

HANDBOOK

PARTICIPATORY LAND USE PLANNING

TOOLBOX



HANDBOOK

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FOREWORD

At the end of 2009, a manual for Participatory Land Use Planning (PLUP) was published by the Ministry of Agriculture and Forestry (MAF) and the National Land Management Authority (NLMA) to provide a common basis for PLUP implementation in Lao PDR. This manual determined the important principles of PLUP implementation, especially in relation to community participation in the process. A diagnostic study conducted a few months later in a project implementing PLUP along the new guidelines showed that on-the-ground PLUP implementation was still problematic as some tools and methods had not been detailed in the PLUP Manual. The purpose of this PLUP Handbook is to provide practical tools and methods for PLUP implementation based on experiments conducted by the National Agriculture and Forestry Research Institute (NAFRI) together with relevant district line agencies (District Land Management Authority (DLMA) and the District Agriculture and Forestry Offices (DAFO) with the support of the Centre for International Forestry Research (CIFOR) and the Institute of Research for Development (IRD) in six villages of Viengkham District in 2010, and in eight more villages in 2011 in partnership with the European Union (EU)-funded Agrisud Project. In 2011, PLUP has been implemented in all 25 target villages of the Agrisud Project in conjunction with food security and agricultural extension activities.



Lessons drawn from this experience have been gradually incorporated into the tools and procedures described in this Handbook. Throughout this Handbook the village of Houay Thong is used as an example to ensure consistency. A complementary toolbox has been developed as a reference guide for district staff implementing PLUP in the villages. Most of the reference documents have been adapted from the annexes provided in the PLUP Manual.

This Handbook is a reflection of the work in progress and should therefore not be considered as a reference document applicable to elsewhere in Lao PDR. We hope the lessons learnt can be shared with other PLUP implementation projects so as to consolidate the different experiences and to develop a coherent approach for PLUP implementation at the national level together with detailed guidelines for implementers at the local level.

ACKNOWLEDGEMENTS

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and implementation by a team of district staff from the District Land Management Authorities (DLMA) and the District Agriculture and Forestry Office (DAFO).

The methods and tools presented in this Handbook have been designed and tested by Jean-Christophe Castella, Jeremy Bourgoin, Lionel Cottet, Maëlle Drouillat, Khamla Nanthavong, Sangthong Phatsalin, Guillaume Lestrelin, Bounthanom Bouahom and Manithaithip Thepphavanh, who are also the authors of the document. The ideas expressed in this Handbook are those of the authors and the participating agencies should not be held responsible for its content. The authors thank all villagers, consultants and staff from government agencies who were involved in the field activities.

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PARTICIPATORY LAND USE PLANNING
HANDBOOK

INTRODUCTION

PLUP IN A SINGLE WEEK A LEARNING PROCESS

The project began as an action research design exercise on land use planning, involving researchers from NAFRI and international research agencies in a diagnostic study on both the previous LUP/LA and the new PLUP implementation following the procedures described in the PLUP Manual (MAF-NLMA, 2009). Initially, many implementers were needed to conduct the lengthy PLUP process at the kumban level. This was then gradually rationalized so that the whole process could be implemented within a single week by a district team of just five DAFO and DLMA staff members.

The table on the right shows how two teams, each of 2 or 3 people, share their time between the successive activities of the PLUP process. Full details of this are given in this document and in the toolbox.

Before PLUP can be implemented in a village, some preparatory work is necessary. The equipment and the budget needed are described in PLUP Toolbox 1. The village area should be estimated from a rapid village survey, or from existing maps showing the village points or the estimated village polygons. The contour lines corresponding to the village area are then extracted from a digital

topographic map and printed on a piece of A0 plastic paper to be used as the blueprint for building the three-dimensional (3D) model. A recent ALOS satellite image is also prepared in digital format to generate the current land use map projected once on the 3D model.

Village authorities are informed about PLUP implementation well in advance to ensure that the introductory village meeting is well attended. On Day 1, the target villagers invite representatives of the neighbouring villages to participate in the delineation of the target village boundaries that takes place on Day 4.



MORE INFO

PLUP Toolbox 1:

Equipment and budget for PLUP implementation in Viengkham.

MORNING

TEAM	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
1	WHOLE VILLAGE MEETING INTRODUCTION TO PLUP	BUILDING THE 3D MODEL	VILLAGE BOUNDARY DELINEATION	GPS POINTS	ZONING ON 3D MODEL	VLM AGREEMENT	TRAINING THE VLMC HOW TO REPORT TO VILLAGERS
2		SOCIO-ECONOMIC DATA COLLECTION	PLUP FICTION	ZONING ON 3D MODEL		MAP PAINTING ON WOODEN BOARD	INSTALLING THE WOODEN BOARD
						LAYOUT MONOGRAPH	

AFTERNOON

TEAM	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
1	VILLAGE HISTORY	BUILDING 3D MODEL	GPS POINTS	CURRENT LAND USE MAP ON 3D MODEL	DRAFTING VILLAGE AGREEMENT: VLM RULES AND PLOT DESCRIPTION	DOCUMENT PREPARATION: MONOGRAPH AND VILLAGE AGREEMENT	FINAL VILLAGE MEETING
2	POPULATION GROWTH PROBLEM CENSUS	SOCIO-ECONOMIC DATA COLLECTION AND ANALYSIS	PLUP FICTION		VILLAGE ACTION PLAN	MAP PAINTING ON WOODEN BOARD	

1. VILLAGE MEETING

1.1 OPENING BY REPRESENTATIVES OF THE DISTRICT AUTHORITIES

Representatives of the district, i.e. Governor, Head of DAFO and/or District Land Management Authority (DLMA), open the meeting to formalise the process with the villagers.

1.2 INTRODUCTION OF THE PLUP PROCESS

After the introduction of the team members, each step of the PLUP process is explained and illustrated with posters (in Lao language).

1.3 SELECTION OF MEMBERS OF THE VILLAGE LAND MANAGEMENT COMMITTEE

Twelve villagers are selected with the approval of the whole village to be members of the Village Land and Forest Management Committee (VLMC). These villagers take part in all the activities organized for the next few days. The rationale for the selection of 12 VLMC members is that this number allows for the inclusion of villagers with different of social backgrounds and responsibilities without making the negotiation and deliberation processes with larger numbers too difficult or slow. Special attention is paid to the gender balance, ethnic groups, age groups and social status in the VLMC membership. Enough time should be allowed for the village negotiation leading to the selection of committee members as this committee will have a very important role during and after the land use planning process.



IN A NUTSHELL

The field work starts with a meeting in which the village population are given an introduction to information on the land zoning process to be conducted in their village.



PARTICIPATORY LUP

AIM: Land zoning and management plan to create a sustainable territorial balance between socio-economic development and environmental preservation, through:

- Improvements in local participation
- Development of plans and socio-economic networks at the kumban level
- Allocation of community use zone (communal land titling)



Drawings are from the NAFRI Uplands Source Book 2005: Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

VILLAGE BOUNDARY DELINEATION



Delineation on the 3D model of the kumban

Field survey preparation

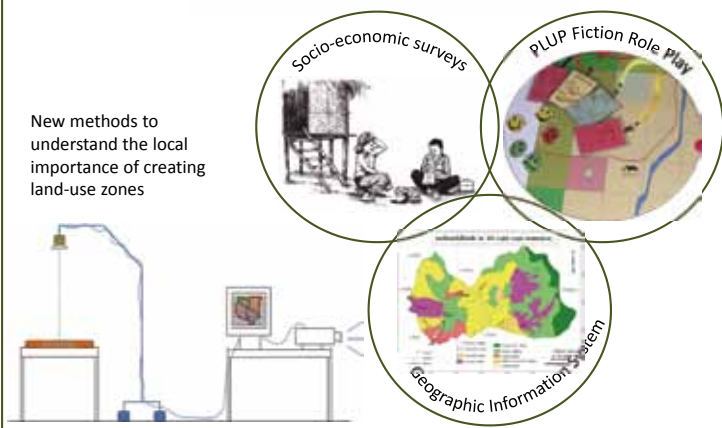


GPS field measurements



LAND-USE ZONING MANAGEMENT PLAN

New methods to understand the local importance of creating land-use zones



WEEK SCHEDULE

- DAY 1:** Village meeting / focus group discussions / socio-economic survey
- DAY 2:** Socio-economic survey & analysis / 3D model building
- DAY 3:** Village boundary / Role play
- DAY 4:** Ground survey (GPS) / Land zoning
- DAY 5:** Land zoning / village action plan
- DAY 6:** Final agreement and map painting
- DAY 7:** Village meeting (closing ceremony)



2. SOCIO-ECONOMIC DATA COLLECTION

2.1 VILLAGE HOUSEHOLD CENSUS

Basic data on all households in the village are collected. A few key questions are asked so that all the households can be easily surveyed within the first two days of the PLUP process. If necessary, the unit heads can be surveyed to collect information about any missing households. For each household, data collected and their use during the PLUP process are summarized in the following table. At the end of the process all data are summarized in a village monograph.

TABLE 1 : SOCIO-ECONOMIC DATA COLLECTED IN THE VILLAGE HOUSEHOLD SURVEY AND THEIR USE

TOPICS	USE
WEALTH RANKING	DATA USED TO CHECK THE COMPOSITION AND REPRESENTATIVENESS OF THE VILLAGE LAND MANAGEMENT COMMITTEE
POSITION IN THE VILLAGE	
ETHNICITY	
HOUSEHOLD COMPOSITION (NUMBER OF MEMBERS, WOMEN, CHILDREN, ETC.)	CLASSIFICATION INTO 4 HOUSEHOLD TYPES DEPENDING ON MAIN ACTIVITY: SHIFTING CULTIVATION, LIVESTOCK, PLANTATIONS OR OFF-FARM.
NUMBER OF LABOUR FORCES (FULL TIME AND TEMPORARY)	
LAND OWNED (NO OF PLOTS, AREAS AND LOCATION)	PARAMETERS USED FOR LAND ZONING IN PLUP – ESTIMATION OF LAND USE MAP REALISM, FEASIBILITY PLAN
LIVESTOCK OWNED	
NTFP COLLECTION	
OFF-FARM ACTIVITIES	ASSESSMENT OF CAUSE OF RICE SHORTAGE: POOR PRODUCTIVITY IN A SUBSISTENCE FARMING SYSTEM OF MARKET ORIENTED STRATEGY
ASSETS OWNED (WATER TURBINE, TELEVISION, MOTORCYCLE)	
RICE SHORTAGE	

2.2 POPULATION GROWTH

This parameter is estimated through a focus group discussion. It is used as an input parameter in the PLUP process. Using the annual number of births, deaths, immigrants, and emigrants collected over the last six years, the changes in population size over this period can be estimated. The annual population growth rate is calculated using this formula:

$$\tau_n = \frac{P_n - p P_{n-1}}{P_{n-1}}$$

$\tau_n = \text{Annual population growth rate in year } n$
 $P_n = \text{Population in year } n$

The average population growth rate (T) is the average of the population growth rate calculated over the last five years.

$$T = \frac{1}{5} \sum_{n=2006}^{2010} \tau_n$$



IN A NUTSHELL

Village socio-economic data are needed: (i) as parameters for PLUP implementation and (ii) to make the greatest possible use of the knowledge relevant to the target village in a descriptive summary report that we call a monograph. Household socio-economic data are collected through a rapid survey of all households in the village combined with more in-depth focus group interviews with village representatives who describe the village history, and conservation and development issues.

2.3 VILLAGE HISTORY

The purpose of the focus group on village history is to obtain a quick identification of the main drivers of changes in the village and their impacts on village landscape and livelihoods. Historical conflicts within or between villages are given special attention as these must be taken into consideration during the village boundary and village zoning activities.

The first step consists of identifying certain periods in the village history since its establishment. Then for each period identified, villagers are asked to describe changes in:

- Infrastructure: schools, roads, meeting rooms, irrigation systems, etc.
- Population: people migrations, diseases, etc.
- Agricultural systems: crops cultivated, land management, technical innovations, etc.
- Livestock system: types of animals, herd size, diseases, livestock management, etc.

Quantitative approximations of the household numbers, rice yields, rotation periods and numbers of animals are also estimated for each period. It is important to highlight the main changes, and identify the differences between the previous periods.

The staff facilitate discussions and record results on poster paper as the discussion progresses. The results are summarized and computed in the 'village name'_diagnosis Excel spreadsheet.

2.4 PROBLEM CENSUS

The problem census focus groups aim to identify problems related to village agricultural and forest land, and opportunities to address these by land management plans and village extension programs. Men and women work in two separate focus groups as the problems identified are often different. After having summarised and listed all the problems, all participants come together and rank them in order of importance.

Each problem is first discussed in each gender group and then again during a problem solving session involving both men and women in order to identify the causes of each problem, the impacts and suggested solutions and/or opportunities. Again, the group size should be between 5 and 10 knowledgeable people (e.g. from the Committee of Village Elders and/or village leaders) so that the group is representative of the village in terms of ethnicity, social status, age and wealth distribution.

The staff facilitate discussions and record results on poster paper as the discussion progresses. Men and women's group discussion results are aggregated in a 'village name'_diagnosis Excel spreadsheet.

TIP

District authorities collect taxes in proportion to the number of animals, the size of the labour force or number of plots. To keep taxes low, local communities are used to the systematic under-reporting of the numbers given to the administration. Therefore special attention should be paid to explaining to the village community that the data are not collected for tax purposes, but are aimed at guiding villagers through the zoning process.

Even though villagers are told that the data are not used to collect taxes, most of the time villagers admit that during the land zoning process they gave incorrect numbers because they did not realize the importance of the information they were asked for. The area under rotational crops obtained from the household surveys and the current land use map designed through PLUP should therefore be cross-checked using a satellite image of the village (\$7.2).

FOR MORE INFORMATION

PLUP Toolbox 7:

Synthesizing PLUP knowledge in a village monograph

3. CHARACTERIZING THE VILLAGE LAND USE SYSTEM

The following steps are used:

First, all village land use types are listed, including those types the village had in the past, have nowadays and may have in the future (e.g. trends in neighbouring villages or suggestions by extension agents). These land uses can be summarized as shown in the table below.

TABLE 2: TYPES OF LAND USES.

CROPPING SYSTEM	LIVESTOCK SYSTEM	FOREST	OTHER
PADDY FIELD	GRASSLAND (LIVESTOCK AREA)	CONSERVATION FOREST	SHRUB
PERMANENT CROP	IMPROVED GRASSLAND - PASTURE	PROTECTION FOREST	RESERVE LAND
ROTATIONAL CROP		PRODUCTION FOREST	VILLAGE AREA
PLANTATION		SACRED FOREST (CEMETERY)	WATER BODIES

Then parameters are defined for one hectare of each land use type, including two environmental indexes: biodiversity and carbon.

The parameters below are calculated with VLMC members for one hectare of each land use type, as indicated in the following equations.

3.1 RETURN-TO-LAND

FROM AGRICULTURE

$$= \sum_{crops} (Gross\ income - input\ costs) \times \% \text{ of land use type under each crop}$$

One hectare of land may be under different rotational crops, for example, 50% of the area may be under upland rice, 25% under maize and 25% under Job’s tears. The income values of the respective percentages of each of these three crops in one hectare of the land use type are added together.. Then, the resulting value is divided by the total number of years of the rotation (cropping years + fallow duration).

For a **permanent crop** the agricultural return-to-land is calculated on an annual basis as the plot is cropped every year.

For **plantations**, the total income over the whole period of the plantation (including the unproductive phase) is divided by the total number of years in order to calculate the annual return-to-land per hectare of plantation.

FROM NTFP COLLECTION

$$= \sum_{NTFPs} (Income) \times \% \text{ of income from each NTFP in the land use type}$$

Several NTFPs can be collected from the same land use type (i.e. production forest) at different times of the year. The vol-

ume of each NTFP collected on average from each land use type and the price for which they can be sold are assessed collectively during focus group discussion. Then the group calculates the NTFP return-to-land of each land use type by compiling values of all NTFPs (e.g. peuk meuk, khem) that can be collected in that land use type. Wildlife hunting can be added but villagers were often reluctant to include this income as a return-to-land.

FROM LIVESTOCK

$$= \sum_{Animal\ type} Net\ profit\ per\ ha$$

For each land use type the participants estimate a livestock ‘carrying capacity’ calculated as the number of large ruminants that each land use type can support sustainably. For example, in Houay Thong village the carrying capacity of one hectare of natural grassland was set at one animal (cattle or buffalo) by VLMC members while improved pasture systems (with cultivated grass) increased the carrying capacity up to three head of livestock. The income generated by livestock for each hectare depends on the age and price at which the animals are sold. For example, if one buffalo fed on one hectare of natural grassland is sold after three years for four million kip, the livestock return-to-land of that hectare of grassland is four million kip divided by three years. All potential returns-to-land from livestock are calculated at the carrying capacity value for the land use types to which livestock have access (i.e. during the planning process VLMC members may decide that they prevent livestock access to some land use types such as those under permanent crops or conservation forest).

3. CHARACTERIZING THE VILLAGE LAND USE SYSTEM

FOR MORE INFORMATION

PLUP Toolbox 2:

Socio-economic data and PLUP parameters

IN A NUTSHELL

Socio-economic data for land use planning are collected from the village household census, focus group discussions (as described in Section 2) and also from the PLUP Fiction role play. The average income values and labour force requirements for each land use type are elicited from the VLMC members. These data are first cross-checked with the household level data compiled for the whole village, and then the VLMC members agree together on the parameters that will be used all through the land use planning process. VLMC members fully understand that all the parameters come from them and that they participate in the entire calculation process. This elicitation process makes sure there is no 'black box effect', especially during the calculation of the socio-economic and environmental impacts of land use plan scenarios tested on the virtual village landscape. Local people have therefore full ownership of the whole process.

3.2 LABOUR FORCE REQUIREMENT

The labour force requirement is that required for all activities in the land use type over one year, i.e. the number of labour force units required per hectare for agriculture, NTFP collection and livestock. One labour unit corresponds to the labour of one adult person.

$$= \sum_{crops} \text{Number of labour units} \times \% \text{ of land use type under each crop}$$

3.3 ENVIRONMENTAL INDEXES

In addition to the socio-economic parameters, the two environmental indexes of biodiversity and carbon are discussed and included. The ideas of carbon and biodiversity are introduced to the villagers. For each land use, a coefficient ranging from 1 to 4 is proposed based on forest inventories conducted in Viengkham District.

