Using Local Capacity for Improved Land Resources Planning: A Case from Ethiopia

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Key words: local, land resources, planning, support tool, Ethiopia

SUMMARY

Government land resources intervention planning has been weak in many countries because of several reasons, among which are lack of adequate institutional capacity at various levels of government service agencies, and lack of appropriate information to be used for planning. Periodic monitoring of the environmental impact of government interventions, thereby monitoring the status of natural resources is fundamental to generate adequate information for planning and policy-making for their sustainable management. This paper provides an overview of a new framework based on local characterization of land resources problems in defined planning units for supporting a land use, management and conservation planning systems in resource poor environments. It begins with a discussion of existing paradigms in land resources planning and intervention. The new conceptual framework is then outlined with a case study in Alaje *Woreda*, Tigray Region, Northern Ethiopia signifying the steps necessary for effectively implementing the planning tool and possible representation and use of information in the planning process. An application of the tool is demonstrated by producing various outputs made by the local planners and their evaluation. Finally, we present issues relevant to the design of improved land resources planning methodologies and support tools and the challenges facing governments of developing countries. Our conclusion is that a planning support tool that is simple, user-driven, based on existing institutional capacity, and has the commitment of local planners for using the tool in policy design and development interventions is more likely to be successful.

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1. INTRODUCTION

Issues that warrant land use, management and conservation planning and strategy for poor countries like Ethiopia are many of which increase in population, intensification of agricultural land, use of marginal lands, land degradation, encroachment of forest areas are the main ones. Above all though, lack of effective administrative and legislative framework for land use, management and conservation and institutional constraints are the critical ones.

Land management and conservation decisions in Ethiopia are diverse and complex due to the varying agro-climate and agro-economics in the region. Due to this reason, farmers respond to this diversity by developing a large number of different land use strategies. Whereas government organizations use standardized programmes with uniform procedures for planning and implementation (Irwin, 1997). There are no visible land resources planning procedures at local levels of governance and those that are in place are not sufficient to function properly. Local organizations responsible for this do not yet posses the skills and capability to develop such plans and centrally organized sectoral agencies still dominate this 'bottom-up' planning process, one way or another. However, it is accepted that the experience and local knowledge of the land users and local technical staff should be used to mobilize to identify development priorities and to draw up and implement plans.

This being the case, seeking consensus for prioritizing options towards prompt land resources interventions by local government organizations in optimal allocation of scarce resources is a highly challenging problem for decision makers that, perhaps above all, require good information. Land use, management and conservation planning as a process involves the application of a rational system of choices among feasible courses of investment and other development possibilities based on a consideration of economic and social benefits and costs (Olivier *et al*., 2003).

To support planning in developing countries one should thoroughly examine the way how planners perceive, handle, use and communicate land resources information. Therefore, understanding the local planning processes in developing countries by focusing on the use of land resources information and communication aspects in support of strengthening local planning organizations and extension services is of commanding importance. Even in the western societies the scientific progress in building tools to support planning process is perceived impressive (Budic, 2000); there has been little effort to provide practical guidance on strategic information management, to institutionalize information and decision support tools, and the transfer of technology to planning settings.

We argue that capturing the spatial perceptions (on land resources, resource related problems, activities and impacts.) of local planners, through analysis of their task and mapping this perceptions can have a big effect in local planning process in many developing countries. In this paper, we will outline part of our research program to provide such a planning support tool for one rural district in Northern Ethiopia. Even though a broad based understanding in land resources management is useful, the application of the spatial knowledge of local planners for delivering a useful set of results that improves the planning process is equally interesting and important.

2. ADVANCES TO IMPROVED LAND RESOURCES PLANNING

Land use planning can be done in many different ways. Unfortunately, conventional frameworks for planning agriculture and rural development have not been particularly receptive to the capacity, means, and knowledge known to and used by local planners in local government organizations in developing countries.

Participatory Land Use Planning (PLUP) (Rambaldi *et al*. 2003; Ball 2002; Sedogo 2002), Participatory Geographic Information Systems (P-GIS) (McCall 2004, 2003; Dunn *et al*. 2003; Ball 2002; Zurayk *et al*. 2001; Craig *et al*. 2002; Krishna 2002), Participatory Resource Mapping (PRP), and Poverty Mapping (Alderman *et al*. 2001; Mistiaen *et al*., 2002) are some of the attempts to address an improved rural land resources management.

For example, participatory land use planning (PLUP) is the process of developing a land use (or natural resource use) plan with the local community taking the central role. Bringing the local community to take the central role can only be done by eliciting people's own analysis of their own environmental process, poverty and their wellbeing provides a deeper understanding of dimensions of environmental problems. But, experience has shown that effective outcomes are greatly hampered by preparation time by local planning team (including training and stakeholder identification) and follow up time (including dissemination and policy linking) (Marison, 2000; Peter, 1996). In many cases, the techniques are becoming absorbed into the routine administrative process of planning (Porter. *et al*., 1999).

Ball in Moore and Davis (1997) questions “how can the process of communication be modified to allow professionals and laypeople to understand each other and so make best use of the participatory techniques?”, and suggested that “it must be the way in which information is presented, which suggests that other means of presenting the information, that also allow the participant to provide their own information must be explored.”

In an effort to enhance the possibility of institutionalizing GIS-based planning support tools in the planning process in developing countries, many researchers (Dunn *et al*. 2003; Ball 2002; Zurayk *et al*. 2001; Hall *et al*. 1998) have reached to a common argument that there are significantly more problematic issues in the developing countries and involve, problems such as the nature of government, that the planning support tools *per se* cannot be expected to address directly. They all seem to agree that “a GIS should never be used as a ‘quick fix’

strategy; rather its introduction should be slow, with long-term or medium-term training programmes, directed at real needs, and the design should be relevant to local conditions." In order to make progress with respect to the global objective of supporting decision process in areas of important planning need, they recommended, "a first requirement is to have appropriate tools in place."

