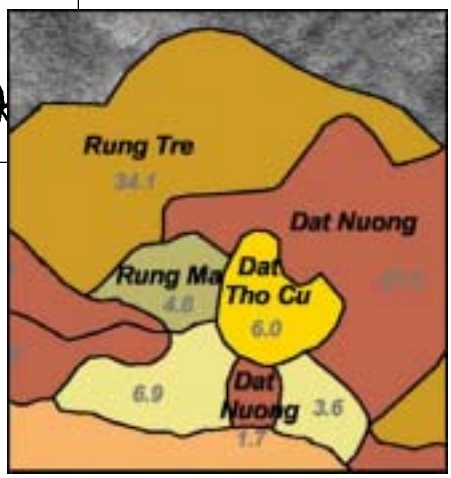
METHODOLOGY FOR PARTICIPATORY VILLAGE MAPPING USING PHOTOMAPS



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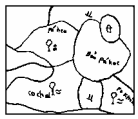
TRAINER GUIDE

first draft, 22/04/2002 Son La



INTRODUCTION

What are photomaps?

Photomaps are printouts of geo-referenced aerial photographs placed in a map coordinate system. Plotted and orthorectified photomaps are the most accurate and economical remote sensing data for mapping purposes with large scale maps. Photomaps are easy to use and a non-literate tool to effectively engage farmers in discussions on natural resource use, planning and management.

What is participatory mapping?

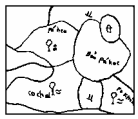
Conventional approaches to obtain land use maps are usually conducted by outsiders who interpret remotely sensed images without profound knowledge of local resource conditions. Limited field experience possibly results in inaccurate delineation and misinterpretation of land use classes.

The objective of participatory mapping is to enable villagers to carry out the interpretation of aspects of their land resources, which are of significant importance to them. In this process villagers delineate their land use on transparencies laid over a geo-referenced aerial photograph, which will later be scanned, geo-referenced and digitised. Involving local stakeholders with their extensive field experience is expected to improve the accuracy and precision of obtained data.

Why participatory mapping?

Photomaps are an effective participatory communication tool on village level to:

- **visualize resource use** to facilitate discussions without communication barriers and to motivate participants to reflect and discuss about land issues.;
- allow a **rapid identification of social, economic, and environmental problems** of the village by determining and debating issues related to natural resource use with active participation of the community;
- create a **common understanding** among local land users and administrative bodies on spatial distribution and status of resources and resource use;
- provide a tool for **joint and demand-driven decision-making** between different villages and between villages and state entities;
- acquire **accurate spatial data** on large scale on the basis of local knowledge;
- provide options for **participatory impact monitoring** for rural development investments from government and other donors;
- settle prevailing **boundary conflicts**;
- elaborate accurately scaled information that could be **officially approved** for management purposes.



PROCESS

Participatory photomapping is a process, which can be used to generate a series of outputs to be transferred into a Geographic Information System (GIS). Derived information permits for various ways of processing, analyses, and presentations and can be easily updated according to the specific objective. The process of conducting participatory photomapping contains the following steps:

1. Preparatory work
2. Field work
3. Data processing
4. Feedback to and from stakeholder

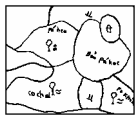
Each step is described in the following sections.

I. Preparatory work

- Collection of secondary information on natural resources and socio-economic data
- Village selection according to identified objectives
- Selection of participants, which should represent the whole village population in terms of gender, age and social status. Group size may range from six to 15 persons
- Aerial photomap print-out, preferably in A0; scales depending on the desired level of detail and on local conditions, typically at 1:5,000. The name of the village and the scale of the map has to be added to the print-out. It is important to include the houses of users whenever possible, because this helps users to interpret photomaps and also gives them confidence that they are part of the community land to be discussed
- Transparency to place on top of the photomap print-out. The outer boundaries of photomap coordinate system have to be transferred to the transparency for consistent future data processing
- Stationary: double clips (to temporarily fix the transparency securely on top of the aerial photomap), permanent and white board marker in different colours
- GPS receiver (if available) can complement data collection and allows instant verifications of mapping results in the field as well as additional transect walks
- 3D village print-out (A4 or bigger) might support the understanding of terrain features like valleys and slopes and summits of hills

II. Village meeting

The village meeting can be scheduled from two to three hours according to the motivation and specific interests of local participants. Participants should be clearly informed in advance about the topic to be discussed and the place and date of the meeting. The meeting point should be on an even surface with good overview of



surrounding land resources. The facilitator has to ensure that all users have equal opportunities to participate in discussions and express their real expectations.