First, the facilitators give VLMC members some examples of carbon and biodiversity values attributed to a few of the different land use types. Then, VLMC members are asked to guess the values for the other land uses. This helps to verify that the concepts are well understood. Villagers can easily rank the different land use types depending on their perceptions of the environmental values and so become aware of the potential impact of their decisions on the environment.

TABLE 3: STANDARD VALUES OF BIODIVERSITY AND CARBON INDEX VALUES FOR EACH LAND USE.

TOPICS	BIODIVERSITY INDEX STANDARD VALUE	CARBON INDEX STANDARD VALUE
CONSERVATION FOREST	4	4
PROTECTION FOREST	4	4
PRODUCTION FOREST	3	3
SHRUB	2	2
VILLAGE AREA	2	1
PLANTATION	1	2
IMPROVED GRASS LAND	1	1
PERMANENT CROP	1	1
ROTATIONAL CROP	1	1
LIVESTOCK AREA	1	1
PADDY AREA	1	1

Finally, all the values per hectare are summarized in a table on a piece of A0 paper that is displayed in the room as a common reference for all participants.

Some of the village level information derived from household surveys and focus group discussions (see Section 2) are also displayed on the board such as:

- Prices of one kg of rice, of an adult cow and buffalo, etc.
- Average composition of the families, labour force available in the village, population growth

All parameters are compiled in an Excel spreadsheet .

4. ENGAGING LOCAL COMMUNITIES IN PLUP WITH 'PLUP FICTION'

4.1 INTRODUCING THE VIRTUAL LANDSCAPE

'PLUP Fiction' is a role play used to introduce the basics of land use planning to villagers, who are often poorly educated, within only a few days. Simulating land use planning helps villagers to better understand the risks and benefits involved such as the economic development of the village, constraints of labour force availability, rice self-sufficiency, livestock carrying capacity, etc. and to increase their awareness of the impacts of their decisions made during land use planning.

First, the villagers are shown a game board representing a virtual landscape of a simplified village composed of 100 cells of 1 ha each. Each of the twelve VLMC members represents one labour unit and has to make decisions not only for himself or herself but for the whole village community that shares this virtual village landscape of 100 ha. The initial composition of the virtual landscape reflects the real percentage of land cover types as observed from recent satellite images (ALOS 2009) in Viengkham District.

4.2 THE SUCCESSIVE STAGES IN PLUP FICTION

During each round of the role play, participants negotiate a zoning arrangement and decide on the land use to be allocated to each plot (cell). A new page of tracing paper is used for each iteration to draw the land use plan with coloured chalks over the virtual landscape. Once a land use type has been allocated to all the plots and the participants have decided which plots are to be accessible to livestock, the round ends and calculations are made to assess the output values of the scenario.

During the first round, the participants calculate the outputs themselves using simple pocket calculators. They multiply the parameter values (i.e. incomes from agriculture, NTFPs and livestock, the labour force needed, and the biodiversity and carbon indexes) of each land use type by the area under that land use type in the land use plan. The facilitators provide guidance throughout the process and report the results on the board or on A0 paper. The results are also calculated by computer in order to show participants that the computer does the same calculations as they do manually with the simple calculators. Then to save time the computer (by means of an Excel spreadsheet) is used for the next rounds; but participants are invited to calculate some values by themselves to verify their good understanding of the calculation process. Through this iterative negotiation process, the villagers gradually improve their land use plans until a final agreement is reached.

4.3 ASSESSING SCENARIOS IN PLUP FICTION

Village parameters are compiled in an Excel file (table below with parameters of the role play). The parameter values are fixed for all scenarios and the calculations are automatically updated when the area of different land use types and livestock access to different land use types are modified.

For each scenario the following inputs are entered:

- Number of hectares of each land use type.
In PLUP fiction the total area should always be 100 ha
- Livestock access to each plot (1 or 0)
- For the three main types of land use (rotational crops, permanent crops and grass land), the percentage of the land that is really cropped/used depending the topographic constraint (rocks, slope...)



IN A NUTSHELL

After the calculation of the economic parameters pertaining to the village land use system, VLMC members learn how to conduct land use planning through a role play using a virtual landscape. The economic and environmental impact of their decisions is displayed, analysed and discussed collectively.

Land use plans are gradually improved through successive iterations so as to satisfy all stakeholder groups represented by the participants (i.e. forest conservationists, development specialists, different household types).

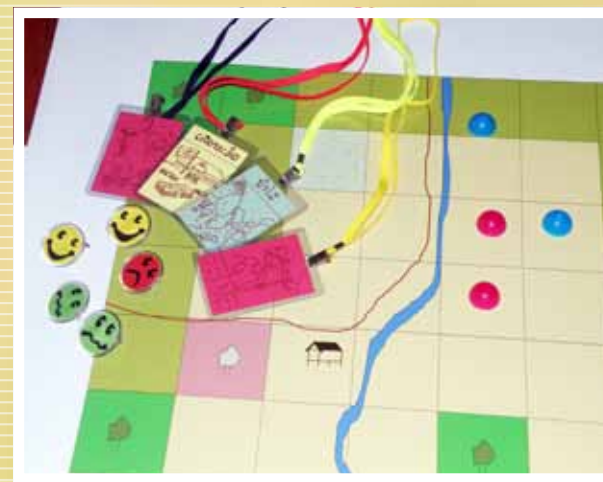
After each round of planning, the resulting scenario can be assessed collectively and compared with the previous scenario to see if the new plan improves the output parameters. Then, participants can modify again learning from their mistakes until they reach a satisfactory land use plan.

The output parameters considered in the assessment of each successive plan are as follows (see table below 'Output variables of land zoning simulation'):

- Number of labour force units needed at the village level to implement the plan.
- Total village income generated from agriculture + NTFPs + livestock + off-farm activities.
- Average income per labour force unit in the village.
- Average income per labour force unit of each household type: A, B, C and D.
- Maximum number of livestock, the villagers can raise on their land (carrying capacity).
- The biodiversity and carbon indexes of the land use plan

$$= \sum_{\text{Land uses}} \text{Index Value} \times \text{number of ha in the land use plan}$$

Some other indicators such as those of rice sufficiency and poverty are used as warnings. The corresponding cell becomes green when conditions are fulfilled or red when rice sufficiency or poverty rates are below the threshold defined by VLMC members.



4. ENGAGING LOCAL COMMUNITIES IN PLUP WITH 'PLUP FICTION'

MORE INFO

PLUP Toolbox 3:

The 'PLUP Fiction' role play
Bourgoin J, Castella J.C. (2011) 'PLUP Fiction': Landscape Simulation for Participatory Land Use Planning in Northern Laos. Mountain Research and Development 31(2): 78-88.



TABLE 4: PARAMETERS OF THE ROLE PLAY

TOPICS	AGRICULTURAL INCOME (KIP/HA)	CARBON INDEX STANDARD VALUE	LIVESTOCK CAPACITY (HEAD/HA)	LABOUR REQUIREMENT (MAN/YEAR)	BIODIVERSITY INDEX	CARBON INDEX
CONSERVATION FOREST	0	3,000,000	0.5	0	4	4
GRASS LAND	0	100,000	1.5	0.1	1	1
PERMANENT CROP	2,500,000	200,000	0.5	1	1	1
SHRUB	0	0	0.5	0	2	2
PRODUCTION FOREST	2,500,000	5,000,000	0.5	0	3	3
PROTECTION FOREST	0	2,500,000	0.5	0	4	4
ROTATIONAL CROP	600,000	1,500,000	1	0.25	1	1
PLANTATION	4,000,000	100,000	0	0.1	1	2
LIVESTOCK AREA	0	100,000	1.5	0.25	1	1

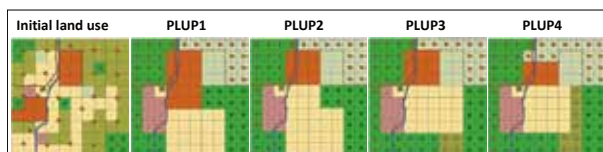
TABLE 5: OUTPUT VARIABLES OF LAND ZONING SIMULATION

	INITIAL LAND USE	PLUP1	PLUP2	PLUP3	PLUP4
OVERALL ANNUAL INCOME (MILLION KIP)	240	422	407	402	380
AVERAGE ANNUAL INCOME PER LABOR UNIT (MILLION KIP)	12.6	19	23	24.8	31
SHARE A TYPE HOUSEHOLDS (MILLION KIP)	10.3	15.3	18.6	19.8	24.2
SHARE B TYPE HOUSEHOLDS (MILLION KIP)	13.9	19.8	23.9	25.8	32.5
SHARE C TYPE HOUSEHOLDS (MILLION KIP)	15	27	33.5	36.8	47.7
SHARE D TYPE HOUSEHOLDS (MILLION KIP)	22.1	32.5	37.9	42.1	55
BIODIVERSITY VALUE	169	200	200	200	196
CARBON VALUE	171	207	207	207	203
NUMBER OF LIVESTOCK	29.5	36	36	36	40.5
LABOR FORCE NEEDED	18.95	22.2	17.7	16.3	12.2

The facilitators may introduce these results in the discussion to adjust the land use planning strategies if one of these indicators turns the cell red, and thus creates possible food security problems for the village.

- The coloured cells give warnings about the status of rice sufficiency and poverty under different scenarios.
- Labour force requirements now, in 5 years and in 10 years are also displayed in the Excel spreadsheet.
- The successive steps in the calculations (e.g. income values constrained by topography and/or labour force availability) are also shown in the spreadsheet.
- The successive steps in the calculations (e.g. income values constrained by topography and/or labour force availability) are also shown in the spreadsheet.

The iterative planning process ends when the plan can no longer improve the output parameters. All participants should be satisfied by the results in terms of the increased economic and environmental value of the village landscape.



5. THREE DIMENSIONAL (3D) MODEL CONSTRUCTION

5.1 THE ADVANTAGES OF THE 3D MODEL

ENHANCED PARTICIPATION

- The 3D model is used to enhance the entire PLUP process from boundary delineation to networking and extension activities.
- The level of participation is enhanced because villagers are able to visualise and identify with the “real” and “to-scale” situation displayed on the model.
- Zones, e.g., grazing and forest protection zones, which cross-cut village boundaries can be discussed between village representatives easily.

EASY FOR THE VILLAGERS TO BUILD AND TO MANIPULATE

- With the help of the facilitators, villagers are able to build the 3D model themselves using inexpensive materials: cardboard, plaster bandage strips, etc.; see cost estimation in Toolbox 1.
- Villagers readily recognise the topographic features and are able to add information to the model with the help of a facilitator.
- Villagers use coloured pins and string to define and make changes to boundary lines or land use zones.

COMPATIBLE WITH OTHER TOOLS AND METHODS

- Information on the 3D map can be transposed to GIS digital maps and used interactively for discussion with district staff and villagers.
- The 3D model can be used in combination with prints of satellite images and topographic maps for discussions with villagers.
- The 3D maps are can be transported in vehicles or on motor bikes and/or can be hand-carried by villagers from village to village.

PROVIDES A PERMANENT OBJECT KEPT AS A REFERENCE POINT IN THE VILLAGE

- Models can be built for work at different levels, kumban or village
- It is a permanent object which can be kept at the village or kumban office for on-going activities.
- After all the steps are completed the boundaries, land use zones and other features can be painted on the 3D model as a permanent record of decisions and any changes can be recorded by repainting different areas.

IN A NUTSHELL

A three dimensional (3D) model provides a good support for participatory mapping. Built to scale, it reproduces the topographic features of the landscape. Constructed simply of cardboard and plaster materials in only one day, its main advantages are that it can be easily understood by everyone, used in many different ways, and is highly interactive. During two dimensional participatory planning, some people found it difficult to find their location on the map and so remained passive. However these same people were empowered by the 3D model and became active participants in the planning process.

FOR MORE INFORMATION

PLUP Toolbox 4:
Constructing a 3D model

5. THREE DIMENSIONAL (3D) MODEL CONSTRUCTION

5.2 MATERIALS

The materials necessary for constructing the 3D model are summarized in the following table (See Toolbox 1 for an estimation of costs and Toolbox 4 for a illustrated introduction to 3D model construction).

TABLE 6: MATERIALS FOR THE 3D MODEL

CONSUMABLES

MATERIALS AND EQUIPMENT	QUANTITY	CHARACTERISTICS
TOPOGRAPHIC MAP WITH CONTOUR LINES, ROADS, AND RIVERS.	1	SIZE: 1M X 1M
CARDBOARD	AS MUCH AS IS NEEDED TO REFLECT CONTOUR LINES IN THE TOPOGRAPHIC MAP	SIZE 1 X 1 M
CARBON PAPER	≈10 SHEETS (ENOUGH FOR 1 M ²)	THICKNESS 0.5 OR 0.7 MM
STICKY TAPE	6 ROLLS (ENOUGH FOR 1 M ²)	
GLUE	3 BOTTLES	1 LITRE BOTTLES
PLASTER BANDAGE STRIPS	4 ROLLS	
PINS	AROUND 50	

REUSABLES

MATERIALS AND EQUIPMENT	QUANTITY	CHARACTERISTICS
STANLEY KNIFE	4	
BOWL	2	



5. THREE DIMENSIONAL (3D) MODEL CONSTRUCTION

5.3 THE MAIN STEPS IN CONSTRUCTING A 3D MODEL

About 20 layers of cardboard are needed to make a 3D model to display a 40m altitude between contour lines (with a total altitude difference of 800m). A group of six people can build this easily in a single day. The construction steps are summarized below.

STEP 1: A TOPOGRAPHIC MAP IS PREPARED

Prior to building a 3D model, a base map (topographic map) showing the contour lines, rivers and roads in the area should be generated with a GIS. If the village boundaries have not yet been defined, either ask village representatives to draw the village boundaries on a topographic map, or deduce the village area from the areas covered by neighbouring villages.



STEP 3: CARDBOARD CONTOUR LAYERS ARE CUT AND PASTED

The contour layers are then cut out using Stanley knives and pasted one after another onto the base board beginning with the lowest altitude and finishing with the highest altitude.

STEP 2: CONTOUR LINES ARE DRAWN ON THE CARDBOARD

The cardboard is first cut to the size of the base map. Then, enough sheets of carbon paper are put together to cover the base map area (1 x 1m). This is then put between the printed topographic map and the cardboard. These three layers are pinned together to avoid any slippage during the drawing of the contour lines which are then drawn by using a pen to trace over the contour line selected on the topographic map (going from the lowest to highest altitude) on one cardboard layer after another.

STEP 4: THE MODEL IS COMPLETED

The relief model is covered with sticky tape to even out the surface. Then plaster bandage strips are laid over the 3D model to cover detailed parts of the model to create an overall smooth surface. Once the 3D model is dry, geographic features such as rivers and roads can be painted on it.



6. VILLAGE BOUNDARY DELINEATION

6.1 DOCUMENTATION OF THE 3D MODEL

Village representatives from all neighbouring villages are invited to participate in a meeting held at a convenient location to discuss village boundaries. The presence of district authorities is important, especially if there are any pre-existing village boundary conflicts.

The 3D model should be oriented in line with the real village landscape so that when people point in a particular direction on the 3D model of the village this direction corresponds to the direction in the real village landscape.

Villagers agree on the description and naming of the topographic features represented on the model to ensure that they can establish the correspondence between the modelled and the real landscapes. The main features (rivers, residential areas, mountain tops, etc.) are labelled on the model in the local language(s).

6.2 DELINEATION OF VILLAGE BOUNDARIES

The limits of the village are marked on the 3D model using coloured pins and string. During the delineation process, the boundaries are described orally to provide the opportunity for all participants to react and discuss these.

6.3 COLLECTION OF GPS POINTS

If any conflicting areas are identified, or points where the boundary line does not follow natural features such as streams, or mountain peaks and ridges, two knowledgeable villagers are selected from each village to accompany a team to conduct ground surveys. Critical points where GPS readings are necessary along the boundary are recorded. The GPS data are imported into the open-source GIS software QGIS (www.qgis.org) and can also be shown on the 3D model (see Toolbox 6).

6.4 DESCRIPTION OF VILLAGE BOUNDARIES

After the village boundaries are delineated on the 3D model, two other pieces of supporting evidence are used to capture the same information.

MAP INTO QGIS

A photograph of the 3D model on which string delineates the village boundary is taken and uploaded in QGIS software, and the village boundaries are digitized on-screen. The GPS points are also shown on the resulting map.

NARRATIVE FOR FINAL AGREEMENT

The villagers are asked to describe the boundary (e.g. from this mountain to that river, etc.). This written description is then included in the PLUP agreement and read out loud by VLMC members to all villagers during the closing meeting.

IN A NUTSHELL

The village boundaries are delineated on the 3D model and a written description of the boundaries is recorded, describing the geographic features of the 3D model. Representatives of the neighbouring villages are invited to discuss the village boundaries and resolve potential land conflicts.



7. LAND ZONING

7.1 THE ART OF LAND ZONING

In most reference texts available on land zoning in Lao PDR and elsewhere, there is the assumption that once a dataset that includes the current land use map, satellite images and socio-economic data (including data from household surveys, problem census, etc.) has been assembled, then the process of land zoning is clearly understood by the participants. With the help of district officials, the local community would be able to delineate zones corresponding to their needs and expectations. But looking more closely at this critical stage of land use planning, Lestrelin et al., (2011)¹ showed that:

- either district officials imposed their views on villagers who had no real understanding of the whole land zoning process (This was especially true at the beginning of LUP/LA in the mid-1990s when the 3-Plots Policy was somehow imposed on villagers),
- or villagers were left free to plan their own land use and who most of the time reported their “current land use” by exaggerating the area under agriculture and rotational crops to such an extent that it was in excess of the area that could be realistically cropped with the available village labour force under the existing cropping systems.