Participatory GIS (PGIS), in its present form, i.e., a combination of participatory field methods and GIS, may lead to valuable information but too often results in few changes in the livelihoods of the target communities (Zurayk *et al.*, 2001). Many of such 'conventional' PGIS projects in developing countries are perpetuated through various external development organizations because of the economic pressure to bid for work and accept commissions, even when the professional staff is aware that the approach embodied in terms of reference is flawed (Dent, 1993). This is what was evidenced by Zurayk *et al*. (2001) when the said "why, after working for decades on combating poverty, and after thousands of pertinent documents, they have not moved very far." Their conclusion was that "there is a pressing need for a new paradigm", a viable alternatives to the "tried-and-tested-and-failed" procedures in natural resource survey and land use planning (Dent 1993).

In general we can conclude that the methodology development in land resources planning support systems, particularly at local level of government in developing countries is very limited. Even though grassroots farmers' engagement is necessary in the planning process, local government planners should also be equipped with simple techniques to efficiently utilize the knowledge, information, and other available resources in their disposal.

From the literature reviewed one can draw a lesson that there is a need to focus on improved planning support tools, identify and reach key planners and decision-makers, and support them with relevant information backed up by education and training.

The next section outlines a simple framework addressing these issues in case study in Tigray Region, Northern Ethiopia.

3. THE STUDY AREA

The study was conducted in Alaje *Woreda*, located in the Southern Zone of *Tigray* (Figure 1) between 1999 and 2002. It has thirteen *Tabias* (Districts) and 55 *Kushtes* (Villages) and 181 *Mefasseses* (sub-catchments). The total area of the *Woreda* is about 81,692.79 ha. Out of this area, plane land constitutes only less than 3% and the rest 97% is rugged land (Table 1). The altitude ranges from 3840 *m.a.s.l.* at the peak of *Emba-Alaje* Mountain to 1500 *m.a.s.l.* at the alluvial plain.

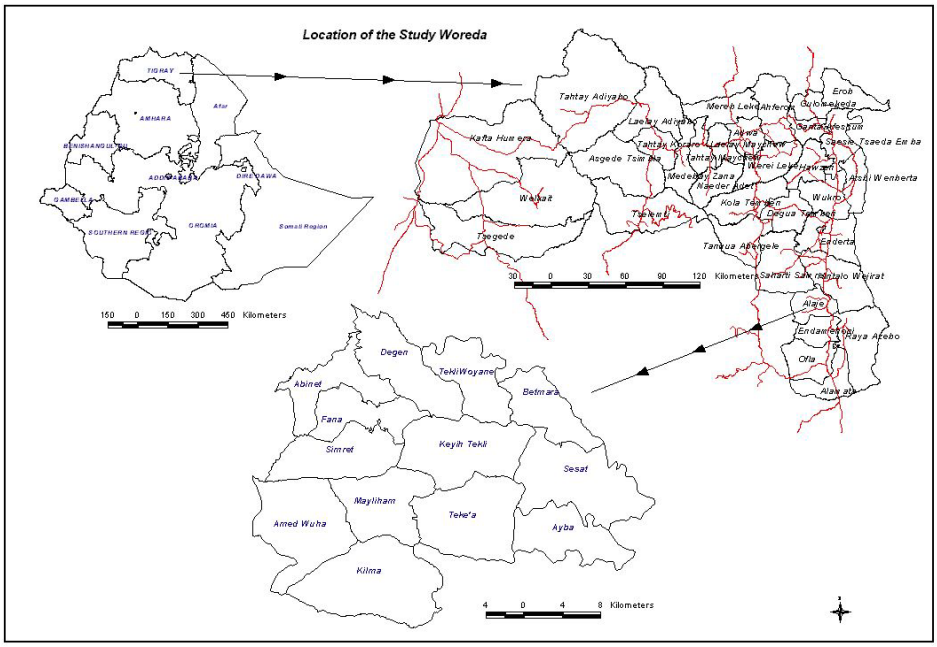


Figure 1. Map of the study area: Ethiopia (upper left), Tigray Region (upper right), Alaje *Woreda* (bottom)

4. THE PLANNING PROCESS

Local level land resources planning in Tigray is the result of two cross-fertilized plans. One is that regional Bureau of Agriculture and Natural Resources[a] develops a comprehensive region-wide plan. And the other is the *Woreda* offices, based on the regional targets, work out detailed plans.

To accommodate the regional requirements, the *Woreda* offices must prepare areas according to priority and capacity to achieve the stated goals provided by the region. Usually, it is based on the recommendations and indicators that the region received from the *Woredas* that the regional plan is compiled.

a) Comprehensive local land resources management plan

Woredas have the authority to prepare and implement comprehensive soil, water, forestry, extension and other management plans. The purpose of these plans is for local governments to mobilize their resources for the management and protection of land resources in the *Woreda*. Through each planning process, local planners are, especially, required to:

- collect data and information on resources problems

[a] See recent development in Desalegn Rahmeto, 2004. in "Searching for tenure security" At present the administration of land has been vested in the Environment Protection and Land Administration and Use Authority (EPLAUA) which has recently been established by law in each Region (*Killil)*. Each Authority is responsible also for environmental protection and natural resource management.

- assess the conditions of land resources in the *Woreda*
- identify and prioritize local resource issues, problems, and opportunities
- develop a set of goals, objectives and actions – based on the regional requirements
- and develop an implementation program for the period of the plan – which is generally every year.