A short introduction should provide (i) sufficient information about the approach of participatory mapping, (ii) a brief explanation of the techniques of aerial photography, (iii) the year and month of origin of the aerial photograph used and (vi) ensure enough opportunities to clarify remaining questions.

Whenever possible the facilitator should allow users to direct their own discussions. At the beginning participants should be provided sufficient time to get familiar with the photomaps. Orientation could be facilitated through the identification of the present location and the recognition of easily identifiable landmarks such as rivers, roads and residential areas. Mapping activities could start with important classes like paddy fields and ghost forests and with land types close to the village and on relatively flat terrain.

Forest users are generally very skilled at interpreting photomaps and facilitators should be patient and allow users to conduct their own interpretation;

Users like to position photomaps in relation to a clearly visible landmark (like a road, a river, the edge of the forest). If such landmarks are difficult to find it is sometimes helpful if the facilitator correctly positions the photomap with the aid of a compass;

Often boundaries need to be re-adjusted during discussion. Therefore, villagers are supported with white-board markers, which can easily be wiped off in case of non-satisfying delineation. After common agreement is reached correct polygons can be fixed with permanent, waterproof markers.

Land use classifications are marked with agreed symbols and local names are used to identify localities such as hills and rivers.

As the boundary map is part of a legal agreement it is important that the positions of boundaries are marked carefully and with agreement from all participants.

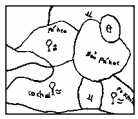
Note: The facilitator should spend more time listening than talking

III. Data processing

To process village information with GIS software for future use in planning and management, four steps have to be accomplished.

1. *Preparation of transparency:*

After field work, data can be inputted into a GIS program. Therefore, the geo-referencing information is needed to rectify the village land use map to the coordinate system of the utilized reference map. The transparency should show the coordinates of this map projection and map datum to make later referencing possible. One option is to add small crosses (drawn with a thin permanent pen) on the transparency at the intersection of the gridlines from the photomap. These crosses will be used to align the scanned transparency to other reference information.



Further preparatory steps include the cleaning of the polygons on the transparency by removing breaks in the lines and erasing mistakes and unnecessary drawings. Polygons could also be closed on the outer boundary of the photomap to ease later digitising.

2. Scanning

The transparencies have to be scanned in separate tiles as input to GIS software. The number of tiles depend on the size of the scanner. With an A4 scanner it would result in approximately 15 tiles to be referenced.

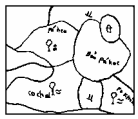
The transparencies can be scanned in black and white with an output resolution of 150 PPI, because scanning quality is not of major importance since only the outline of the polygons are needed from the transparencies. Black and white scans decrease file size and therefore reduce subsequent processing time. To store the scans filenames should be used, which can be associated with their position on the transparency. We suggest to give sequential numbers to the scans indicating the position on the transparency. The scan in the upper left corner could be named “11”, the next one to the right “12”, and so on. The second row of scans would then start with number “21” for the left tile in the second row. In addition, the scans for different villages should be placed in separate directories on the computer to avoid later confusion.

3. Data input into GIS

This manual illustrates data input for the example of ArcView GIS software with Image Analysis extension. In ArcView, the scans have to be added as ‘Image Analysis Data Source’. Then the ‘Align Tool’ can be used to rectify the image to the coordinate system of the reference map. Exact coordinates are known for the small crosses, which were drawn on the transparency at the intersections of the map grid. The crosses can be entered as control points with the ‘enter coordinates tool’. That procedure has to be repeated for at least four points in the corners of the scan. If coordinates are properly entered a root mean square error can be displayed, which should be below one. The rectified and saved image can then be added as ‘Image Data Source’. All rectified scans added together should reflect the whole village map as it was drawn on the transparency.