The PLUP approach proposed aims at rationalizing the negotiations between the different participants and stakeholder groups that take place during the land zoning process. The

¹ Lestrelin G., Bourgoïn J., Bouahom B., Castella J.C. (2011) Measuring participation: Case studies on village land use planning in northern Lao PDR. Applied Geography 31: 950-958.

tools proposed make it possible for all participants to see the consequences of their land zoning decisions in terms of economic development and environmental conservation. They also help VLMC members in managing the trade-offs between conservation and development objectives. Participants understand the consequences of alternative landscape patterns thanks to training based on the ‘PLUP Fiction’ role play.

Zones are directly delineated on the 3D model with pins and coloured string just as for the village boundary delineation. A specific colour is used for each land use type as shown in Table 6.

TABLE 7: RESPONSIBILITIES WITHIN THE VLMC

STRING COLOUR	LAND USE
	CONSERVATION FOREST
	PROTECTION FOREST
	PRODUCTION FOREST
	ROTATIONAL AREA
	PERMANENT CROPS AREA
	GRASS LANDS
	IMPROVED PASTURE
	SACRED FOREST
	VILLAGE
	PLANTATION
	RESERVE

A zone represents a portion of the village territory that has or will have the same use. A zone is therefore an homogenous area with few physical differences.

IN A NUTSHELL

Be it art or science, zoning is core to land use planning. Zones are delineated on the 3D model to represent the spatial distribution of planned land use types in the village landscape. Guided by a continuous feedback provided by a computer-based impact assessment, land use plans are designed successively until all the VLMC members are satisfied. The iterative zoning process is facilitated by the use of GIS software and an Excel based tool (see Toolboxes 5 and 6).



FOR MORE INFORMATION

PLUP Toolbox 5:

Scenario analyses with the Excel spreadsheet

7.2 CURRENT LAND USE

VLMC members are first asked to map their current village land use on the 3D model. Once all plots are delineated, a high resolution satellite image (ALOS 2009 in our case) is projected onto the 3D model to check and adjust the current land use zones.

A photograph of the 3D model with the current land use zones is then captured in QGIS and digitized on-screen (see Toolbox 6). The areas of each of the land use zones are then computed by GIS software and input into the Excel spreadsheet for the calculation of the output parameters (i.e. average income for different household types, labour requirement, livestock carrying capacity, etc.). These results open space for negotiation on improving land zoning, taking into account the expected changes in population and socio-economic context in the next 10 years.

7.3 NEGOTIATING LAND USE PLANS

As for 'PLUP Fiction', successive iterations of land zoning are made through a collective negotiation process until a final Land Use Plan is agreed upon. During each round:

- Homogenous land use zones are delineated on the 3D model using pins and coloured strings,
- A photograph of the 3D model is taken and uploaded on QGIS software.
- Land use zones are digitalized on-screen with QGIS.
- Areas of different land use zones are computed with QGIS and input into the Excel spreadsheet.

- Socio-economic and environmental output values are given to the VLMC members.

As in 'PLUP Fiction', an Excel spreadsheet is used to quickly calculate the outputs of each scenario. Input data in the first spreadsheet are the same as those in 'PLUP Fiction' except for the labour force available in the village obtained from the household survey.

For each scenario input data are:

- Area in ha under each land use type
- Livestock access to land use type (1) or not (0).
- Percentage of land that is really used given the topographic constraints (rocks, steep slopes, etc.) especially for rotational crops, permanent crops and grasslands.

VLMC members and facilitators together discuss the outputs of the land use plan and search for ways to improve the results in the next round of zoning. The facilitators record the changes made after each round.

Facilitators may also suggest various land management options that VLMC members may not have thought of, such as innovative land use systems (e.g. improved fallow techniques, conservation agriculture, agro-forestry) or environmental protection measures such as:

- Joining patches of protected forest in order to create ecological corridors,
- Creating protection forest buffers along the rivers to prevent soil erosion and silting,
- Delineating conservation forests around residential areas to create a better living environment.

TIP

The experience repeatedly gained in several villages was that villagers systematically over-represented their current land use on the 3D model while under-estimating the number of their fields and cropping areas in individual interviews. As a result, there is often a discrepancy for the same type of land use between those areas declared by an individual and those mapped collectively by the villagers. The facilitators used this problem to show villagers the importance of reliable data. The limited village labour force available made it impossible, under the current cropping practices, to exploit the large area delineated as agricultural land. VLMC members then often acknowledged that the number of plots declared by each household had been under-estimated to escape taxes, the plots were larger than the one-hectare plots usually declared and the fallow period was longer than the 'official' three year period. Then they agreed to revise the initial household data to get figures closer to the reality, which allowed the group to engage in a more realistic land zoning process. As a result, the plan gradually became more realistic in terms of labour force required and size of the village herds of livestock.

After delineating the current land use map, it is necessary to spend time with VLMC members in reconciling data from different sources (e.g. household surveys, map and satellite image). It is important to make sure the knowledge base is coherent and consistent before engaging in the first round of land zoning.

At this stage it is important to check the data provided by villagers on fallow durations, numbers of plots, plot sizes, labour force available in the village, livestock numbers, etc.

7. LAND ZONING

During the zoning process, evening meetings can be organized with village authorities or a larger village community if VLMC members feel that such consultations are necessary. The negotiation process continues until a final Land Use Plan is agreed upon by everybody. The process usually ends after 3 or 4 iterations.

7.4 POST-ZONING TREATMENTS

The land use plan is mapped in three different ways: on a 3D model to be kept in the village meeting room, a digital map generated with QGIS software for the final PLUP agreement and on a wooden board posted at the village entrance.

DIGITIZED PLUP MAP

A photograph of the final land use plan is uploaded in QGIS and digitized on-screen. In the legend the number of hectares of each land use is indicated. This map is also used as the legend for the 3D model.



PAINTING OF THE 3D MODEL

After reaching an agreement on the land use plan, the 3D model is painted by the facilitators. Zone boundaries delineated by the pins and coloured strings are drawn in ink with a pen. Then, each area is coloured with water paint to match the particular land use type. Some colour mixing should be made in order to get the same colours as those in the maps generated with the GIS software. A paper with the legend of the land use plan, including the areas of the different land use types, is nailed onto the 3D model (see next section).



7. LAND ZONING



PAINTING THE WOODEN BOARD

The digital map is projected using a video projector onto the wooden board and its main features are drawn in with a pencil. Then the wooden board is painted with oil paint. The facilitator/painter uses the same set of colours as used for the 3D model and digital map.



THE WOODEN BOARD

The wooden board is posted at the village entrance. In this way all villagers and outsiders can access the information on the village land use plan.

FOR MORE INFORMATION

PLUP Toolbox 6:
Land Use Planning with QGIS



8. VILLAGE ACTION PLAN

8.1 WHAT IS THE VILLAGE ACTION PLAN?

The Village Action Plan is a sub-product of PLUP whereby the villagers commit to the implementation of a number of concrete activities (e.g. fencing livestock areas, developing tree plantations in identified areas) with the support of extension agents and development projects. Even though the land use plans are conceived as spatial representations of villagers' ambitions for the future development of their village, previous research has shown that villagers were often unable to implement the plans (for technical and/or financial reasons). Follow-up extension activities are essential to overcome local shortcomings in the implementation of the land use plans.

Extension activities are expected to have a greater impact when embedded in a PLUP, as not only are they fully endorsed by the local community, but they also respond to local demands and are integrated in a spatially explicit development planning process. The Village Action Plan is therefore a way to match the development projects' "supply" for technical innovations and the villagers' "demand" for agricultural extension support. The Village Action Plan is the point where the technical knowledge and inputs that projects bring to the villages (supply side) in response to a participatory problem census and need assessment process (demand side) meet.



IN A NUTSHELL

The village action plan translates the land use plan into concrete extension activities that must be implemented to reach the goals collectively negotiated within the PLUP time frame.



8.2 METHODS

The Village Action Plan is created after the land zoning process together with the preparation of forest and agricultural land management plans. Socio-economic data, land use maps, and results of the problem census are used by DAFO extension staff to suggest a range of activities that are both relevant to the local problems and feasible in terms of the resources available at the district level (i.e. DAFO with support from development projects).

Those VLMC members, who participated in planning the future land use of their village during the PLUP process, discuss concrete development activities that would help to implement the land use plan over the next ten years. The facilitator who is also a member of the DAFO extension staff review each land use type and the corresponding plots on the village 3D model, inviting the participants to propose relevant activities to convert their land use plan into actions. The technical staff can also propose activities that may be unknown to villagers, provided that those activities help to overcome the problems identified during the Problem Census Session.

The facilitator's role is to ease the discussions between villagers and district technical staff and to mobilize the knowledge of village issues gained through the diagnostic phase to suggest locally appropriate solutions. For each activity, possible support from DAFO or other projects are discussed. At the end of the session a common agreement is reached regarding the priority activities for the first years of the land use plan. Whenever necessary, the facilitator may design certain participants to take charge of follow-up activities.

8.3 SOME LESSONS FROM VIENGHAM DISTRICT

Preliminary lessons can be drawn from these first villages in Viengkham District where the village action plans were collectively designed.

AN INNOVATIVE WAY TO RESPOND TO VILLAGERS' DEMANDS

The extension activities are collectively defined after a 5-day diagnostic and planning process which allows extension staff to better understand the local issues. Alternative scenarios are envisioned by the local community to overcome the problems collectively identified. Thus the extension staff are in a position to accompany the local community along the development pathway they have decided by themselves. This process avoids proposing technical options that may be irrelevant to local circumstances.

INTEGRATION OF LAND USE PLANNING AND EXTENSION ACTIVITIES

Since the Village Action Plan is a demand-driven extension process not all activities proposed can be addressed by a single project. In each village, the facilitators systematically review the activities proposed to define which are manageable by villagers using their own resources, which can be addressed by existing projects within a reasonable timeframe and finally, which have to be postponed due to limited resources. The latter activities can be reactivated at any time when a new project comes to respond to the development issues identified by the villagers themselves. Ideally, a consortium of development projects would be coordinated by DAFO staff to tackle the issues defined and prioritized by the villagers themselves.

VILLAGE ACTION PLAN AS CATALYST OF A LAND USE PLAN

The Village Action Plan is an essential component of the PLUP as the activities proposed are expected to engage local communities in implementing their land use plan. It is therefore important (i) to allocate sufficient time in order to formulate the Village Action Plan and (ii) to involve the same group of villagers who participated in the land use zoning process in the follow-up extension activities. But in addition to the involvement of the VLMC members it is important to provide time and space for broader village consultations involving all the households and relevant projects.

A Village Action Plan committing the village communities and DAFO staff to go beyond individual projects can play a role in integrating development activities with the multiple projects that support DAFO. The impact of development interventions is increased when village communities follow their own planned development pathways in addressing the village priority issues. It is important to involve both villagers and extension agents in the monitoring of the land use plan (including Village Action Plan) to ensure that the agreements made during the planning sessions are effectively translated into concrete actions.

EXAMPLE

In Nam Xoy village, the villagers wished to grow broom grass in an area they had planned for permanent crops during the zoning process. However without fencing, broom grass may be damaged by large ruminants, and bamboo fences are not strong enough to prevent these animals from destroying the crops after some years (broom grass is harvested over a long period, i.e. more than 10 years). Therefore villagers asked support from Agrisud to construct stronger fences from barbed wire.

- In Houay Kou village, one of the limiting factors of agricultural intensification is the water supply. The existing water system is defective and there is not enough water for gardening and for livestock. In the present situation, the most urgent activity for the village would be to improve the water supply system to unlock other development activities.



9. PREPARATION OF THE PLUP AGREEMENT

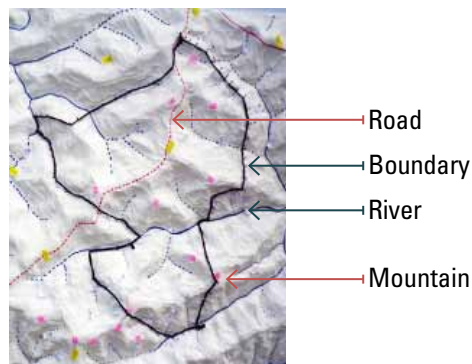
The steps for the PLUP Agreement document and its acceptance by district authorities follow:

9.1 VILLAGE BOUNDARY AGREEMENT

During land delineation, the authorities of the target village and neighbouring villages (at least two people per village) are invited to describe the boundary as a narrative and as a polygon on the 3D model.

GPS points that have been taken are added to the description. The agreements on GPS points previously signed by surveyors from the two neighbouring villages when any GPS point is taken, are signed and stamped by the village heads of the two villages and then added to the village boundary agreement.

Once the boundary agreement is finalized, it is signed and stamped by the authorities of the neighbouring villages. Copies of the village boundary agreement are given to the neighbouring villages' authorities.



9.2 COMPOSITION OF THE VILLAGE LAND MANAGEMENT COMMITTEE

The 12 members of the Village Land Management Committee (VLMC) selected during the PLUP opening meeting are given the specific responsibilities as follows:

TABLE 8: RESPONSIBILITIES WITHIN THE VLMC

MATERIALS AND EQUIPMENT	QUANTITY
VILLAGE AGRICULTURAL LAND MANAGEMENT	3
VILLAGE FOREST LAND MANAGEMENT	3
INVESTIGATING AND SANCTIONING DEVIANT BEHAVIOUR, AND SOLVING DISPUTES WITH NEIGHBOURING VILLAGES	6

The assignment of these responsibilities to different VLMC members should be carefully negotiated to ensure that those members are fully aware of their rights and responsibilities of their new position. All VLMC members should endorse the decisions before endorsement by the whole village community during the closing meeting, and then made official in the VLMC Agreement signed by the District Governor.

9.3 LAND USE ZONE DESCRIPTION

All land use plots of the final Land Use Plan are described in the PLUP agreement as a narrative just as that for the village boundary. This plot description can also be used for communal land registration. In addition, a table summarizes the main features of the land use plan by listing the land use types (land use type, and plot numbers, areas and locations) found in the

IN A NUTSHELL

“The agricultural land and forest management and use agreement is prepared to capture and elaborate the details of the land management plans for the various land use zones. Land and forest agreements, prepared in consultation with village authorities and villagers, are tools to help villagers manage and utilize village forest and agricultural land in accordance with the GOL policy and the requirements of the villagers. The rights, roles and responsibilities of village authorities and villagers in forest and agricultural land utilization and protection are elaborated. The conditions and rules vary between villages depending on the types of forest and agricultural land present in the village and the uses of each type of forest or land.” (MAF-NLMA, 2009)

9. PREPARATION OF THE PLUP AGREEMENT

village. This information is generated with GIS software (see PLUP Toolbox 6). The following table gives an illustration:

TABLE 9: LAND USE ZONE DESCRIPTION TABLE FOR HOUAYTHONG VILLAGE

NO	LAND USE TYPE	NO. OF PLOTS	LOCATION	PLOT AREA (HA)	TOTAL AREA (HA)
1	CONSERVATION FOREST	2	KHIEWTALONGKAEN	90.51	165.17
2			HOUAYTONG YONG	74.66	
3	IMPROVED PASTURE	1	SANAM HOUAYKA	122.54	122.54
4	LIVESTOCK AREA	1	BANHEUAKHAMPHAN	552.10	552.10
5	PERMANENT CROPS	1	TINPHOUKOUANENG	27.62	27.62
6	PLANTATION	3	HOUAYMONG YA	69.95	312.22
7			TINSANPHOUSAKXONG	7.97	
8			SANPHOULYPAO	234.30	
9	PRODUCTION FOREST	2	PHOU NANGKHOUAY	67.95	351.25
10			KHET OMBAN	283.30	
11	PROTECTION FOREST	6	POMLYPAO	50.33	455.01
12			KHET HOUABANTAI	14.91	
13			HOUAYKOU & HOUAYKHANG	145.30	
14			HIQUAYPHAE	39.26	
15			HOUAYTHONG	61.03	
16			HOUAYKA & HOUAY NGOU	144.19	
17	RESERVE LAND	1	KHEMHOUAYKA	251.78	251.78
18	ROTATIONAL CROPS	3	PHOUKHOUT	510.62	1577.08
19			PHOUTIALA	370.23	
20			VANG NGEUAK & HOUAY NGOU	696.23	
21	VILLAGE AREA	2	KHETBANNOY	3.24	12.34
22			KHETBAN YAI	9.10	

9.4 LAND USE MANAGEMENT RULES

To design the land and forest management and use agreement the following steps are undertaken (adapted from MAF-NLMA, 2009):

Discuss existing village land and forest use rules and agreements with the VLMC.

Discuss the rules and agreements that should apply to each land use zone.

Prepare a first draft of the agreement which specifies the conditions and rules for each of the forest-land use zones and other areas. The agreement covers activities allowed/permitted or not permitted in each land use zone. The sanctions for breaches of the conditions and rules for each zone are specified. A template agreement from the PLUP manual (MAF-NLMA, 2009) is usually used.

Present the draft agreement and the land use zoning map to a general village meeting. The villagers are invited to attend the meeting prepared and organised by the VLMC to hear, review, improve/adjust and agree on all the conditions for each land use zone described in the village agreement.

9. PREPARATION OF THE PLUP AGREEMENT

9.5 INTEGRATION OF INDIVIDUAL DOCUMENTS INTO THE OVERALL PLUP AGREEMENT

All intermediary documents, i.e. village boundary agreement, VLMC composition, land use zone description, land management rules and the map of the final land use plan (the digital version produced with QGIS) are compiled in a single document. This official agreement is endorsed by the village community and authorities during the closing meeting of PLUP (see next section). Seven original copies of the document are then signed and stamped by the village head, the DAFO director, the District Land Management Authority (DLMA) director and the District Governor. Then the signed copies are distributed to the various parties: village, kumban, DAFO, DLMA, District Governor's Office, NAFRI and supporting international projects.

The closing village meeting features presentations made by VLMC members to village households and district authorities. With the help of the painted 3D model, the village boundary is explained, land use zones are described, and land management rules specific to each land use type are pointed out in the map. The land use plan is presented as the result of the villagers' (VLMC members') work with the help of the facilitators. To close the meeting, the facilitators officially hand over the 3D model to the village head. Kept in the village meeting room, this 3D model becomes a common reference for the village community. Our experience shows that the 3D model makes it much easier for villagers to understand the plan and locate the zones than to do so using the map on the wooden board.

