and disadvantages of Participatory GIS are given in Table 1 below.

Table 1 Participatory GIS: advantages and disadvantages

Advantages	Disadvantages
If it is viewed as a participatory process, it can empower the FUG by involving them in the decision-making process and raise their expectations of information availability for them	But, if the participatory process is not well constructed, it can distance the FUG from the decision-making process
It can be used to effectively combine quantitative and qualitative approaches to community forestry and rural development in general	There is a potential to encourage the extractive collection of data
Maps, resource management information and other spatial data can be given to an FUG to aid with their decision making and negotiations without the need for them to have access to a GIS	There is an increased potential of the information being misused – if it is held centrally it could be used for unintended cadastral purposes for example
Information can be easily collated, analysed and returned to stakeholders	Can disempower disadvantaged groups, by not involving them in the participatory processes, effectively excluding them from the 'mapping' process
The appropriate level of information can be returned to stakeholders	Requires technology, knowledge of the technology, and encourages a centralised approach

As with any good participatory methodology, the focus has to be on the people, the participants. This has been the key problem with using GIS, as the focus has usually been on the technology. The following five points need to be concentrated on when developing a participatory GIS.

- Evaluate why GIS should be used, and what the use of GIS adds to the participatory process. If there is no defined need for it, don't use it!
- The participatory process (including the collection and dissemination of information) is more important than the 'technical' GIS issues. A good participatory framework and practices are fundamental.
- Concentrate on having the decision-making processes within the community. If information is taken away and put into the GIS, outputs should be used to enable the FUG (or other stakeholders) in *their* decision making.
- Consider who owns the information, how it is going to be stored, who has access, can it be used for purposes the participants may not want?
- Is there the infrastructure and institutional support to obtain participatory information, input it into a GIS, analyse it and return it to the participants in a way they can use it?

Gavin Jordan, Department of Agriculture & Forestry, Newton Rigg College, University of Central Lancashire, Penrith, Carlisle, CA11 1OH, UK. Email: gjordan@newtonrigg.ac.uk, and Bhuban Shrestha, People and Resource Dynamics Project, International Centre for Integrated Mountain Development, Kathmandu, Nepal. Email: bhuban@icimod.org.np

Acknowledgements

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