4. Digitizing of land use polygons

The fastest way for the relatively small village maps is straightforward on-screen digitizing of the land use polygons. Every polygon of the resulting shapefile need to have an identity code (ID) for the land use class and one identity code for the local names. Before additional data processing the shapefile has to be clipped with the boundaries of the photomaps and cleaned from gaps and overlays. When editing work is finished, land use statistics for the respective villages can be calculated and various layouts of the land use maps prepared.



IV. Feedback to and from stakeholder

After the data processing is finalised a print-out of the developed map is brought back to the village and further details are verified or re-adjusted if necessary until a final agreement has been reached among all parties involved.

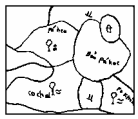
The final mapping information has to be presented in a way that meets the local capacities and demand. Information to be provided on the map should be the year of the aerial photograph, the identified land boundaries, land use classifications and local names.

One copy of the developed map remains in the village to be used as a decision-making tool for villagers during their further village meetings.

GENERAL REMARKS ON PARTICIPATORY PHOTOMAPPING

Strengths and Weaknesses

Strengths	***Weaknesses***
Easy to understand	Missing topography on 2D photomaps and distorted land use polygons on 3D photomaps
Information can be easily processed, assembled, analyzed and returned to stakeholders	Limited capacity for data input and processing at district and even higher levels
Greater spatial accuracy than presently used land use maps on large scale	When using old photomaps villagers may tend to follow old plot boundaries
Greater clarity and reduced likelihood of arising boundary conflicts	Availability of up-to-date photomaps limited at present
Increased acceptance of results	
Possibility for digital storing enables low-cost re-prints of plots and of generated information	
Enhanced possibilities for information sharing	
Improved planning potential	



Necessary inputs

Cost estimation/village

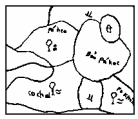
Item	**VND**
1 A0 plot of photomap	100,000
1 A0 transparency	30,000
Stationary	50,000
Total	*180,000*

Time needed/village

Item	**hours**
Preparation of layout for print-outs	2
Field work	2 * 4 (two facilitators)
Preparation of transparency and scans	2
Geo-referencing and on-screen delineation of land use	2
Preparation of statistics and layout for feedback	2
Total	*16*

Conclusion

Participatory mapping based on photomaps derived from aerial photographs is a precise, cost-effective and participatory tool for land use planning, resource assessment, impact monitoring and conflict resolution. Participants in mapping exercises typically show high level of participation and engagement, most likely due to the authentic nature of the data. Preparation, implementation, and processing can be done in less than two days per village by two persons. Results are more spatially accurate at the mapping scale (< 1:10,000) than all other reviewed land use information. In addition, data input into a GIS program enables post-processing, permits enhanced cadastral activities, better land use statistics and computer-based monitoring of land use changes.



ANNEXES

Figure 1: Aerial photomap of Pa Hoc village, Chieng Hac commune with landuse boundaries, land use classification and local names added by villagers