After a period of intensive work, lively discussions and trust building, the PLUP week and village closing meeting usually ends in a party bringing together all villagers and district staff implementing PLUP.



10. FINAL MEETING

The closing village meeting features presentations made by VLMC members to village households and district authorities. With the help of the painted 3D model, the village boundary is explained, land use zones are described, and land management rules specific to each land use type are pointed out in the map. The land use plan is presented as the result of the villagers' (VLMC members') work with the help of the facilitators. To close the meeting, the facilitators officially hand over the 3D model to the village head. Kept in the village meeting room, this 3D model becomes a common reference for the village community. Our experience shows that the 3D model makes it much easier for villagers to understand the plan and locate the zones than to do so using the map on the wooden board.

After a period of intensive work, lively discussions and trust building, the PLUP week and village closing meeting usually ends in a party bringing together all villagers and district staff implementing PLUP.



IN A NUTSHELL

At the end of the intensive PLUP week, a village meeting gathering together the entire village community allows VLMC members to present the process they went through and the decisions made so that these can be fully endorsed by the village.



11. DATA COMPILATION, SYNTHESIS AND STORAGE

11.1 WHAT IS A VILLAGE MONOGRAPH?

The objective of a village monograph is the compilation of all the useful village information generated during the participatory land use planning process in an accessible format. A village monograph presents a complete overview of the village (describing its livelihood system, history, problems, etc.) from the villagers own perspective. This knowledge is useful during the PLUP process and is also relevant to further development activities and monitoring. However, preliminary diagnostic studies have shown that in all villages where PLUP has been conducted, this information is usually lost after the process has ended with only the PLUP agreement and maps remaining, but not everywhere.

The data and information compiled in the village monograph are those collectively generated by the villagers during the PLUP process since the monograph is developed at the same time in order to manage and store the relevant knowledge. In addition to guiding villagers through the land zoning process, this village information is needed by projects for the selection of target villages, an understanding of the village issues and on-going changes, and for designing relevant action plans. Additionally the village information provided by monographs can be used by district authorities for planning purposes.

The main users of the monographs are therefore district staff and development project staff. The charts, diagrams, and tables used in the monographs: i.e. calculations, data sources, etc. are explained below. Although most of the information is collected during the PLUP process reference values at the district level for comparisons between target village averages and district averages are obtained from various other sources (e.g. project surveys, district statistics).

11.2 CONTENT OF OUR MONOGRAPH

Our monograph is a document of four pages. An example follows:



IN A NUTSHELL
After the field work, the facilitators compile all the data collected. The form chosen is a monograph in which all the main results are clearly presented.



11. DATA COMPILATION, SYNTHESIS AND STORAGE

FIRST PAGE

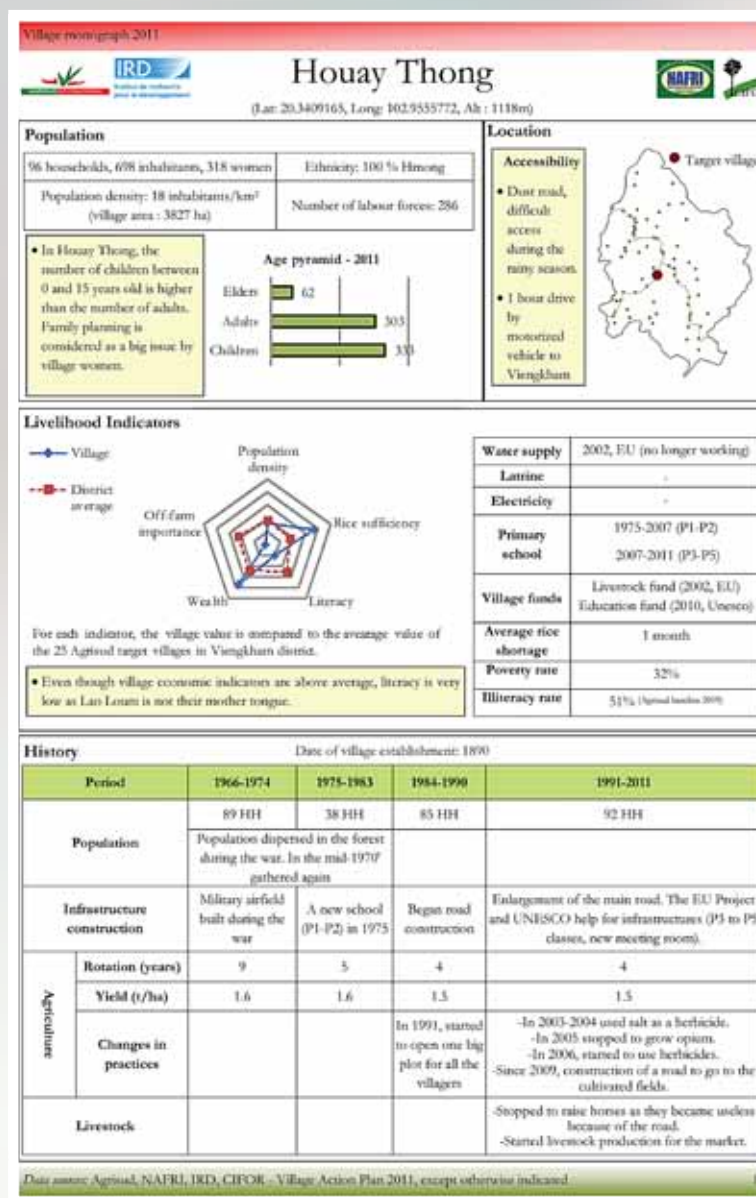
The first page is a quick introduction to the village showing key indicators.

- Population: number of inhabitants, sex ratio, ethnicity, density, age pyramid,
- Location: access (road/river), distance and travel time to the district capital, geographic coordinates and map location,
- Livelihood indicators: electricity source, water supply, school,
- Village history: population dynamics, changes in farming system, infrastructure at different periods

The chart compares the index values of five indicators for the target village and the district average:

- Rice sufficiency
- Literacy
- Wealth
- Off-farm activities
- Population

For each indicator, the index value always varies from 0 to 1.



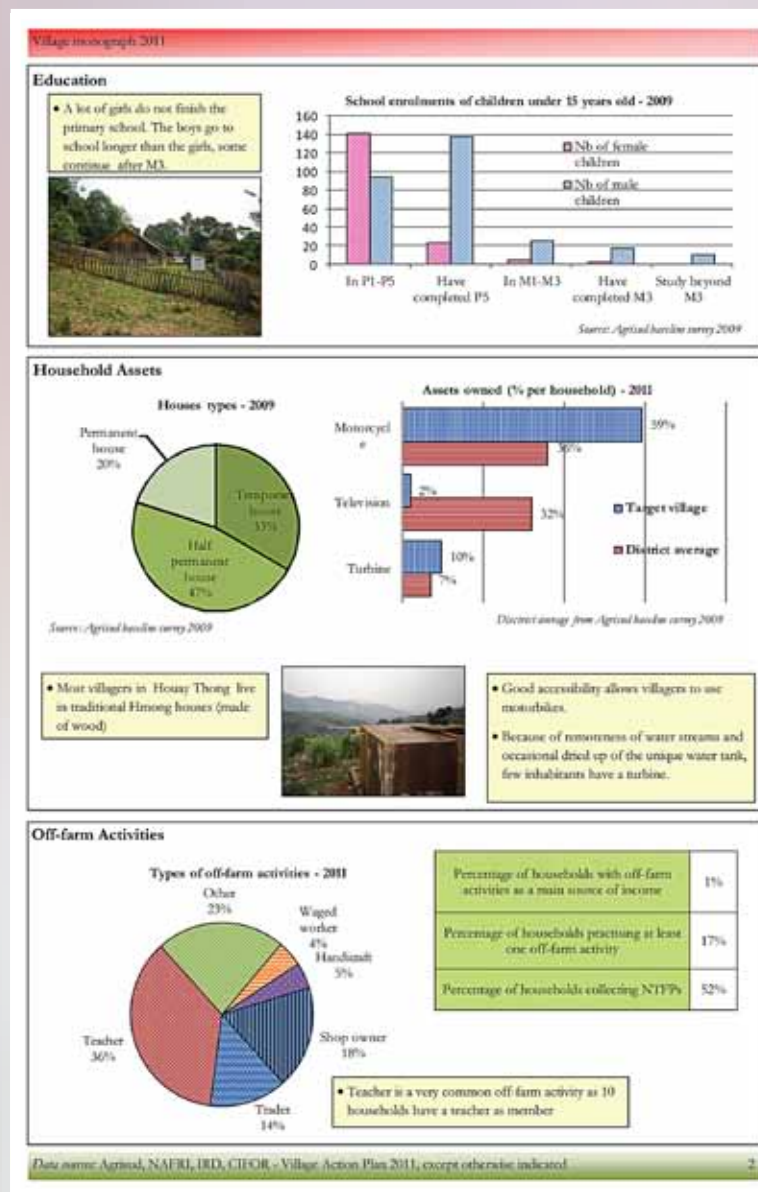
11. DATA COMPILATION, SYNTHESIS AND STORAGE

SECOND PAGE

The first page is a quick introduction to the village showing key indicators.

- School enrolment rates for males and females in the village
- Households assets: house types, percentage of households owning assets in comparison with the district average
- Off-farm activities: percentage of village households practising off farm activities, percentage of villagers whose source of main income is from off-farm activities, percentage of households practising at least one off-farm activity, percentage of households collecting NTFPs.

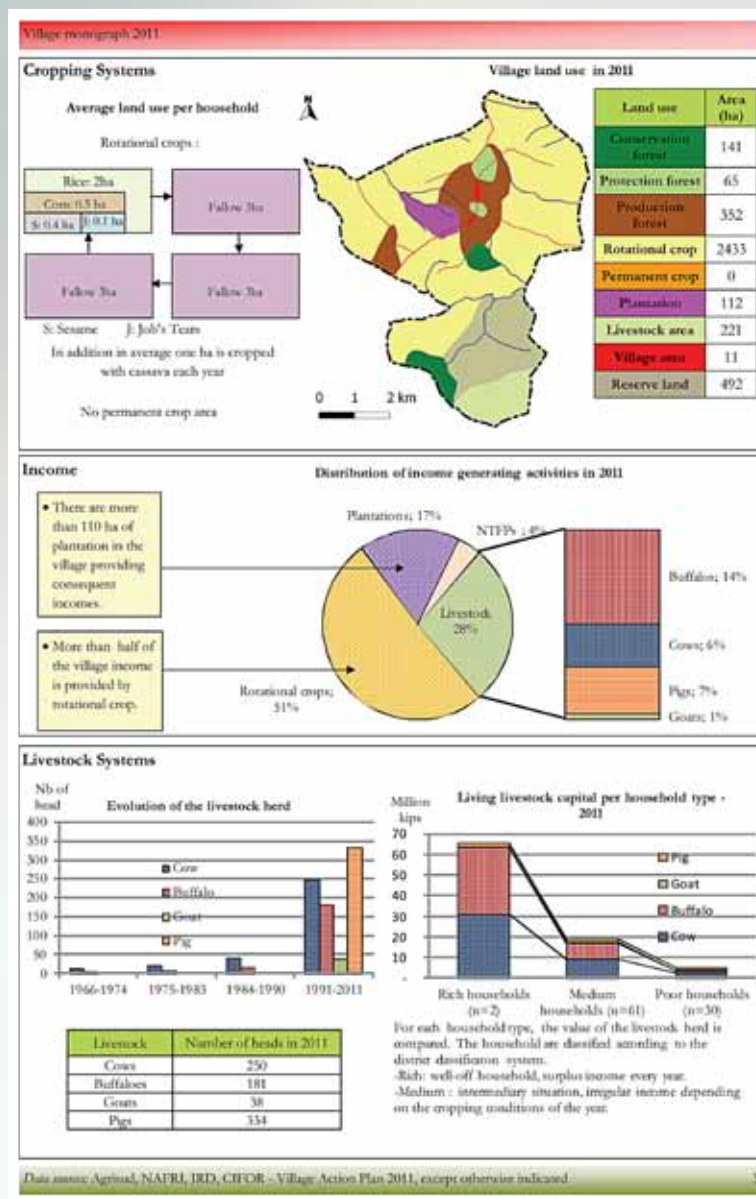
The author of the monograph may add photographs of the village infrastructure (e.g. school, houses, irrigation systems), livelihood systems and the natural environment.



THIRD PAGE

The third page introduces the current land use and farming system:

- Cropping systems: rotational and permanent agricultural land per household
- Current village land use map made from mapping on the village 3D model, then computed with QGIS
- Percentage of income generated by different farming activities in the livelihood portfolio: e.g. crops, livestock, NTFP collection
- Historical changes in the number of livestock
- Comparison of the average livestock capital for three household wealth categories: rich, medium, poor.

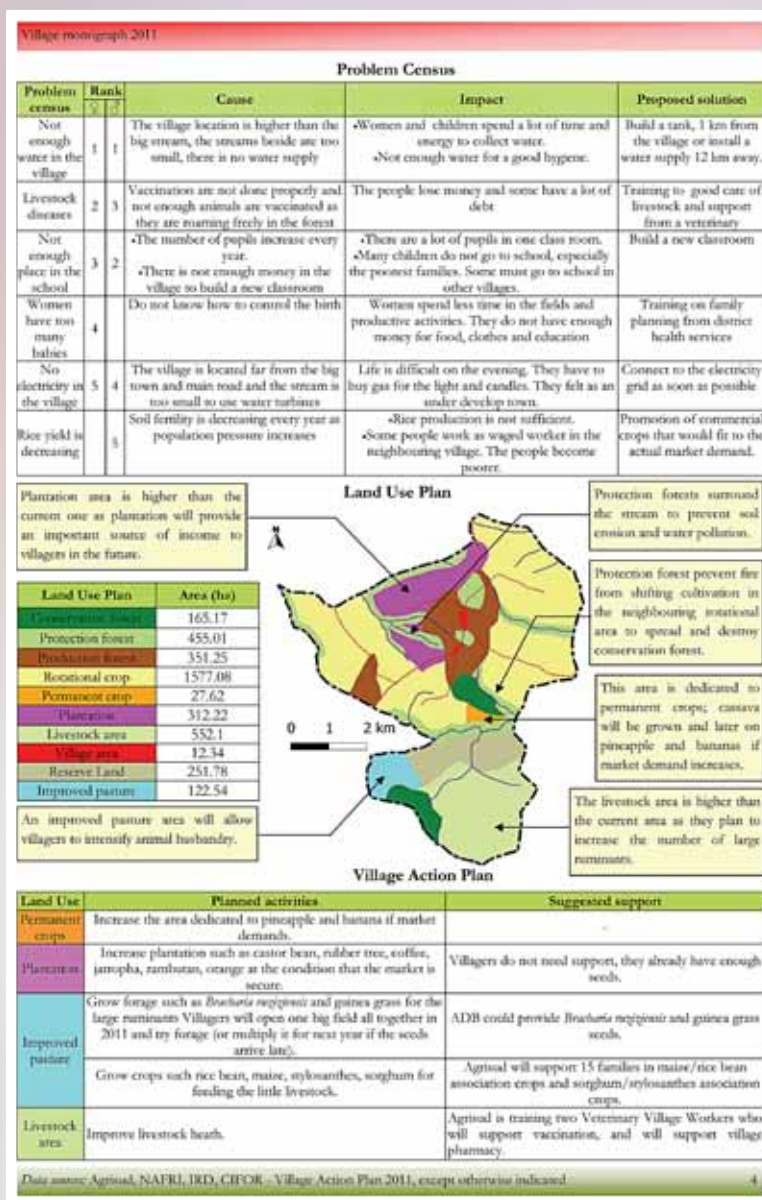


11. DATA COMPILATION, SYNTHESIS AND STORAGE

FOURTH PAGE

The fourth page summarizes villagers' perspectives of the problems faced, and the land use plan and actions they propose to overcome these problems.

- The problem census. The problems are ranked according to the priorities set by separate groups of women and men. The causes, impacts and proposed solutions are described.
- The land use planning map showing the area in hectares of each land use type and explanations by VLMC members about the decisions made and underlying objectives of the final land zoning.
- The village action plan: for each land use (using the same colour code as used in the land use plan), the activities planned and the extension support needed.



11. DATA COMPILATION, SYNTHESIS AND STORAGE

11.3 HOW TO BUILD A VILLAGE MONOGRAPH

Firstly, the household survey data are entered in the first sheet of the Excel file (see PLUP Toolbox 7).

Secondly, the data on population growth, village history and problem census are input in the appropriate spreadsheet in both Lao and English.

Thirdly, PLUP data is copied and pasted in the corresponding spreadsheet of this Excel file. Finally, the sheet that refers to the village action plan (VAP) is completed in both Lao and English.