Each sectors annual plan serves as a guide to *Woredas*' actions during the year and to measure performance. Each year, each *Woreda* must submit to the regional bureau and annual plan of work based on past achievements and anticipations.

b) Planners' role in planning

When assigned to the *Woreda* office, planners assume a leadership role in protection, conservation, and development of the *Woredas*' land resources: soil, water, forest, and other agricultural resources. Their primary responsibility is to set priorities and strategies that direct the programs of the *Woreda*.

Planners are usually involved in all aspects of plan development and implementation. They determine their purpose in their community; they prioritize resource problems the *Woreda* should address and their relative importance. They have also the responsibility to see that all resource concerns of the *Woreda* are brought forth, discussed with the community, and decided upon with regard to the extent of involvement and types of programs the *Woreda* will pursue in addressing them. Once these decisions have been made, planners should ensure that the actions outlined in their plan are undertaken. They also monitor the progress being made in reaching their stated objectives and make appropriate adjustments as necessary.

Planners also have the responsibility in assembling and analyzing of data and the presentation of this data in formats prepared by the regional bureau. However, the textual and tabular format of data greatly obscured the wealth of information and knowledge the planners gained and accumulated in their daily experiences.

5. A FRAMEWORK FOR SUPPORTING LOCAL LEVEL LAND RESOURCES PLANNING USING SPATIAL PERCEPTION

Spatial information in the form of maps, are no longer traditional overviews of landscapes but images created to project the views and perspectives of their creators. With the advent of spatial information science, several underprivileged groups in society have been provided with the opportunity to redefine themselves and their territories with maps (Mark, *et al*. 1991).

Mapping of spatial perceptions of planners' about land resources its representation communicate information and expand new knowledge effectively. This study uses mapping as a framework for plan unit determination, land resources, their problems, government interventions, and change perceptions with outputs tied to and easily accessible by local planners. For the sake of simplicity it is abbreviated as PURPAC (Planning Unit, Resource,

Problem, Activity and Change) framework. It is a framework primarily designed to support the land resources planning of local governments and offers opportunities for resource and problem identification, appraisal of alternatives and options of interventions and monitoring of impacts of interventions.

Conceptually, the schema hinges in four main pillars of land resources planning: the land resource itself, its problems, actions and activities on the resource, and development of the resource. The framework encompasses therefore five main processes (Figure 2.), which are translated into a mapping activity based on spatial perceptions of local planners. The Figure also indicates how the technique can be used within the FAO guideline.