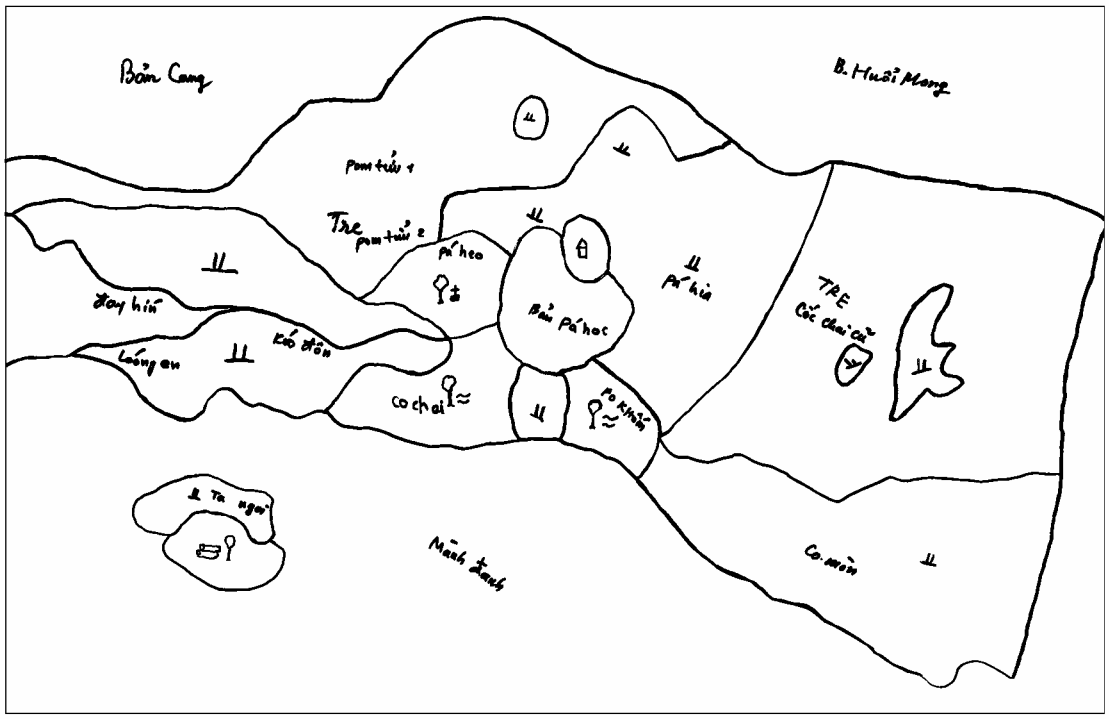


Figure 2: Extracted transparency after village meeting in Pa Hoc village as basis for further data processing and digitalising of land use map database

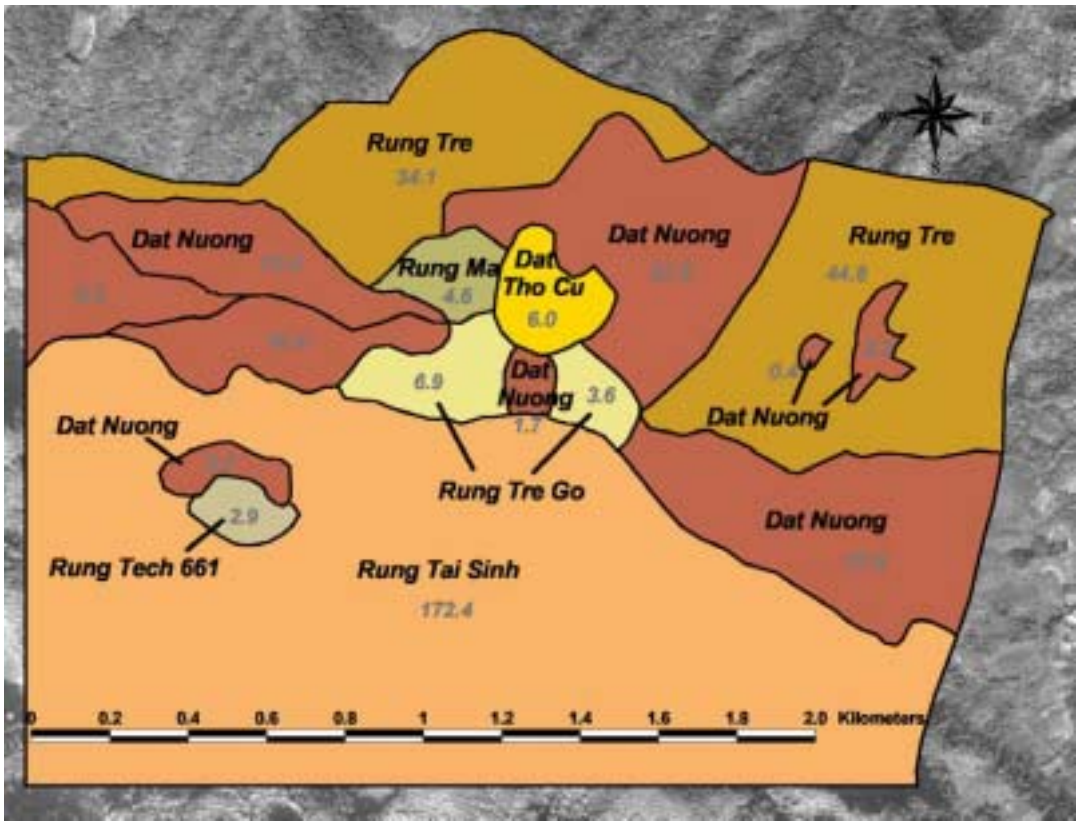


Figure 3: Finalised land use map of Pa Hoc village