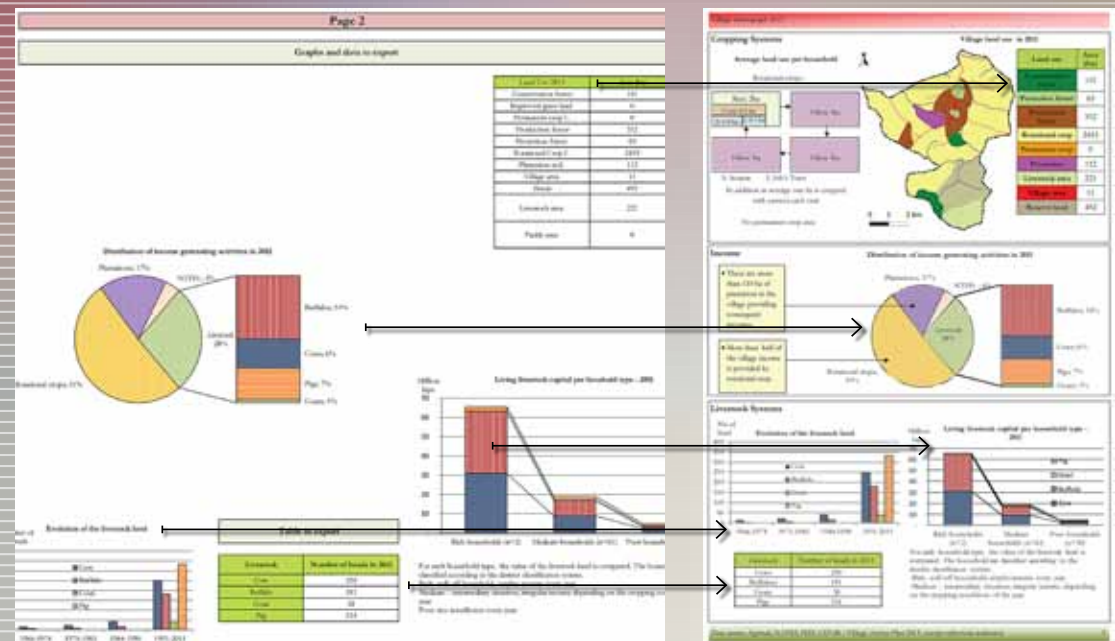
This file automatically generates the charts and tables needed for exported to the monograph file. To complete each page of the Publisher file (as presented above), the user copies and pastes the items from the appropriate Excel file sheet. The user then adds comments and photographs, and if necessary rearranges the items in the Publisher file. As already mentioned, the same Excel file is used to create the monographs in both English and Lao in the separate Excel file spreadsheets.

IN A NUTSHELL

During the field work, all data collected are compiled in an Excel spreadsheet. This file is used to generate the indicator values and illustrations needed for the monograph to be written in both Lao and English.

FOR MORE INFORMATION

PLUP Toolbox 7:
Synthesizing PLUP knowledge in a village monograph



CUTTING AND PASTING FROM THE EXCEL FILE SPREADSHEET TO THE PUBLISHER TEMPLATE FILE

12. PROPOSAL FOR COMMUNAL LAND REGISTRATION

Land allocation is the next logical step after land use planning as described in the PLUP manual (MAF-NLMA, 2009). Securing land tenure is an important step towards sustainable natural resource management in the uplands of Lao PDR.

12.1 CONSTRAINTS ON LAND REGISTRATION

The District Land Management Authority (DLMA) of Viengkham is the only agency authorized to proceed with land registration and to deliver land titles after PLUP. At the time of writing this handbook, Viengkham DLMA has not yet registered any land. Limited expertise and resources have been a recurring constraint on land allocation. With the advent of new projects, the systematic land use planning and land allocation of all villages in Viengkham District as planned by DLMA for 2011, many methodological and practical questions will be raised.

Suggestions for the implementation of land registration based on our PLUP experience in Viengkham District are as follows.

Main constraints faced by villagers in individual land registration are:

- (i) most subsistence farmers cannot afford to pay the cost of individual plot registration, and
- (ii) certain current land use types are not eligible for land titling such as land under rotational crops. Land use of this type represents most of the area classified as agricultural land while paddy land is very limited in Viengkham District as in many other upland areas of northern Lao PDR.

12.2 TOWARDS A 'NESTED-LAND REGISTRATION SYSTEM'

To prevent the risks of land grabbing by external investors, a nested-land registration system is proposed. The system consists of registering all plots delineated during the land zoning process as communal land using the form proposed in the following pages. The different zones would be officially recognized as managed by the village under the authority of the VLMC and village head. The land management rules and grievance mechanisms would be those described in both the PLUP Agreement and in the Communal Land Registration form.

Individual households willing to register individual land would then have to show that:

- the plot is cropped permanently (in accordance with the Land Law),
- it belongs to the village territory, and
- it is used in accordance with the Land Management Rules of the particular land use zone as defined in the PLUP Agreement.

As a result, in addition to avoiding land grabbing by external stakeholders, land registration would become one more incentive for households to comply with the land use plan in addition to the village action plan.

We hope these suggestions can be discussed with other practitioners and relevant agencies so that clear guidelines related to land registration can be provided to the district staff and village communities.

13. PLUP MONITORING

Monitoring is an essential component of any planning and development intervention. It provides the insight necessary to draw lessons from past experiences, identify what went wrong or well and why, and so to adapt existing plans and decisions accordingly, and improve planning approaches and future interventions. With regard to PLUP, two important dimensions should be considered for monitoring: (i) the implementation process itself and (ii) local accountability and capacity vis-à-vis agreements signed and the implementation of Village Action Plans.

13.1 THE PLANNING PROCESS

As emphasized in the PLUP manual and throughout this Handbook, enhanced public participation is crucial to the success of land use planning. On the one hand, it can generate important functional gains in terms of more legitimate decisions, wider public support and facilitated implementation of the plans. On the other hand, it carries also important ethical concerns in terms of equity and the right to self-determination. Thus, enhanced participation to planning is likely to engender a more sustainable development process.

Assessments of community participation in PLUP implementation should be undertaken in order to feed an adaptive learning process. At the level of individuals, assessment of community participation can focus on three main variables: (i) presence and influence during different stages of the planning process, (ii) ability to voice questions, aspirations and concerns, and (iii) understanding of the planning process, its objectives and outcomes. At the level of the community, participation should also be assessed in terms of the diversity of actors involved in the planning process (i.e. gender, ethnic and generational balance, social status).

In the context of the NAFRI-IRD-CIFOR project, a simple quantitative approach was developed based on questionnaire surveys in study villages having undergone PLUP or LUPLA. The following extract describes the method employed:

“Four key indicators were derived from questionnaire surveys of a random sample of 15–30 individuals in each study village. The first of these indicators, called presence, accounts for the physical attendance of individuals in different activities that constitute the village LUP process. Activities were attributed different values on the basis of (our perception of) their potential to bring about participation. This allowed us to derive scores valuing the level of presence of individuals during the LUP process. The second indicator, referred to as voice, relates to the types of verbal interventions made by individuals during LUP meetings and group discussions; that is, a simple request for clarification is attributed a value of 1, a demand for modification of the plan has a value of 2 and a direct critique has a value of 3. This scoring system enabled us to assess individuals’ contributions to discussions about village LUP. The third indicator measured individuals’ level of understanding of the objectives of village LUP. We asked interviewees to offer two main objectives of village LUP; understanding levels were then derived on the basis of the correspondence between perceived and official objectives – a value of 2 for key objectives explicitly mentioned in village LUP manuals (e.g. “to limit deforestation”, “to clarify land tenure”)

13. PLUP MONITORING

and 1 for more implicit or secondary objectives (“to reduce poverty”, “to promote tree plantations”). Finally, an overall participation level for each individual was calculated by summing presence, voice and understanding scores” (Lestrelin et al. 2011: 953).²

Although the above study remained limited to inter-individual differences in terms of social status (simple citizens versus. local elites), combining the method with data on gender, age, ethnicity, wealth, etc. of each individual interviewed can provide information on the average participation levels of a variety of social actors and thereby allows characterizing community participation in more detail. In turn, this assessment can provide useful indications for identifying shortcomings in the planning process, refining the methods and tools used, and, potentially, targeting facilitation efforts towards the participation of under-represented social groups.

13.2 LOCAL ACCOUNTABILITY AND CAPACITY

With a view to the long-term, monitoring efforts should also consider local compliance with agreements on village boundaries, land zoning and land use regulations. As stipulated in the PLUP agreement, the VLMC is the primary body responsible for recording all cases of land mismanagement, mediating land conflicts, filing charges against offenders and, potentially, communicating to the district authorities for conflict resolution...

²Lestrelin, G., Bourgoïn, J., Bouahom, B., Castella, J-C. (2011). Measuring participation: Case studies on village land use planning in northern Lao PDR. *Applied Geography* 31: 950-958.

Going beyond simple recording and sanctioning of deviant behaviour, monitoring must also be employed more positively in a reflection of the practicability and sustainability of existing land use plans and agreements. Again, the VLMC plays a key role in assessing the capacity of villagers to implement Village Action Plans. VLMC should produce annual reports on local achievements and challenges. These reports document, for each land use zone included in the Village Action Plan, existing shortcomings in local capacity (human, technical and financial) and extension support). On this basis, it suggests adapted support from extension services.

Keeping the momentum after the initial planning phase until it is decided to engage in a new PLUP is a real challenge for local communities in the absence of external incentives. Extension projects or mechanisms of payment for environmental services, such as REDD, may provide the necessary support to the VLMC towards long term monitoring of PLUP and its impacts on landscapes and livelihoods.

CONCLUSION

In this Handbook as in the PLUP Manual of MAF-NLMA, the presentation of the PLUP process as successive steps numbered from 1 to 9 or 13 makes it appear as being strictly linear. However, the activities are logically connected with one another and some obviously depend on the results fed in from a previous activity. The proposed chronological order helps in organizing field activities, but the coherence of the whole process is only realised after all the activities have been im-

plemented. The carrying out PLUP up to only stage 4 or 5 (or further), as is often mentioned by district staff, has no meaning whatsoever. PLUP must either completely implemented or not done at all. Therefore, it is very important that implementers make sure they have sufficient resources to carry out all activities with the village community otherwise an incomplete process can become a source of conflicts and/or frustration for all partners.

TOOLBOX

PARTICIPATORY LAND USE PLANNING



PARTICIPATORY LAND USE PLANNING (PLUP) IMPLEMENTATION BUDGET

In order for research and development projects to go beyond pilot exercises and engage in the full implementation of PLUP, a clear budget showing the costs of materials, equipment and human resources is required. Costs per village usually decrease when the equipment is used over large areas and as the expertise of the implementation team improves.

The cost estimates presented in this document are those gained from our PLUP implementation experience in Viengkham District in Luang Prabang Province in 2010-2011.

The costs are separated into the three categories described below:

- MATERIALS AND CONSUMABLES,
- PER DIEMS FOR DISTRICT STAFF AND PARTICIPANTS.
- EQUIPMENT (CAN BE USED FOR MORE THAN ONE VILLAGE).

Field expenses may be lower in some cases depending on the per diem policy of each project and on the specifics of each village (size, number of neighbouring villages, availability of electricity, etc).



1. MATERIALS COST

MATERIALS FOR THE CONSTRUCTION OF THE 3D MODEL (1 M²)

All prices quoted are in kip and are those prevailing in Luang Prabang in 2010-2011. These prices and may vary from place to place.

CONSUMABLES

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	LATEX GLUE	3	15,000	45,000	1 KG BOTTLE
2	PLASTER BANDAGE STRIPS	4	30,000	120,000	AVAILABLE FROM HOSPITALS OR PHARMACIES - LARGE SIZE
3	STICKY (SCOTCH) TAPE	6	20,000	120,000	LARGE ROLLS
4	PINS	1	20,000	20,000	SMALL BOX
5	COLOURED PAINT	1	10,000	10,000	6 COLOURS
6	TOPOGRAPHICAL MAP	1	200,000	200,000	PRINTED ON A0 PAPER
7	CARDBOARD	30	2,000	60,000	
8	CARBON PAPER	1	5,000	5,000	
TOTAL				580,000	

SMALL EQUIPMENT (SUFFICIENT FOR FIVE VILLAGES)

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	SMALL BOWL	2	10,000	20,000	
2	LARGE STANLEY KNIFE	2	20,000	40,000	
3	SMALL STANLEY KNIFE	4	13,000	52,000	
4	PEN	2	500	1,000	
5	RULER	2	10,000	20,000	1 METRE LONG
6	PAINT BRUSH	8	4,000	32,000	
TOTAL				165,000	33,000 PER VILLAGE

MATERIALS FOR LANDSCAPE SIMULATION AND ZONING

CONSUMABLES

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	NOTE BOOK	12	1,000	12,000	
2	PEN	12	1,000	12,000	
3	A0 PAPER	20	1,000	20,000	
4	MARKER PENS	6	5,000	30,000	3 COLOURS
5	AA BATTERIES	1	15,000	15,000	FOR A DIGITAL CAMERA
6	A4 PAPER AND PHOTOCOPYING			50,000	FOR PLUP AGREEMENTS
TOTAL				139,000	

SMALL EQUIPMENT (SUFFICIENT FOR TEN VILLAGES)

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	CALCULATOR	12	15,000	180,000	FOR VLMC MEMBERS
2	COLOURED STRING	12	10,000	120,000	12 COLOURS
3	WHITEBOARD	2	50,000	100,000	
TOTAL				400,000	40,000 PER VILLAGE

MATERIALS FOR MAKING THE WOODEN BOARD FOR THE DISPLAY OF THE LAND USE PLAN IN THE VILLAGE

The final land use plan is painted in colour on a wooden board and posted either at the village entrance or close to the village meeting hall. The cost (in kip) of the materials for its preparation is given below:

CONSUMABLES

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	WOODEN BOARD	1	350,000	350,000	120cm X150cm
2	COLOURED PAINT	5	10,000	50,000	SMALL BOTTLES
3	NAILS	2	15,000	30,000	
4	PAINT BRUSHES	2	8,000	16,000	
5	ROOFING TILES	4	40,000	160,000	
TOTAL				606,000	

2. PER DIEM FOR DISTRICT STAFF AND PARTICIPANTS

PER DIEM FOR THE PLUP FACILITATION TEAM AND PARTICIPANTS

- 4 facilitators: district staff from District Agriculture and Forestry Offices (DAFO) and District Land Management Authority (DLMA)
- 12 members of the Village Land Management Committee (VLMC)

Representatives from the neighboring villages (to be invited when the village boundaries have not yet been delineated by the district authority). Since, in our experience, most target villages share their borders with about 5-6 villages, we have based our estimate on six villages giving a maximum of 12 people assuming there are two representatives invited from each village:

NO	POSITION	NO. OF		KIP		COMMENTS	
		PEOPLE	DAYS	PER DAY	TOTAL		
1	DISTRICT STAFF	4	8	70,000	2,240,000	INCLUDING TRAVEL DAYS	
2	VLMC MEMBERS	12	6	30,000	2,160,000	EXCLUDING THE MEETING ON THE LAST DAY	
3	REPRESENTATIVES FROM NEIGHBORING VILLAGES	12	1	30,000	180,000	INCLUDING TRAVEL COST	
					TOTAL	4,760,000	

N.B. Our experience has shown that it is important to provide incentives to VLMC members in order to ensure that the same people participate in all of the week's activities. Otherwise, people constantly come and go from the meeting room. This disturbs their concentration and causes a loss of interest, and so limits the value of the initial training. Incentives are also important to ensure that all representatives of neighbouring villages are

present during both the village boundary delineation and collection of GPS points. If no incentives are offered some villages may not be represented in the meetings leading to complaints about village boundaries after PLUP has been completed.

PER DIEM FOR DISTRICT AUTHORITY REPRESENTATIVES

Representatives of the district authority (the Office of the Governor, DAFO and DLMA) are invited to attend the opening and closing village meetings of the PLUP process. Their presence is essential to make the process official and to ensure the full commitment of local communities and administrations.

NO	MATERIALS	NO. DAYS	KIP		COMMENTS	
			PER DAY	TOTAL		
1	HEAD OF VILLAGE CLUSTER	2	70,000	140,000	OPENING AND CLOSING MEETINGS	
2	DAFO REPRESENTATIVE	2	70,000	140,000		
3	DLMA REPRESENTATIVE	2	70,000	140,000		
4	DISTRICT GOVERNOR'S OFFICE REPRESENTATIVE	2	70,000	140,000		
					TOTAL	560,000

NB: Costs for the transportation of officials from the district and kumban are also covered by the project. They vary according to the distances travelled.

3. EQUIPMENT

LIST OF EQUIPMENT FOR PLUP IMPLEMENTATION

No prices are given in this equipment list because the costs of the equipment and associated consumables vary greatly depending on the quality.

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	GPS	2			
2	DIGITAL CAMERA	1			
3	LAPTOP COMPUTERS	3			
4	PROJECTOR	1			
5	COLOUR PRINTER (+ INK)	1			

ADDITIONAL EQUIPMENT REQUIRED IN VILLAGES WITHOUT AN ELECTRICITY SUPPLY

In the event that a village has no electricity supply additional equipment and consumables are required as shown below:

NO	MATERIALS	QUANTITY	PRICE/UNIT	TOTAL	COMMENTS
1	GENERATOR (+ PETROL AND 4T OIL)	1			1 KW
2	ELECTRICAL CABLE	30 M			
3	LAMPS	2			
4	ELECTRICAL PLUGS	2			
5	ELECTRICITY STABILIZERS - UPS	2			

COST SUMMARY

The costs per village, excluding those for equipment, are summarised in the table below.

NO	ITEM	COST (KIP)
1	MATERIALS FOR 3D MODEL CONSTRUCTION	613,000
2	MATERIALS FOR LAND ZONING	179,000
3	MATERIALS FOR WOODEN BOARD (VILLAGE LAND USE PLAN)	606,000
4	PER DIEM FOR DISTRICT STAFF AND PARTICIPANTS	4,760,000
5	PER DIEM FOR DISTRICT AUTHORITY REPRESENTATIVES	560,000
		TOTAL 6,718,000 KIP
		TOTAL COST (USD) 840 USD

SOCIO-ECONOMIC DATA AND PLUP PARAMETERS

One of the most important steps in the PLUP process is entering the information gathered into a computer. The information must be changed into data before it can be entered - this process is called parameterisation. The data is then used to evaluate the socio-economic and environmental impacts of different land use planning scenarios. The parameterisation is used for both PLUP Fiction and real land zoning. Data provided by villagers and members of the Village Land Management Committee (VLMC) need to be reliable as these have a greatly influence on the overall planning process and its outputs.

This toolbox provides insights on how to formulate the questions that will elicit the most reliable answers.

In order to calculate the impacts of a scenario quickly, an Excel program is used. The results are automatically calculated when entering the socio-economic data given by the VLMC.

This document also explains how to enter data in the Excel program **'villagename'_PLUP**.

IMPORTANT

First open the Excel file **'villagename'_PLUP** and click on the first sheet **"parameters"**, data must be entered on this sheet.



All data elicited from the villagers are entered in an Excel file for an automatic computation of the results. This makes it possible for the facilitator to check if the results calculated by the VLMC members are consistent with those generated by the computer.