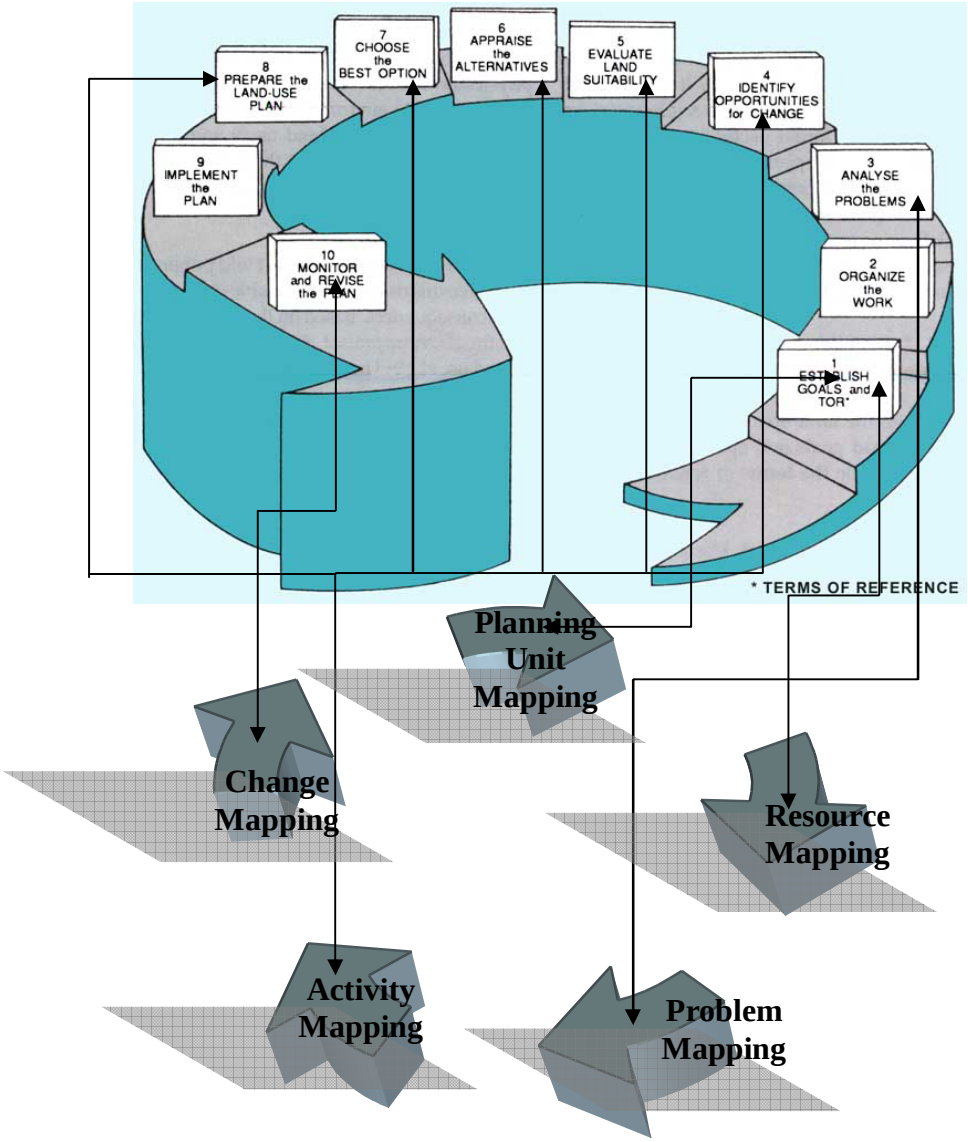


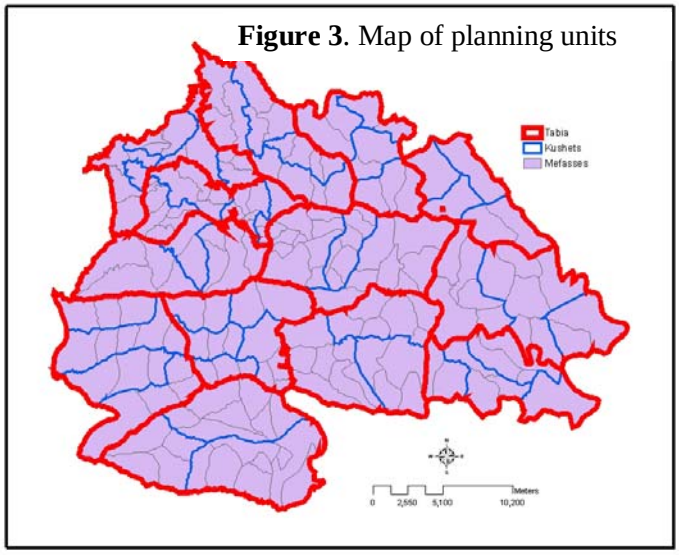
Figure 2. The mapping tool within FAO LUP framework

6. DATA ACQUISITION: THE MAPPING PROCESS

6.1 Mapping prime planning units

In the period 1999 and 2002 two mapping activities were implemented. A topographic map, scale 1:50,000, was used as a baseline map for the delineation of the boundaries of the planning units and varies themes of the *Woreda (*district*)*. The first activity before the identification of the major resources and problems was to finalize the demarcation of the prime planning units: 181 *Mefasse*s, 51 *Kushet*s (villages) and 13 *Tabia*s (sub-district). By their physical definition, *Mefasses* are (figure 3) small micro watersheds where a group of farm households shares the resources (cultivable land, area closures, small grazing areas, commercial plantations, and waste land) within it. The delineation of *Mefasse*s also enables an aggregation procedure to form *Kushet*s and *Tabia*s that forms the base for the database for this study.

Figure 3. Map of planning units



The planners, which are specialist and non-specialist users, use these classification levels as baseline for interventions. They depicted the units as a decision tree, showing a typical arrangement of the decision units in the districts' natural resource management exercises. *Mefasses* is the smallest planning unit referred by the *Woreda* planning experts, which is used mainly as a target area for mobilization based government interventions. The visual communication using maps of *Mefasses* was found essential for speedy recognition of map units by the planners whereby immediate textual description or a mental image of the map unit can be retained.

Lots of experience and knowledge of the area by development supervisors and extension agents enables the delineation process of the planning units faster and simpler. Most of the planners knew such demarcation activities being carried out by regional or national levels experts in which their role was to guide the experts, not to do it themselves. Participatory training approach and learning by doing techniques were used to get the planners familiar with the delineation of boundaries on the topographic maps. Topographic maps, pencils, and white papers are the only things used for this process. Land marks such as churches, streams, mountain peaks were very essential information on the topographic maps to orient the planners to the demarcation processes. Reproduction of the maps was done in the GIS facility at Mekelle University.

6.2 Mapping resources and problems

When the delineation of *Mefasse*s was completed, participatory methods were used to acquire planners' perceptions of the land resources within the planning units. The perceptions were captured as a result of group discussions, as the process was more similar to meeting proceedings, which is the common way of planning at *Tabia* level. The summary of the perceptions and their content is indicated in Table 1 and the figures below.

Table 1.Perception variables and categories used

Resource Perceptions	Perception values
(i) Soil types (ii) Soil depth	According to local perceptions, soils are classified according either to their type (*Walka, Baekel, Hutsa, Sheshiher*) or depth[1] (*Reguid, Maekelay, Rekik*). Perceptions were based on the proportion of the total area of the *Mefasses.* Three level proportions were recorded (larger, medium, and smaller proportion of the total area). Perceptions mainly involve proportions (majority, dominant, mainly, some extent, etc. Kind of expressions).
(iii) Agro climatology	It is very customary to distinguish places by their climatic characteristics, particularly in relation to their agricultural significance. At all hierarchies, i.e. starting from the *Mefasses* up to the *Tabia* level, climatic characteristics can be expressed into four classes: — *Degua* meaning highland — *Woyna Degua* meaning medium highland — *Derek Woyna Degua* meaning dry medium highland — *Kola* meaning lowland
(iv) Land cover	Cultivated land: is land in farms that is devoted to crop production (Barely, wheat, teff, beans, and sorghum are the major crops grown in the *Woreda.* Mixed cropping is commonly practiced in order to minimize risk) Closed hill sides (area closures): These areas are either been left to re-vegetate naturally or have been planted with a variety of tree species to enrich the existing cover and administered through a local by-law or regulation (*Serit*). Commercial plantations: These areas are managed by a local NGO called the 'Relief Society of Tigray' (REST). Grazing land: embraces two contrasting categories of use: pasture (enclosed and/or what is called improved grassland or '*Hizaeti*', often used for intensive livestock feeding), and range or '*Mewcha*' (often unenclosed or unimproved grazing land with sparser grass cover and utilized for more extensive production). Wasteland
(v) crops grown	The common crops grown in the area are barley, wheat, *Teff*, sorghum, beans and peas.