1. TO COMPLETE “GENERAL VILLAGE INFORMATION” DATA IN THE EXCEL SPREADSHEET

Cells 1 to 6 must be completed first. To complete Cells 2 to 5, copy and paste the data from the “PLUP data” spreadsheet in the Excel file “village name” diagnosis. To complete Cell 6 ask “What is the average price of one kg of rice in the village?”

LABOUR FORCE CALCULATION

The formulas shown below are those in the Excel spreadsheet which automatically calculate labour force numbers required in 5 and 10 years’ time:

Cell 3 “parameters” where x = percentage population growth rate

YEAR 00:

Labour force numbers = P_0 (in the sheet “parameters”: Cell 2)

YEAR 01:

Labour force numbers = P_1

$$P_1 = P_0 + (P_0 \times \tau) = P_0 \times (1 + \tau)$$

YEAR 02:

Labour force numbers = P_2

$$P_2 = P_0 \times (1 + \tau) + (P_0 \times (1 + \tau) \times \tau) = P_0 \times (1 + \tau) \times (1 + \tau) = P_0 \times (1 + \tau)^2$$

YEAR 03:

Labour force numbers = P_3

$$P_3 = P_0 \times (1 + \tau)^3$$

YEAR N:

Labour force numbers = P_n

$$P_n = P_0 \times (1 + \tau)^n$$

2. TO COMPLETE THE “DESCRIPTION OF THE DIFFERENT ROTATIONAL AND PERMANENT CROPS”

Ask the Village Land Management Committee (VLMC) members the following questions to get the information needed to fill in all the empty cells of the Excel spreadsheet.

QUESTIONS TO ASK ABOUT VILLAGE LAND USES

1. For rotational crops in general:

- “Which rotational crops do you usually cultivate and which do you plan to cultivate in the future?” (Enter only the data for the crops cultivated and for those they plan to cultivate.)
- “How many hectares of each crop does one household cultivate on average in one year?” => (Deduce from this information, the percentage of each crop in the rotational crop cultivation area => enter in Cell 7 of the Excel spreadsheet).

2. For more information about each rotational crop:

- “How many years of fallow are there between each cropping season?” (=> enter in Cell 8)
- “How many labour units (man-years) are required to crop one hectare of each crop per year?” (=> enter in Cell 9. Write the result of this shown in Cell 9 on a piece of A0 paper and explain this to the VLMC members.)
- “Do you use herbicides on the cultivated plots?” If the answer is “Yes”, ask “How much do you spend for 1hectare?” (=> enter in Cell 12)
- “What is your average yield?” “How much do you get when you sell 1kg of this crop?” Calculate the income per hectare from these two answers (multiply the yield by the sales price). (=> enter in Cell 13. Write the result on the piece of A0 paper, explain how it was calculated).

2. TO COMPLETE THE "DESCRIPTION OF THE DIFFERENT ROTATIONAL AND PERMANENT CROPS"

EXAMPLE CALCULATION OF THE ANNUAL LABOUR FORCE NEEDED FOR ROTATIONAL RICE CULTIVATION

In Houay Thong Village, the labour force required per hectare for the cultivation of rotational rice cultivation is calculated as follows:

If 0.67 labour force units are needed to cultivate 1 hectare of rotational rice and for each 1 hectare of rotational rice, 3 hectares of fallow are needed, Thus in 1 year, 0.67 labour force units "use" 4 hectares of rotational rice.

$$\text{Then the annual labour force needed to cultivate 1 hectare of rotational rice} = 0.167 \left(\frac{0.67}{3+1} \right)$$

EXCEL CALCULATION OF THE LABOUR FORCE

The formulas in the Excel spreadsheet calculate the labour force needed for **1 ha/year** automatically:

For each rotational crop the following formula is used:

$$\text{Labour force (1bf) for 1ha/year} = \frac{\text{Nb of 11bf needed to cultivate 1ha}}{\text{Number of years of fallow} + 1}$$

$$\text{Result in Cell 9} = \frac{\text{Cell 9}}{\text{Cell 7} + 1}$$

EXAMPLE CALCULATION OF THE INCOME PER HECTARE OF ROTATIONAL RICE IN HOUAY THONG VILLAGE:

Rice costs about	2,500 kip/kg
The average village yield is about	1,500 kg/ha
Yearly income from one-hectare of rice is	3,750,000 kip

There are three fallow plots for every cultivated plot.

There are two applications of herbicides:

One costing	105,000 kip/ha
One costing	30,000 kip/ha
The total cost for herbicides is	135,000 kip/ha

So the final income from the shifting cultivation of upland rice is:

$$3,615,000 \text{ kip/ha} \\ (3,750,000 - 135,000)$$

But all the village plots are not under cultivation: for each hectare cultivated, three hectares are left fallow.

$$\text{Therefore the income from 1 hectare of rotational rice is } 903,750 \text{ kip/ha} = \frac{3,615,000}{(3+1)}$$

EXCEL CALCULATION OF THE INCOME PER HECTARE OF ROTATIONAL RICE:

The formulas in the Excel spreadsheet calculate the income per hectare of rotational rice automatically:

$$\text{Agricultural income from 1ha of rotational rice} = \frac{\text{Agricultural income for 1ha cultivated} - \text{herbicide expenses}}{\text{Total no of fallow plots} + 1}$$



2. TO COMPLETE THE "DESCRIPTION OF THE DIFFERENT ROTATIONAL AND PERMANENT CROPS"

3. For information on the collection of Non-Timber Forest Products (NTFPs):

- "From how many "fallow plots" does one household collect NTFPs?" (=> enter in Cell 10)
- "Which NTFPs do you collect in the fallows?" "How many kilograms do you collect per hectare?" "How much do you get for 1 kg of NTFPs?" The total income from NTFPs per hectare of fallow is the sum of all the income from the sale of each NTFP, (=> enter in Cell 11. Write the results generated on the piece of A0 paper, and explain the calculation).

EXCEL CALCULATION OF PERCENTAGES OF INCOME FROM NTFPS

The formulas in the Excel spreadsheet calculate the total income from the collection of NTFPs automatically :

$$\text{NTFP income /ha of rot.rice/year} = \left(\frac{\text{No of fallow plots in which NTFPs are collected} \times \text{NTFP income /ha of rot.rice}}{\text{Total no of fallow plots}+1} \right)$$

$$\text{Result in Cell 11} = \text{Cell 11} \times \frac{\text{Cell 10}}{\text{Cell 7} + 1}$$

4: The results from the above calculations are used to calculate the following averages:

- The average labour force number needed for the cultivation of 1ha of rotational crops
- The average total income from NTFPs from 1ha of rotational crops
- The average total income from agriculture income from 1ha of rotational crops

The three numbers are obtained averaging the values corresponding to the different activities for 1 ha over one year. For example, in the case of labour force for rotational crops the calculation is:

[Average number of labour forces for 1 hectare of rotational crop
= Number of labour force for 1 hectare rotational rice
x percentage of rotational rice in the rotational area
+ Number of labour force for 1 hectare rotational maize
x percentage of rotational maize in the rotational area
+... + Number of labour force for 1 hectare of other rotational crop
x proportion of other rotational crop in the rotational area]

CALCULATIONS

The screenshot shows an Excel spreadsheet with columns for 'Labour force', 'Percentage of rotational crop', and 'Total labour force'. The 'Total labour force' column is highlighted in orange, indicating the result of the sumprod function.

The function "sumprod" allows summing up the products of these two columns.

The formula used is the following:

Average number of labour forces needed for one hectare of rotational crop = sumprod (cell 8, cell 9')

5. For information on livestock grazing in rotational crop fallows

The data used here are the same as those already calculated with the exception of the income from NTFPs as livestock can damage these and/or reduce their natural regeneration. Ask villagers which NTFPs the animals eat and then subtract the income from these particular NTFPs from the total income. (=> enter in Cell 14).

6. For information on permanent crops without livestock grazing

Ask first the following questions:

- "Which permanent crops do you cultivate?"
- "How many hectares of each crop does one household have?" => Calculate the percentage under each crop in the cultivated area (=>enter in Cell 15).

For each crop ask the following questions:

- "How many labour force units are required for one hectare every year?" (=> enter in Cell 16 and write the result on the piece of the A0 paper)
- "Do you collect NTFPs in fields with permanent crop?" If the answer is "Yes" ask "Which do you collect?", "How many kilograms do you collect?" and "How much do you get per kilogram from the sale?" Calculate the total income from NTFPs by adding up the income from each NTFP for one hectare. (=> enter in Cell 17 and write the result on the piece of A0 paper).
- "Do you use herbicides or other agricultural inputs on the

2. TO COMPLETE THE "DESCRIPTION OF THE DIFFERENT ROTATIONAL AND PERMANENT CROPS"

plots?" If the answer is "Yes" ask "How much does it cost per hectare?" (=> enter in Cell 18).

- "What is your average yield?" and "How much do you get when you sell one kilogram of the crop?" Calculate the income per hectare by multiplying these two numbers (=> enter in Cell 19 and write the result on the piece the A0 paper).

EXAMPLE CALCULATION OF THE INCOME FROM PERMANENT CROPS:

The agricultural income from permanent crops is calculated as follows:

To calculate the income per hectare from a particular crop multiply the average yield by the sales price of 1kg) then subtract the cost of the inputs (e.g. herbicides).

Comment: Villagers often find it difficult to estimate the yield of cassava as this is harvested over a long period as and when needed by the households. However it is possible to estimate the production following the example of Houay Thong Village:

Here the villagers dug 2,400 holes, on 1 ha, in which to plant the cassava. This resulted in the growth and harvesting of only 2,300 plants since 100 were damaged by wild pigs and other animals

1 cassava plant yields an income of 1,000kip.

Therefore from 2,300 plants, the farmers income is 2,300,000 kip which is equivalent to **766,600 kips/ha/year** assuming the cassava is harvested over a three year period

3. TO COMPLETE "GENERAL INFORMATION ABOUT EACH LAND USE AND LIVESTOCK PRICE"

Before beginning PLUP, the following data for each land-use type must be collected:

1. The NTFP income per hectare from conservation, protection and production forests. Often the villagers do not have this information. This can be gained as follows:
 - Find out how many kilograms of each NTFP are collected per year either by the whole village or by a single household. In the latter case, multiply the number of kilograms collected by a single household by the total number of households collecting NTFPs in the village. Calculate the total income from NTFPs for the whole village by adding up all incomes from NTFPs.
 - Ask the villagers about the size of the forest area in which they collect NTFPs. To estimate the NTFP income per hectare divide the total village income by the number of hectares in which the NTFPs are collected.

Continue in the same way for the other land use types (=> enter in Cell 20 and write the result on the piece of A0 paper)

2. The agricultural return for 1hectare of each land use (=> enter in Cell 21 and write the result on the piece of A0 paper)
3. Ask about the number of large animals that can be raised on 1 hectare of every land-use type (=> enter in Cell 22 and write the result on the piece of A0 paper)
4. Ask about the labour force needed for 1 hectare of the different land uses. (=> enter in Cell 23 and write the result on the piece of A0 paper)

EXAMPLE CALCULATION OF INCOME FROM NTFPS:

In Houay Thong Village, the following NTFPs are collected in the forest:

Pong Peng: 100kg @ 1,500 kip/kg
= 300,000 kip for the whole village

Bamboo shoots: 50kg/HH by 94 HH = 4,700kg @ 2,000 kip/kg
= 9,400,000 kip for the whole village

Wild vegetables: 5 kg/HH by 94 HH = 470 kg @8,000 kip/kg
= 3,760,000 for the whole village

Bamboo worm: 20 kg by all the village@ 30,000 kip/kg
= 600,000 kip for the whole village

Bamboo: 50 canes by 94 HH = 4,700 kg @ 1,000 kip/cane
= 4,700,000 kip for the whole village

Wood: 50 trees/HH * 94 HH= 4,700 kg @ 2,000 kip/kg
= 9,400,000 kip for the whole village

Therefore the total village income is about **28,160,000 kip**. Villagers collect NTFPs from 1/3 (i.e. from 266ha) of almost 800ha of forest.

Therefore the income from NTFPs per hectare of forest (conservation, protection or production) is about **106,000 kip/ha**.

EXAMPLE CALCULATION OF PERCENTAGES OF LARGE ANIMALS IN HOUAY THONG VILLAGE:

There are 350 cows and 138 buffalo making a total of 488 large animals

The percentage of buffalo is	$(138/488) \times 100$	= 28 %
Therefore the percentage of cows is	100-28	= 72 %

- FOR INFORMATION ON PIGS AND GOATS, ASK ABOUT THE AVERAGE AGE AT WHICH THE ANIMALS ARE SOLD AND FOR HOW MUCH (=> ENTER IN CELLS 30-31-32-33). THE AVERAGE INCOME PER ANIMAL PER YEAR WILL THEN BE CALCULATED.

EXCEL CALCULATION OF THE AVERAGE ANNUAL INCOME FROM LARGE ANIMALS:

The Excel formula to calculate the average income per large animal per year is as follows:

Average income per large animal per year

=

Average age at which buffalo are sold *
their average price *
percentage of buffalo in the village

+

Average age at which cows are sold *
their average price *
percentage of cows in the village *

Average income per large animal per year

=

Cell24 * Cell25 * Cell26 + Cell27 * Cell28 * Cell29

4. TO COMPLETE "AREA OF THE DIFFERENT LAND USES FOR EACH PLUP ITERATION"

The same Excel file is used for both the parameters of the PLUP fiction role-play and for the real PLUP.

In PLUP fiction: for PLUP 1 (i.e. the first iteration), begin by entering the number of hectares for each land use calculated on the game board in **Cell 35**. In the subsequent rounds, enter the results in the correct order in **Cells 36-37-38...**

For the final round (simulation with a REDD project scenario) enter the number of hectares in **Cells 41**. Enter the change in the number of hectares of conservation forest as decided by the players as compared to the last PLUP iteration. (=> enter in **Cell 42**)

IMPORTANT POINT

Do not forget to fill in all the **Cells** for EACH PLUP iteration: the presence or absence of livestock (enter 1 or 0 respectively) and the percentage of rotational crop land, permanent crop land and grasslands/livestock areas that the villagers are really able to use when the topographic constraints are taken into account.

For the real PLUP, the first round corresponds to the current land use. The number of hectares for each land use must be entered in Cell 34. For the next rounds, enter in the order: PLUP iteration 1-2-3... (**enter in Cells 35-36-37...**)



'PLUP FICTION' ROLE PLAY

'PLUP Fiction' is a role play involving the 12 villagers selected by the whole village to serve as members of Village Land Management Committee (VLMC) in zoning simulations. It aims at increasing awareness of land zoning impacts on socio-economic and environmental parameters (e.g. incomes, labour

force numbers needed, rice self-sufficiency, livestock carrying capacity, biodiversity, etc.) associated with each land use plan.

This toolbox focuses on explaining the learning process supported by 'PLUP Fiction' through different rounds of planning.



FOR MORE INFORMATION

Bourgoin J, Castella J.C. (2011) 'PLUP Fiction': Landscape Simulation for Participatory Land Use Planning in Northern Laos. *Mountain Research and Development* 31(2): 78-88. <http://dx.doi.org/10.1659/MRD-JOURNAL-D-10-00129.1>

IMPORTANT POINT

During the first round, the players calculate by themselves the socio-economic and environmental impact of the scenario (i.e. the land use plan). For this, note books and calculators are provided. More information about the parameters and calculations are available in Toolbox 2.



INTRODUCTION TO THE VIRTUAL LANDSCAPE

The 12 villagers selected to serve as VLMC members are first introduced to a virtual landscape on the game board comprising 100 cells of one hectare each. There are 12 coloured role play cards: eight of these are red, two are yellow and two are green. The VLMC members each draw one of these cards in order to define their particular role as either farmers (villagers) or district officials during the role play.

- The eight VLMC members who drew the red cards represent the villagers
- The two VLMC members who drew the yellow cards represent staff of the Economic Development Division; their aim is to increase the income generated by the whole village as much as possible.
- The two VLMC members who drew the green cards represent staff of the District Forest and Environment Division; their aim is to preserve biodiversity and manage carbon stocks.

FIRST ROUND

The aim of the first round is to familiarize the VLMC members with the game. The land cover/use (agricultural area, forest area, shrub, plantation, village area, grass land) is represented on the game board in a virtual landscape of 100 1 ha cells. The players are asked to allocate land uses to each plot without modifying its land cover. The land uses associated to each land cover are summarised in the following table.

LAND COVER	LAND USE
AGRICULTURAL AREA	ROTATIONAL CROP AREA
	PERMANENT CROP AREA
FOREST AREA	CONSERVATION FOREST
	PROTECTION FOREST
	PRODUCTION FOREST
SHRUB	SHRUB
PLANTATION	PLANTATION
VILLAGE AREA	VILLAGE AREA
GRASSLANDS	NATURAL GRASSLANDS
	IMPROVED PASTURE

The players allocate the agricultural land (the yellow cells on the virtual landscape) to either rotational crops or permanent crops, the forest area (the green cells) to conservation, protection and production forest, and the grasslands to either natural grassland or improved pasture. They also choose the livestock zones and management strategy (e.g. free roaming, fences...).

FOR MORE INFORMATION

Castella J.C. et al. (2011) Evolving relations between agriculture and forest in Viengkham District, Luang Prabang Province. *Lao Journal of Agriculture and Forestry*, 23: 61-89.



SUBSEQUENT ROUNDS

During the second round, the future land use is planned from the initial land cover. The eight red card players (i.e. village representatives) return their cards and discover that they now belong to one of four different farmer types. This is to take into account the differences in household types within villages as described by Castella et al. (2011):

- A type households comprise those farmers whose subsistence depends on upland crops under shifting cultivation and NTFP collection.
- B type households are those able to accumulate rice surpluses and invest in livestock.
- C type households are those having reached a higher level of capital accumulation and invested in tree plantations of teak or rubber.
- D type households are those involved in off-farm activities.
- The composition of the player group is as follows:

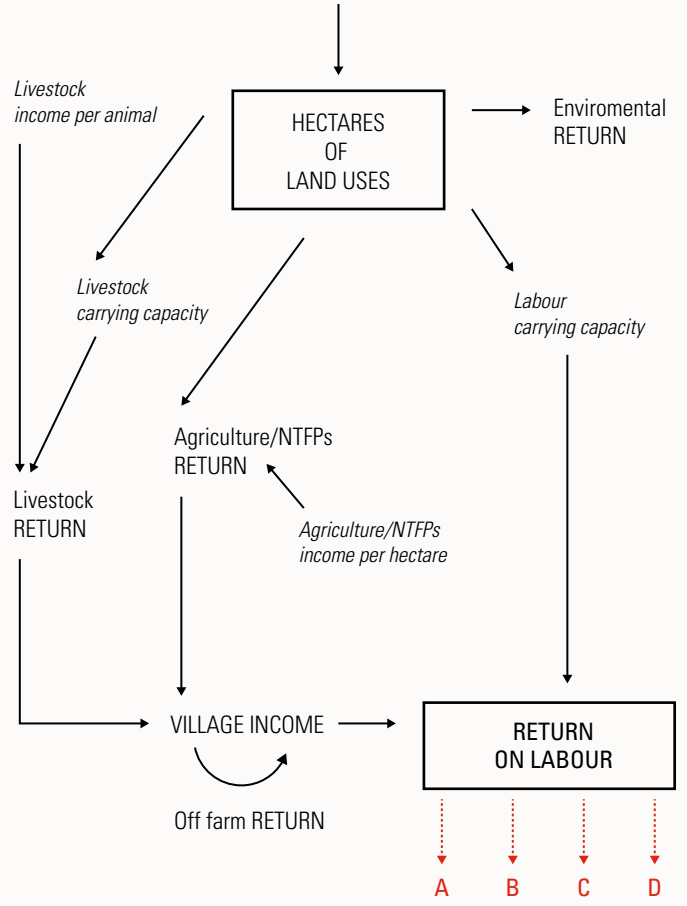
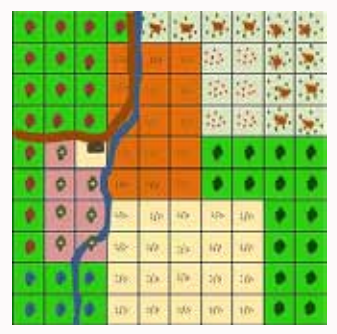
The players realise that land use changes do not have the same effect on different household types. During the next PLUP iterations each player makes decisions in order to increase the

income of his/her household type. Before each round, tracing paper is put over the game board so that the players are able to design their own land use plans. A negotiation process then begins. All the players try to plan the land use that will best match their individual goals. The calculation of the impact of the land use plan on individual and collective wealth, and landscape values in terms of biodiversity and carbon is made using the Excel spreadsheets. The facilitation team helps the players to analyse the impact of their zoning decisions.

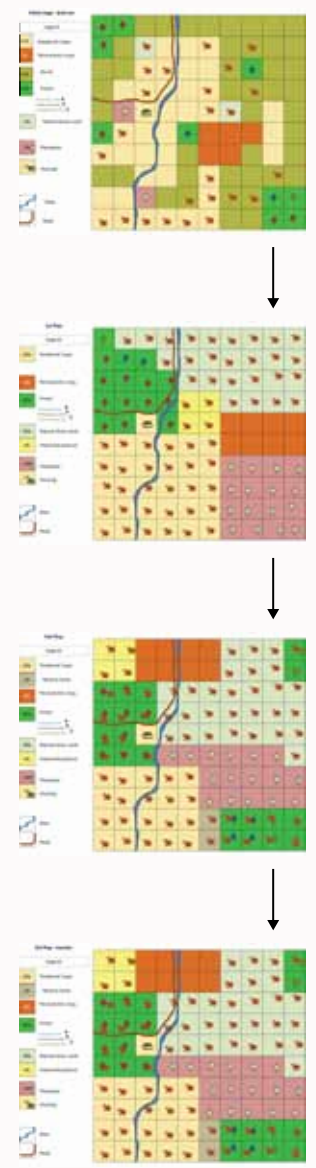
Once the socio-economic and environmental impact of a scenario is computed, each player is asked to choose and pin on one of the three satisfaction-level badges indicating how well the scenario fits with their strategy. These badges are coloured green for a good fit, yellow for a moderate fit and red for a poor fit. This gives all the players an idea about the general level of satisfaction. Depending on their role, players are encouraged to plan for the benefit of the whole community and not just in their own interests. The negotiation process ends once all participants are satisfied and a consensual land-use plan is reached.

CATEGORY	SUB-CATEGORY	MAIN GOAL	NUMBER
VILLAGE REPRESENTATIVES	FARMER PRACTICING ONLY SHIFTING CULTIVATION (TYPE A)	TO INCREASE THEIR INCOME	2
	FARMER WITH LARGE RUMINANTS (TYPE B)		2
	FARMER WHO INVESTED INTO PLANTATION (TYPE C)		2
	FARMERS WITH OFF-FARM ACTIVITIES AS A MAIN SOURCE OF INCOME (TYPE D)		2
ENVIRONMENTAL MANAGEMENT OFFICIALS		TO INCREASE BIODIVERSITY AND THE CARBON BIOMASS OF THE VILLAGE	2
DISTRICT ECONOMIC OFFICIALS		TO INCREASE THE TOTAL INCOME OF THE VILLAGE	2

SIMULATION BOARD



AN EXAMPLE OF THE ITERATIVE LAND USE PLANS REACHED IN HOUAYTHONG VILLAGE IN 2011



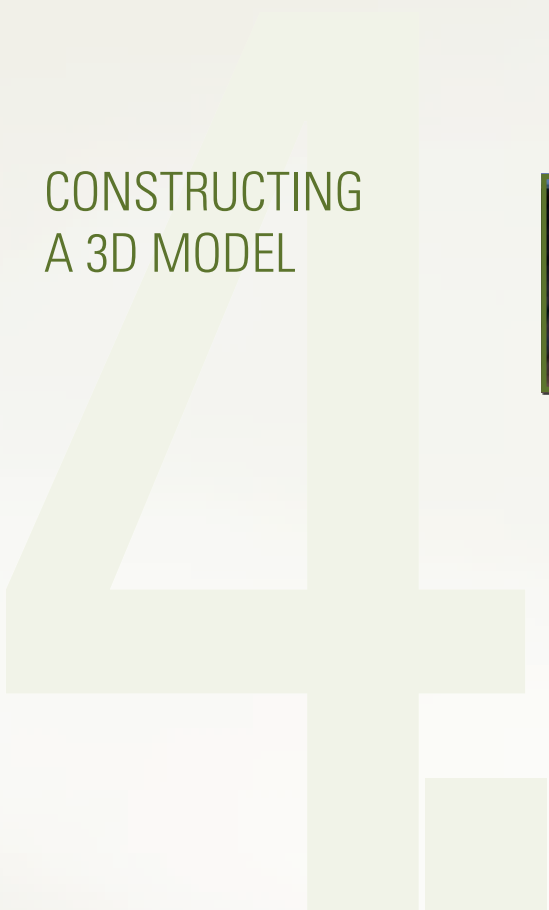
SCENARIO EXPLORATION

When all players are satisfied with the final plan, they are asked to react to different scenarios. The aim is to emphasise the fact that external factors can affect a land use plan. The players need to balance the positive and negative impacts of any external events on the village landscape and be prepared to adapt their land-use plan if they wish. The scenarios proposed are as follows:

1. A facilitator plays the role of a foreign investor planning to request a land concession of 20 ha for a rubber plantation for an annual payment of 100,000 kip/ha from the village.
2. Villagers receive payments for carbon credits under a REDD+ mechanism. For each ha of conservation forest 1,000,000 kip are paid annually to the village.

The whole group then engage in a discussion of these scenarios based on their land use planning experience gained from the previous rounds. They can easily assess the opportunity costs of the existing land uses and compare these with the options proposed.

CONSTRUCTING A 3D MODEL



IN A NUTSHELL

A three dimensional (3D) model provides a good support for participatory land use mapping. Built to scale, it reproduces the topographic features of the landscape. A group of five or six people are able to construct a 3D model from cardboard and plaster materials in only one day. The main advantages are that it is easily understood by everyone, has many different uses, and is a highly interactive tool for use in boundary delineations. During two dimensional participatory planning, some people found it very difficult to find their location on the map and so remained passive. However these same people were empowered by the 3D model and became active participants in the planning process.

See detailed information on Participatory 3D Modelling at:

http://www.iapad.org/participatory_p3dm.htm

A useful user manual is available at:

http://www.iapad.org/p3dm_guiding_principles_2010_en.htm

1. GENERATING THE REFERENCE TOPOGRAPHIC MAP

Prior to building a 3D model, a base map (topographic map) showing the contour lines, rivers and roads in the area should be generated using GIS software and printed on an sheet of A0 plastic paper. The base map generated should be of an appropriate size. We recommend producing a map with sides measuring between 70cm and 1m. If the resulting 3D model is too small, it may be difficult to delineate the topographic features precisely. On the other hand, if the topographic map is doubled in size, it takes four times as long to build the 3D model! However it is important to ensure that the map is large enough to include the entire territory of the village territory.

A layer of carbon paper is used to trace the coloured contour lines identifying the various elevations on the topographic map onto the sheets of cardboard. The contour lines are traced one after another beginning with the lowest and ending with the highest.

The space (e.g. 20m or 40m) allowed between the contour lines should be carefully selected depending on the landscape topography and the thickness of the cardboard to produce a realistic relief on the 3D model. The appropriate space can be checked using the following relationship:

$$\frac{\text{Altitude between each contour line}}{\text{Number of cardboards per contour line}} \approx \frac{\text{Cardboard thickness}}{\text{Scale (horizontal) of the model}}$$



2. DRAWING THE CONTOUR LINES ON THE CARDBOARD SHEETS

Villagers can participate in all the following steps in the construction of the 3D model. The construction process is easier if six participants work in three groups each of two people. Our experience has shown that the process is more efficient if one group is initially in charge of one step.

Group 1: Create the cardboard base of the 3D model by preparing a number of cardboard layers of the same size as the topographic map. The number of cardboard layers prepared must be the same as the number of different contour lines on the topographic map. When all the cardboard layers have been prepared the members of this group can help Group 3 with cutting the cardboard.

Group 2: Tape together sheets of carbon paper so as they match the size of the topographic map, and then place these over the cardboard base. Cover the carbon paper with the base map. The three layers are then pinned together.

Starting from the lowest elevation, use a pen to trace over each contour line so that the line is marked on the cardboard layer.

Repeat the process for each contour line on a new cardboard layer.

Not all parts of these cardboard layers will be used in the construction of the 3D model; some parts will be and others will be thrown away. Mark those parts that must be kept so that the Group 3 people, in charge of cutting the cardboard layers along the contour lines, know which pieces to keep and which to throw away.



3. OVERLAYING AND PASTING THE CARDBOARD LAYERS

The 3D model base is made by pasting together two cardboard layers which are larger in area than the base map. The successive layers of cardboard are then pasted on the base .

4. COMPLETION

Once the glue is dry, the cardboard layers are taped together using sticky tape. The whole 3D model is covered so that the relief is flattened and the model is made waterproof. This prevents the cardboard layers getting wet during the next step in which the 3D model is covered in wet plaster bandage strips (used in making plaster casts for broken arms or legs).

These plaster bandage strips are used to make the 3D model rigid, tough and provide a white surface for painting. The bandage strips are cut into smaller pieces, dampened in a bowl of water and then layered over the 3D model.

Once the 3D model has dried, topographic features such as rivers (in blue) and road (in red) can be drawn or painted. Use the indications of the topographic map to locate the roads, rivers and other landmarks.



SCENARIO ANALYSES WITH EXCEL SPREADSHEETS

After each iteration of the land zoning process, key indicators are calculated in Excel spreadsheets.

This toolbox highlights the way in which the results are calculated and which results should be presented to and discussed with members of the Village Land Management Committee (VLMC).

Some suggestions are given to help the facilitators in analysing these results and comparing them with the results of the previous plan in order to decide if the new iteration has provided better results than the previous plan

(or the current land use plan). Suggestions are also provided for a critical analysis of the results in order to improve the next round of zoning simulation.

This toolbox is to guide the facilitators for the land zoning both during 'PLUP Fiction' simulations and on the village 3D model.

After inputting the parameters of simulated land use plan (scenario) in the Excel file the results can be visualized by clicking on the corresponding sheet (for example for the third round of land zoning click on the sheet "PLUP 3").



1. PRESENTATION OF THE RESULTS TO THE VLMC

After each round of zoning the following results are shown to the VLMC:

- Number of full time worker calculated (required to implement the land use plan)
- Total income generated by the village including off farm activities
- Income equally distributed between the number of labour force needed for this PLUP
- Value of biodiversity index
- Value of carbon index

The table in the Excel file on the right of the precedent one gives the results not averaged to the number of labor forces required but to each type of livelihood system (see parameters in Toolbox 2):

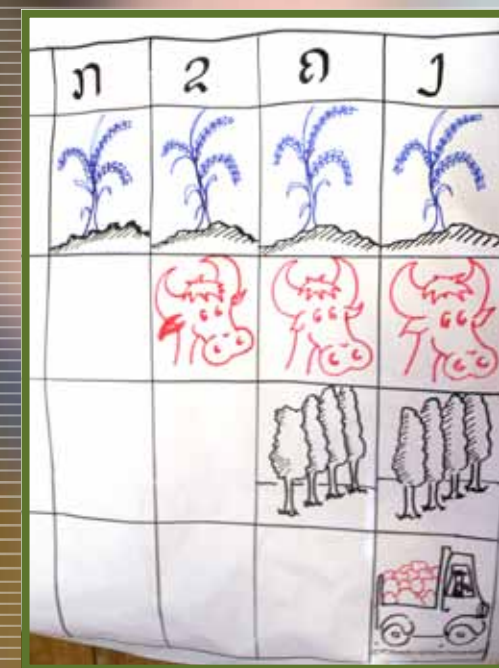
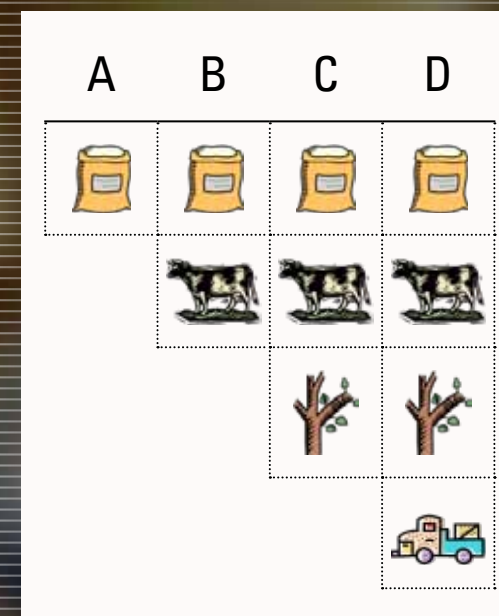
	TOTAL INCOME OF THE VILLAGE	AVERAGE INCOME PER LABOR UNIT	LABOUR FORCE NEEDED	BIODIVERSITY INDEX	CARBON INDEX	INCOME SHARE TYPE A	INCOME SHARE TYPE B	INCOME SHARE TYPE C	INCOME SHARE TYPE D
ROUND 1									
ROUND 2									
ROUND 3									
ROUND 4									

- Average income of Type A household (villager whose main activity is shifting cultivation)
- Average income of Type B HH (villagers whose main activities are cropping and livestock raising)
- Average income of Type C HH (villagers who invested in tree plantation)
- Average income of Type D HH (villagers whose income come from off farm activities)

The table to the right is used to explain the different household type, and why their income is different.

The results are displayed on a A0 paper on the wall (see table below)

The VLMC members can compare these results between successive rounds and assess their progresses in learning PLUP.



2. ENGAGING THE DISCUSSION WITH THE VILLAGE LAND MANAGEMENT COMMITTEE

The discussion with the members of the VLMC can be fed by the following indicators:

1. Compare the number of labour force needed for the PLUP and the number of labour force in the village that is expected in 5 and 10 years (available population trend assessment). Often the number of labour force needed to implement the plan is higher than the number of labour force the village will have in 10 years: The aim of the next round of zoning is to make a more realistic plan by reducing the gap between these required and available labour force. Explanations about how the result is generated also force the villagers to think about the quality of the information they provided as input to the simulation (rotation period, number of labour force...).
2. Look at the number of big livestock they can have with this plan, if it is lower than the number they have nowadays, warn them.
3. On the top right of the sheet, look at the cell "Number of labour force who can be fed with the rice they grow under this land use plan". Compare this number with the current labour force. Rice self-sufficiency cannot be reached under the simulated plan, then the cell appears coloured in orange, if not this one is green. Rice sufficiency may then be discussed with members of the VLMC.



IMPORTANT POINT

The calculated number of large ruminants is the maximum number they can have if all the zones are managed with the maximum number of livestock unit. The income from the livestock is calculated with this number, so often the income is over-estimated.



QGIS FOR LAND USE PLANNING

This tutorial for Quantum GIS is intended to provide users with some basic knowledge on Geographical Information Systems (GIS) as well as providing the skills required to perform a spatially explicit Participatory Land

Use Planning (PLUP). It is not an exhaustive guideline on how to use QGIS, but simply provides the basics in order to use this tool for PLUP in the context of Lao PDR.

QUANTUM GIS SOFTWARE

Free download and documents:
<http://www.qgis.org/>

GIS TECHNICAL TERMS

Coordinate reference system (CRS)	CRS is a coordinate-based local, regional or global system used to locate geographical entities.
Geographic Information Systems (GIS)	GIS is a software program that captures, stores, analyses, manages and presents data with reference to geographic location data.
Geo-reference	Geo-reference features mean to define its existence in physical space by establishing its location in terms of map projections or coordinate systems.
Line	One-dimensional lines.
Point	Zero-dimensional points used for geographical features that can best be expressed by a single point reference.
Polygon	Two-dimensional polygons are used for geographical features that cover a particular area of the earth surface.
Raster	A raster data type is any type of digital image represented by reducible and enlargeable grids.
Shapefile	The Esri Shapefile or simply a shapefile is a popular geospatial vector data format for geographic information systems software.
Vector	Different geographical features expressed by different types of geometry: points, line, polygon.