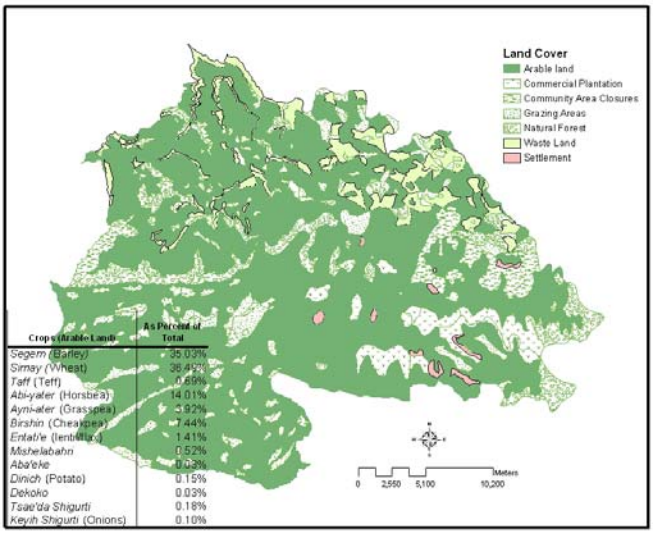


Figure 4. Major land cover/use of the in the study area

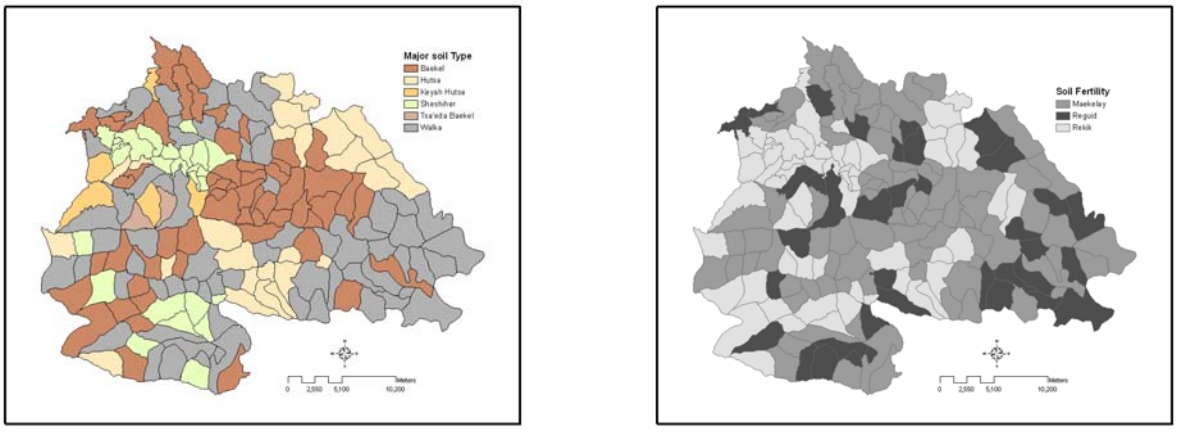


Figure 5. Major indigenous local classification (left) soil types (right) soils depth

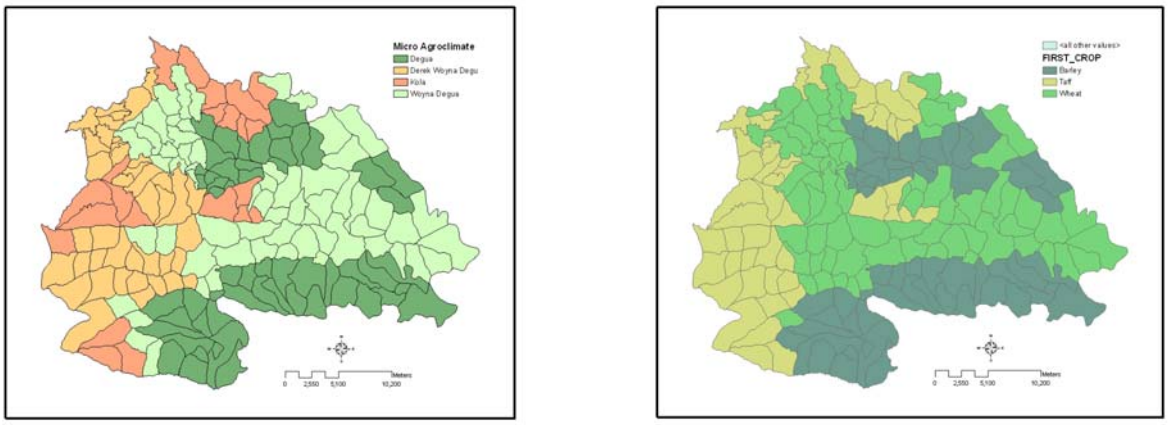


Figure 6. Agro-climate (left) and crops grown (right)

6.3 Land Resources problems of the *Woreda*: Problem mapping

There are three levels of problem identification and measure perceptions, as indicated in table 2.

Table 2. Levels and measures of perceptions

Level		Problem measure perception
Tabia (Sub *Woreda*)	Higher level	Priority
Kushet (Village)	Intermediate	Attention
Mefasses (Hamlet)	Lower	Severity

At *Mefasses* level within each *Kushet*, planners identify the severity levels of problems. And within each *Tabia*, *Kushets* are ordered according deserving attention. This enables the planning team to prioritize activities within *Kushets* within the planning year. And finally the planners prioritize the *Tabias* for specific programs. This is in fact the result of a rigorous participatory planning practice already in place. The results of these sequences of operations are mapped for fourteen land resources related problems as indicated in Table 3 (An example of severity map for erosion is in figure 7.)

Table 3. Problems perceived important to be addressed.

Perceptions	Perception values
Environmental problems (i) Soil erosion (ii) Shortage of cultivable land (iii) Shortage of grazing land (iv) Moisture deficiency (v) Flood sedimentation of cropped land (vi) Steepness of cultivable land (vii) Stoniness of cultivable land (viii) Land slide (ix) Weeds (x) Pests and diseases (xi) Water logging in cropped lands (xii) Fuel wood shortage (xiii) Potable water shortage (xiv) Threat of large mammal pests	The perceptions for all these variables are ordinal indicating the severity of the problems when referring to *Mefasseses*. There were five ordinal scales used: — Very severe — Severe — Moderately severe — Less severe — Not a problem at all At *Kushet* level were perceived as attention levels as: — High attention — Attention — Moderate attention — Less attention And at *Woreda* level, *Tabia*s were put according to priority areas.

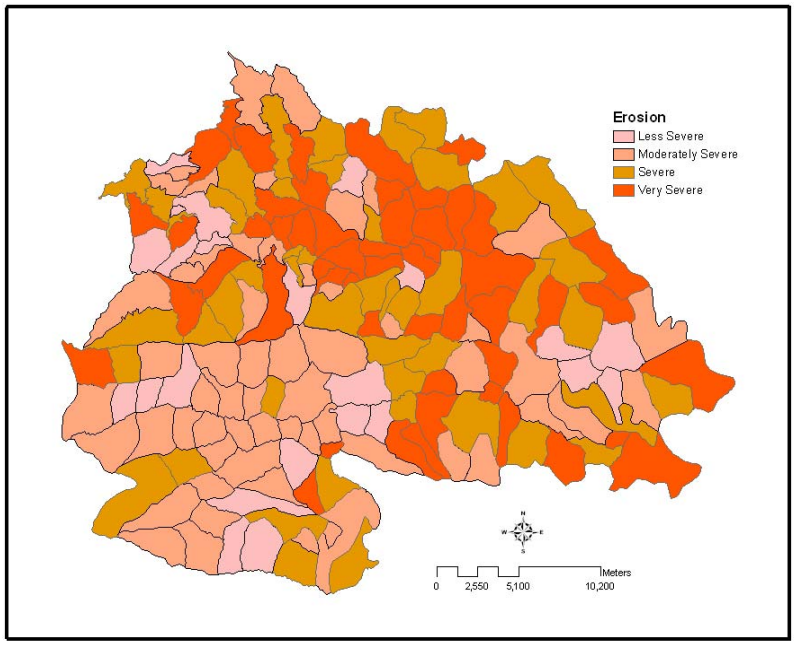


Figure 7. Erosion severity map area

6.4 Government interventions: activity mapping

As has been outlined in previous sections, many of the activities in land resources interventions use community approaches ensuring participation in all stages of planning, design, and implementation and monitoring of conservation activities. Particular emphasis being given to identifying the causes and symptoms of problems and analysis, ways and means of addressing solutions, and sharing of activities and responsibilities (See box 1).

Development interventions (Table 4) in Tigray range from community mobilization based to policy interventions. Community mobilization based interventions are the most common, sometimes with success stories, and often with lack of continuity and consistency. Interventions on agronomic practices, soil and water conservation, and community infrastructure development are among the most common activities. Some of the current activities practiced by local government agencies in Tigray are indicated table 2. An example of a map showing focus areas for soil and water conservation activities is in figure 8.

Table 4. Major NRM related activities of local government development agencies

No.	Type of activity	Local Name	Unit of work	Type of intervention
1.	Hillside terrace	*Kujetawi Zala*	Kms	**mobilization**
2.	Rural road construction	*Serahti Mengedi Geter*	"	**mobilization**
3.	Stone Bund	*Zala Emni*	"	**extension**
4.	Soil Bund	*Zala Hamed*	"	**extension**
5.	Trench	*Metrbeawi Zala*	"	**extension**
6.	Check dam	*Ketri Guhmi*	Numbers	**extension**
7.	Micro-dams	*Firki Werhi*	Numbers	**extension**
8.	Small dams	*Horoyu*	Numbers	**extension**
9.	Percolation tank	*Percolation Tank*	Numbers	**extension**
10.	Hole preparation for tree planting	*Gudguad Miquat*	"	**projects**
11.	Tree Planting	*Felsi Mitkal*	"	**extension**
12.	Planting on terraces	*Ab Zala Mitkal*	"	**mobilization**
13.	Compost preparation	*Compost Midelaw*	Numbers	**extension**
14.	_	*Alay Metreb*	Kms/Numbers	**extension**
15.	Terrace reinforcement	*Zala Tsigena*	Kms	**extension**
16.	Check dam reinforcement	*Reisi Guhmi Tsigena*	Numbers	**mobilization**
17.	Check dam construction	*Dendes Guhmi Mistikikal*	Numbers	**Extension, projects**
18.	Gully side plantation	*Ab Gemgem Guhmi Mitkal*	Kms/Hectare	**extension, projects**
19.	Moisture conservation	*May Meilay (Teli Meikab)*	-	**extension**
20.	Tree seedlings preparation	*Felsi Miflas*	Numbers	**extension**
21.	Area closure	*Mereit Miklal*	Hectares	**extension, projects**
22.	Seed preparation	*Zere'I Me'iray*	Numbers	**Extension**

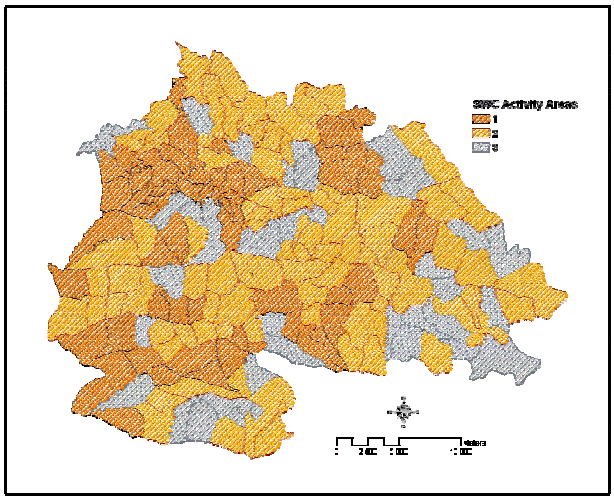


Figure 8. SWC activity areas as put by planners

BOX 1. A typical scenario of activity planning.

Activity planning for Erosion control measures
Problem: Soil Erosion
Causes (derived through participatory appraisal approaches and based on research products): = less protective cover to land + heavy rain + steepness of the land + non-restrictive grazing + harmful farming practices + no incentive for production and protection (neglect) + lack of communal harmony + etc.
Solutions by whom: = individual actions + collective actions + government actions + non-government actions
Individual actions: = terraces + trenches + farming systems + agricultural inputs + tree planting + agro-forestry + small micro dams, water holes and percolation tanks + etc.
Collective actions: = mobilizing resources for non-compensated community work like hillsides terraces, trenches + check dam construction and reinforcement + tree planting and closing of areas+ micro dams + etc.
Government actions through projects and programs: = conservation incentives (degradation disincentives) + production incentives + market + input and credit provision + provision of improved technologies + rules and regulations + management of collective actions + investment on some physical structures like irrigation cannels + micro dams + extension advice and demonstration
Non-government actions through projects and programs: = conservation incentives (like food for work activities) + production incentives + market + input and credit provision + provision of improved technologies + management of collective actions + investment on some physical structures like irrigation cannels + micro dams + extension advice.

6.5 Supporting evaluation: change mapping

Measuring the effects of local interventions in a specific planning unit and developing measures of change indicating the development is essential in assessing the impacts of local planning institutions. Simple and customary ways of explaining developments and changes, as conceived and perceived by local planners in light of the development strategies of the region is necessary but may not be sufficient. Change and/or development map is considered as a difference in perception of problems in different planning steps as depicted in figure 5. In addition to existing socio-economic and bio-physical indicators of development impact, spatial perception by local planners of the impacts of interventions could also be used. This mapping of spatial perception of development could be used as a good source of information for existing monitoring and evaluation exercises as well as subsequent planning activities. This will help to monitor and evaluate local governments' activities in a meaningful spatial context.

In assessing the impacts of soil and water activities sponsored by the local government, the planners depicted their perceptions as where positive impacts have been achieved, or not as indicated in figure 9.

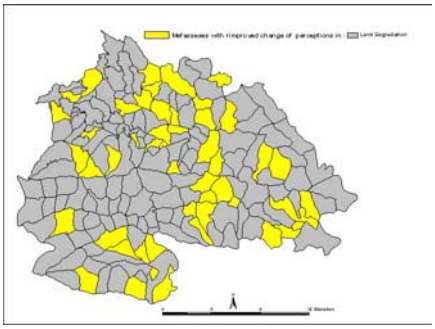
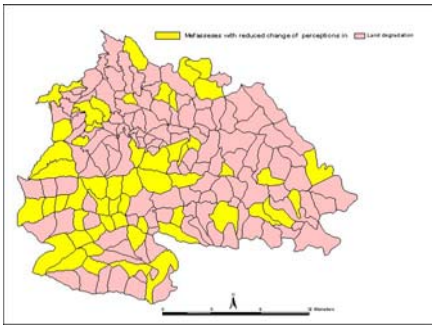
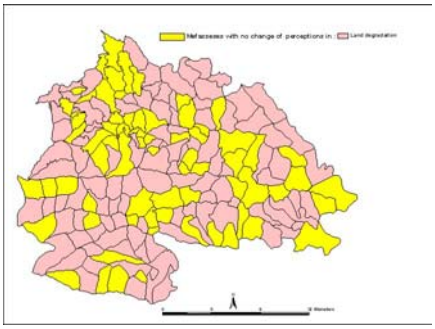
Positive Change	Negative Change	No Change
a. Land degradation		
		

Figure 9. Perception in changes in land degradation

7. RESULTS AND DISCUSSION

Different factors and mechanisms drive changes in environmental stress /problems perceptions by local planners. In many cases intuitive experience appear to be a major determinant of the change in perception. Moreover, the definition of environmental problems changes over time. It could be said that the change mirrors a learning process, whereby the most prominent problems take high level perception and probably solved first.

Change mapping using perceptions of local planners is found to be very essential at least as guide to monitoring development intervention impacts. It is not highly data demanding which makes it easy to be applied as easy way of monitoring tool. In its real sense, monitoring refers to repeated measurements over time that permits changes to be assessed in a particular resource or its problem.

Monitoring impacts of development intervention through assessment of the level of environmental stress perception is the heart of a program aimed at tracking resource conditions and evaluating the threats to environmental resources. No matter how much is known from a one time impact of a development intervention, monitoring over time is needed to evaluate trends. A short-term study identifies a threat and its impact, but monitoring data showing a change in resource condition over time provide a clearer demonstration of the impacts. The amount of essential information to be collected with limited funding is frustrating for planners at local level, but relatively inexpensive step introduced like in this research can be used to initiate a program.

As part of a widespread capacity building effort involving institutional and customary custodians of natural resources, PURPAC method is proved to facilitate easy learning and collaboration, self actualization, awareness enhancing, and is key to other information and knowledge. If properly administered, it can support collaborative natural resource management initiatives and transcend the local contexts by establishing a peer-to-peer dialogue among local planners and central institutions, agencies and projects.

8. CONCLUSIONS AND RECOMMENDATIONS

In this study, we have experienced some relevant issues, and most likely would be challenges, relating to the principles land resources planning which countries like Ethiopia need to address for the successful intervention and development programs.

Government agencies, at all levels, are among the forefront in data collection for their being. Data are required for several reasons among which are for planning and provision of public goods and development policies. As government agencies have to manage large data sets with continuous updating, some kind of data infrastructure is then required to facilitate its use. Though automation seems to enter into most administrative data processing in developing countries, automation in environmental planning seems to be trapped by many constraints (Pieter *et.al*. 1992). Mainly, there are two aspects of this problem. The first is the pure existence of policy or intervention relevant data, and second is the accessibility and usability of existing data.

It is essential therefore to organize the system of data collection in such a way that can be operational with the limited resources available at local levels. Still, as has been indicated in this study, using the existing data collection infrastructure provides an opportunity to this end. Since local planners who have been involved in the day-to-day development interventions in a given planning area could easily be trained in collecting and collating data easily understood for land resources planning.

For processing and making more robust programs of interventions, it may be necessary to have processing capacity, which entails strengthening the existing structures. In the case of Ethiopia as seen recently, the encouraging move towards human capacity building at local levels could be a step forward in solving this issue.

This paper has presented a conceptual framework that is intended to help enhance the local level environmental planning in developing countries. One of the main points of the paper is that effectiveness of planning by using the locally defined definitions and interpretations of land resources and their problems can enhance intervention by local governments. A relatively new tool for achieving this is the PURPAC approach: planning unit, resource, problem, activity, and changing mapping procedure demonstrated by the case study in Ethiopia. Such a practical planning approach could significantly narrow the gap between generation and use of data to effect changes in program interventions and communication. Moreover, opens a window as to questioning the role and accountability of local government planners.

One of the important conclusions of this research is that given the difficulty of acquiring and using quantitative and scientific data in the processes of development planning at local level in developing countries, the critical issues in designing targeted programs and interventions is the appropriate employment of local knowledge and experiences. Linking this local knowledge to formal representations, as presented in this study, enables local planners to enter

into a demystified world of external knowledge of which they may until then only have had the vaguest impressions.

Experience in this research reveals that human capital and financial limitations of institutions at local levels of development planning will remain a major constraint on the use of improved techniques of land resources planning for the foreseeable future. These limitations operate on both the decision-making bodies (local councils) and the planners at various local government institutions (government executive agencies). Before such planning support tools can be effective tools, a process is needed to make essential investments in institutional capability throughout local governments in developing countries.

REFERENCES

Alderman, Harold, Miriam Babita, Gabriel Demombynes, Nthabiseng Makhatha and Berk Ozler 2001. "How Low Can You Go? Combining Census and Survey Data for Mapping Poverty in South Africa" Journal of African Economies, Volume 11, Issue No. 3.

Berhane Hailu, 1995. An overview of agricultural development in Tigray. Paper presented at SSE workshop. Mekelle 1995.

Budic, Zorica D. 2000. Geographic Information Science Implications for Urban and Regional Planning. URISA Journal. pp. 81 – 93.

Craig William J., Daniel Weiner, Trevor M. Harris. 2002. Community Participation and Geographic Information Systems. Taylor & Francis 2002. 370pp.

Dent D. L., Dalal Clayton D. B., Ridgeway R. B. 1994. The future of the Land lies in the capability of its people and their institution. In 'The Future of Land: Mobilizing and Integrating Knowledge for Land Use Options'. Editors: L.O. Fresco, L. Stroosnijder, J. Bouma and H. van Keulen. John Wiley & Sons Ltd. pp. 81-86.

Dunn, C.E., Atkins, P.J., Townsend, J.G., 1997. GIS for development: a contradiction in terms? Area Vol. 29, No. 2, 151-159.

Irwin B.C. 1997. Impact assessment of afforestation policy and activity on participating communities in Tigray. Northern Ethiopia. A dissertation submitted to the University of Wales, Department of Forestry. UK.

Kyem Peter. 1996. Linking Participatory approaches in Institutional Environments. Photogrammetric Engineering and Remote Sensing, 58:1209-1212.

Krishna B., 2002. Community GIS or Community vs. GIS? GIS@Development, September 2002.

Mark D.M., and Frank A.U. 1991. Language, cognitive science, and geographic information systems. NCGIA.

Mistiaen, Johan A., Berk Ozler, Tiaray Razafimanantena and Jean Razafindravonona 2002. "Putting Welfare on the Map in Madagascar" the World Bank, Africa Region Working Paper Series No. 34.

Olivier Dubois, Barry Dalal-Clayton and David Dent, 2003. Rural Planning in Developing Countries - Supporting Natural Resource Management and Sustainable Livelihoods. Earthscan 2003. CPL Scientific Publishing Services Limited. 240 p.

Porter D. and Onyach-Olaa M., 1999. Inclusive planning and allocation of rural services. Development in Practice, Volume 9, Numbers 1 & 2, February 1999. pp. 56-66.

Rambaldi Giacomo and Antonio C. Manila. 2003. Innovative Tools for Mastering Space in Collaborative Natural Resource Management. Paper presented at the 3rd IUCN-World Commission on Protected Areas (WCPA) Southeast Asia Regional Forum April 1-5, 2003, EDSA Shangri-La, Mandaluyong City, Metro Manila, Philippines

Sedogo, Laurent G. 2002. Integration of Participatory Local and Regional Planning for Resources Management using Remote Sensing and GIS. Wageningen: Wageningen University, PhD Thesis. Enschede: ITC Dissertation No. 92. (170p.)

Zurayk, R., F. El-Awar, S. Hamadeh, S. Talhouk, C. Sayegh, A. Chehab and K. al Shab. 2001. Using indigenous knowledge in land use investigations: a participatory study in a semi-arid mountainous region of Lebanon. Agriculture, Ecosystems and Environment 86(3): 247-262.

BIOGRAPHICAL NOTES

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