1. GETTING STARTED

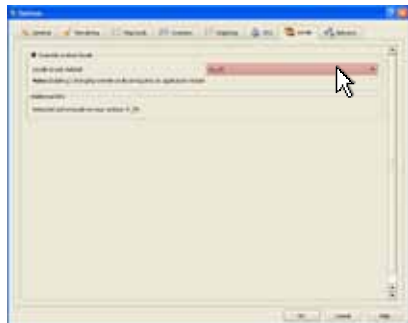
ORGANIZING SPATIAL DATA

BEFORE STARTING, DATA SHOULD BE STORED PROPERLY. CARE IS A NECESSARY QUALITY IN GIS. ALL THE DATA SHOULD BE STORED IN A SINGLE FOLDER. IN THIS FOLDER, A SUBFOLDER SHOULD BE DEDICATED TO THE LAYERS (RIVERS, ROADS, VILLAGES, CONTOUR LINES, ETC.) USED AT LARGER SCALE (DISTRICT, PROVINCE). THEN ANOTHER FOLDER SHOULD BE CREATED FOR EACH VILLAGE.

CHANGING THE LANGUAGE IN QGIS



- CLICK ON SETTINGS/OPTIONS...



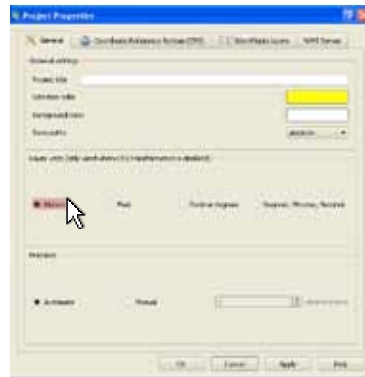
- SELECT THE PREFERRED LANGUAGE: "EN_US" FOR ENGLISH, "LO" FOR LAO

CREATING A NEW PROJECT

- FIRST, DEFINE THE PROJECT PROPERTIES. CLICK ON SETTINGS/PROJECT PROPERTIES...

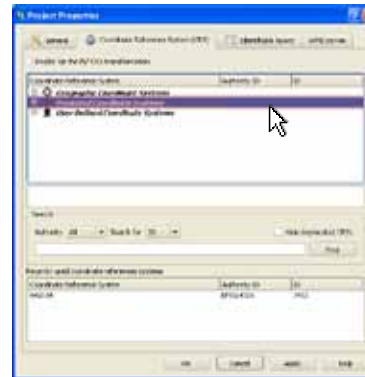


- CLICK ON GENERAL, DEFINE THE LAYER UNITS AS METERS



- CLICK ON CRS

- UNDER PROJECTED COORDINATE SYSTEMS FIND UTM, EXPAND THE FOLDER UNTIL YOU FIND: WGS 84 / UTM ZONE 48N



- PRESS OK
- CREATE A FOLDER NAMED AFTER THE TARGET VILLAGE, AND SAVE THE PROJECT IN THE FOLDER.

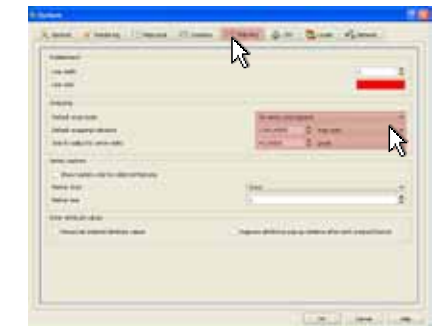
DIGITALIZING OPTIONS

- TO IMPROVE THE SENSIBILITY OF EDITING:

- CLICK SETTINGS / OPTIONS



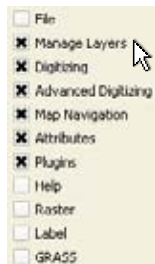
- SELECT THE TAB DIGITIZING, UPDATE THE SNAPPING OPTIONS CHOOSE 1000 MAPS UNITS, 40 PIXELS.



1. GETTING STARTED

SETTING GRAPHICS ENVIRONMENT

- IN VIEW/TOOLBARS MAKE SURE
 - MANAGE LAYERS,
 - DIGITALIZING,
 - ADVANCED DIGITALIZING,
 - MAP NAVIGATION,
 - ATTRIBUTES,
 - PLUGINSBOXES ARE TICKED (SEE BELOW).



- IN VIEW/PANELS MAKE SURE THE LAYERS BOX IS TICKED.

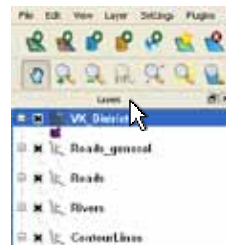
2. CREATING THE MASTER MAP

ADDING FEATURES

- GEOGRAPHIC FEATURES (ROAD, MAP, CONTOUR LINE, ETC..) NEED TO BE ADDED.
- CLICK ON ADD VECTOR LAYER ①, OPEN ②,
- FIND THE DIRECTORY WHERE GIS DATA IS STORED. ADD ROADS, RIVERS, CONTOUR LINES AND VILLAGE POINTS ③



- THE LAYERS SELECTED APPEAR IN THE TOOLBAR LAYERS.



- BY UNSELECTING THE LAYERS, THEY DO NOT APPEAR ON THE MAP.



- A LAYER CAN BE REMOVED BY LEFT CLICKING ON IT, AND THEN REMOVE.
- IF IN THE LAYER TOOLBAR LIST A LAYER IS ABOVE ANOTHER ONE, IT APPEARS IN THE TOP OF IT ON THE MAP.
- FOR EXAMPLE THE VK_DISTRICT LAYER IS ABOVE ROAD_GENERAL LAYER ON THE TOOLBAR LIST.
- THE MAP OF VIENGGHAM IS THEREFORE ON THE TOP OF THE ROAD.



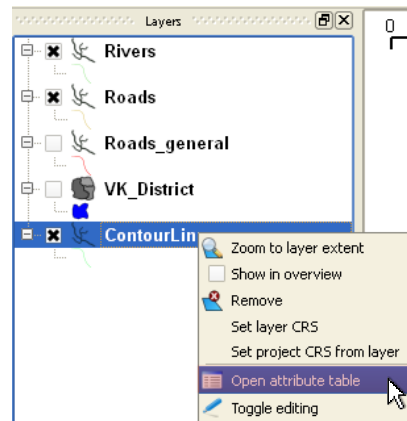
- THE ORDER OF LAYERS CAN BE EASILY CHANGED BY CLICKING ON A LAYER AND DRAGGING IT TO ANOTHER PLACE IN THE LIST.
- HERE THE LAYER ROAD_GENERAL HAS BEEN DRAGGED AFTER THE LAYER VK_DISTRICT.



2. CREATING THE MASTER MAP

VISUALIZING LAYER INFORMATION

- THE LAYERS ORDER CAN BE EASILY RE-ARRANGED ACCORDING TO WHAT THE USER WANTS TO SHOW.
- EACH LAYER CONTAINS DATA SPATIALLY DISPLAYED. ALL THE DATA IN A LAYER CAN BE VIEWED BY OPENING ITS ASSOCIATED ATTRIBUTE TABLE. RIGHT CLICK ON THE LAYER, AND THEN CLICK ON 'OPEN ATTRIBUTE TABLE'.



- THE ATTRIBUTE TABLE IS OPEN. IN THE FOLLOWING ATTRIBUTE TABLE OF THE LAYER CONTOUR_LINE_VIENHGKAM, EACH ITEM (LINE) CONTAINS TWO ATTRIBUTES: ID, AND CONTOUR.

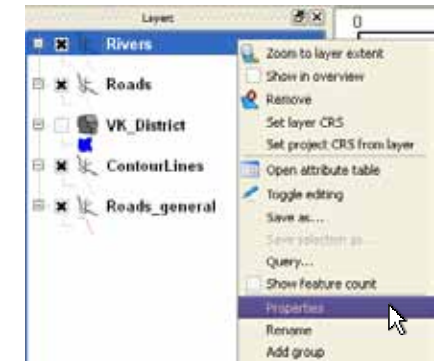
ATTRIBUTES			ITEMS
	CLSID	ELEVATION	
0	7102	1240	
1	7101	700	←
2	7101	700	←
3	7101	700	←
4	7102	740	
5	7102	660	
6	7102	660	
7	7101	1200	
8	7101	1200	
9	7102	660	
10	7101	1100	
11	7101	700	
12	7102	560	
13	7102	860	
14	7102	940	
15	7101	500	

- THE ATTRIBUTE ID IS AN IDENTIFICATION NUMBER WHEREAS THE ATTRIBUTE CONTOUR CONTAINS THE CONTOUR LINE LEVEL. HERE FOR EXAMPLE, THE FIRST ITEM IS A 400 METERS CONTOUR LINE.

MODIFYING THE FEATURES OF THE LAYERS

MODIFY COLOURS

- TO CHANGE THE COLOURS OF THE LAYER, RIGHT CLICK ON THE LAYERS, PROPERTIES, AND THEN SYMBOLOLOGY



2. CREATING THE MASTER MAP

MODIFYING THE FEATURES OF THE LAYERS

ONE COLOUR PER LAYER

- DEPENDING ON WHAT TO BE SHOWN, ONE OR SEVERAL COLOURS ARE USED PER LAYER.
- EXAMPLES: RIVERS, ROADS, VILLAGE POINTS.
- IN THE CASE ONE LAYER IS NEEDED TO BE SELF-COLOURED, SELECT 'SINGLE SYMBOL' IN 'LEGEND TYPE'. THE TRANSPARENCY RATE CAN BE CHOSEN ①, THE PATTERN ②, AND THE OUTLINE WIDTH ③



SEVERAL COLOURS PER LAYER

- GRADUATED COLOUR
- EXAMPLE: CONTOUR LINE
- SELECT GRADUATED SYMBOL IN LEGEND TYPE.
- THEN THE TRANSPARENCY RATE CAN BE CHOSEN ①, THE CLASSIFICATION FIELD ②, AND THE NUMBER OF CLASSES ③. THEN CLICK ON 'CLASSIFY' ④. QGIS AUTOMATICALLY CLASSES THE ITEMS IN THE NUMBER OF CLASSES THE USER SELECTED, ACCORDING TO THE ATTRIBUTE. ENTERED IN 'CLASSIFICATION FIELD'.



- IN THIS EXAMPLE ABOVE, THE CONTOUR LINE ARE CLASSIFIED ACCORDING TO THEIR ALTITUDE, PRODUCING THE MAP BELOW.



- NON GRADUATED COLOUR
- EXAMPLE: MAP OF THE AREAS OF THE VILLAGES.
- SELECT 'UNIQUE VALUE' IN 'LEGEND TYPE', THEN SELECT THE TRANSPARENCY RATE ①, THE CLASSIFICATION FIELD ②. THEN CLICK ON 'CLASSIFY' ③.



- IN THIS ABOVE EXAMPLE, COLOURS HAVE BEEN AUTOMATICALLY DESIGNED TO VILLAGES, PRODUCING THE MAP BELOW



ADD LABELS

- LABELS CAN ALSO BE ADDED. TO DO SO, RIGHT CLICK ON THE LAYERS, PROPERTIES, AND THEN LABELS ①. THE ATTRIBUTE CONTAINING THE LABEL NEED TO BE ENTERED IN 'FIELD CONTAINING LABEL'. IN THE BELOW EXAMPLE, VILLAGE NAME (ATTRIBUTE VILLAGE_NAME) WANTED TO BE ADDED, FOR ALL THE VILLAGES POINTS. THE FONT CHARACTERISTIC CAN BE CHANGED.



- IN THE MAP BELOW THE VILLAGE NAMES HAS BEEN ADDED NEXT TO EACH VILLAGE LOCATION POINT.



EXAMPLE

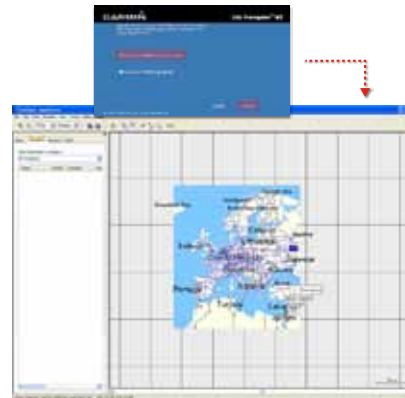
In the picture below, the layer Rivers have been coloured in blue, while the layer Roads is in red.



3. IMPORTING GPS POINTS

INSTALL THE MAP SOURCE PROGRAM

- INSERT THE CD SOFTWARE, THE INSTALLATION SHOULD START AUTOMATICALLY.



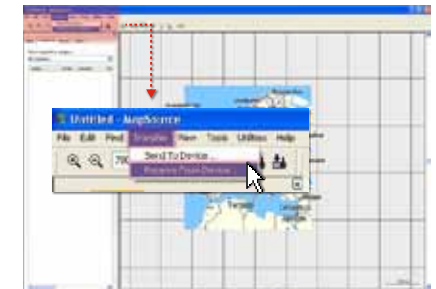
- OPEN THE MAP SOURCE PROGRAM
CLICK ON START ①
ALL PROGRAMS ②
GARMIN ③
MAP SOURCE ④



- PLUG THE GPS IN TO COMPUTER AND TURN IT ON

IMPORT GSP POINTS IN TO THE QGIS PROGRAM

- ON THE TOOLBARS CLICK ON TO **TRANSFER / RECEIVE FROM DEVICE**



- IF THE GPS TOOL LOCATION DOES NOT APPEAR, CLICK ON



- SELECT ONLY **WAYPOINTS / RECEIVE / OK**, THE GPS TOOL LOCATION WILL APPEAR.
- CLICK ON **FILE** ① / **SAVE** ②. SAVE THE GPS POINTS IN THE APPROPRIATE LOCATION IN THE COMPUTER. ADD A NAME ③. SAVE TYPE SHOULD BE GPS EXCHANGE FORMAT (*.GPX) ④. THEN CLICK ON **SAVE** ⑤.



- OPEN THE QGIS SOFTWARE, AND OPEN THE PROJECT THE GPS POINTS NEED TO BE ADDED.

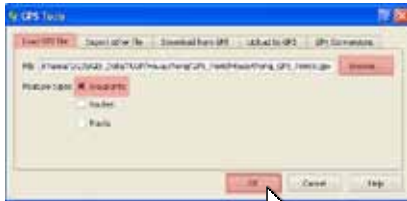
3. IMPORTING GPS POINTS

IMPORT GSP POINTS IN TO THE QGIS PROGRAM

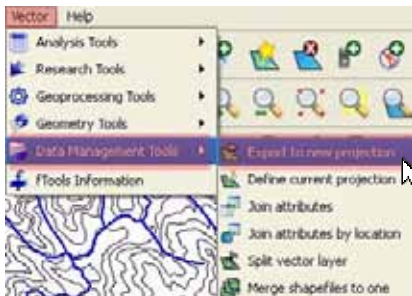
- CLICK ON **GPS TOOLS**



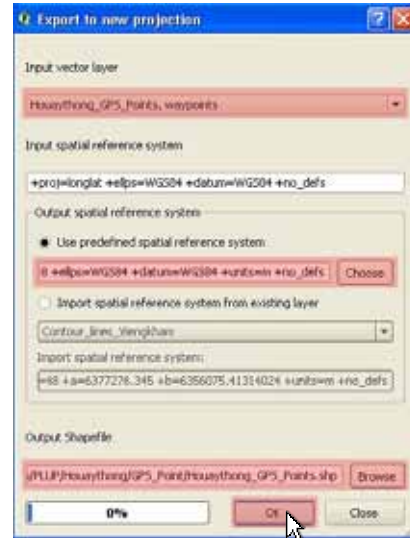
- CLICK ON **LOAD GPX FILE / BROWSE**. FIND THE GPX FILE SAVED. THEN CLICK ON **OPEN**, SELECT ONLY **WAYPOINTS / OK**



- CLICK ON TAB **VECTOR / DATA MANAGEMENT TOOL / EXPORT TO NEW PROJECTION**



- ON THE **EXPORT TO NEW PROJECTION**

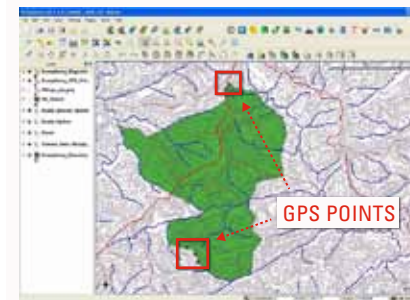
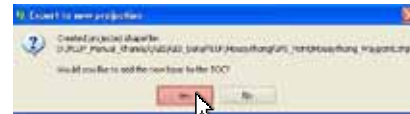


← INPUT VECTOR LAYER = WAYPOINTS

← CHOOSE = WGS 84/UTM ZONE 48N/OK

← BROWSE. FIND THE LOCATION FOR SAVING THE LAYER, ADD A NAME. SAVE
← CLICK OK

- CLICK ON TAB **YES**, WHEN QGIS ASKS "WOULD YOU LIKE TO ADD THE NEW LAYER TO THE TOC". THE LAYER CONTAINING GPS POINTS WILL BE ADDED TO THE PROJECT.



4. CREATE THE POLYGON OF THE VILLAGE BOUNDARY

IMPORTANT POINT

The photo need to be well-oriented (the north is up). Otherwise the georeferencing is impossible. If the photo has been not well-oriented, it needs to be turned up.

BEFORE ZONING, THE VILLAGE BOUNDARIES MUST BE SET-UP. THE VILLAGE BOUNDARIES MAY HAVE BEEN SET-UP BY DISTRICT AUTHORITIES. IN THIS CASE THE TEAM MUST BE COORDINATED WITH THEM AND HAVE A COPY OF THEIR SHAPEFILES TO START ZONING FROM IT. IN THE FOLLOWING PARAGRAPHS, THE TWO CASES ARE STUDIED.

IN THE CASE THE BOUNDARY OF THE VILLAGE HAS NOT BEEN SET UP YET

IF THE VILLAGE BOUNDARY HAS NOT BEEN DEFINED YET, THE LIMITS NEED TO BE ESTABLISHED BY VILLAGERS AND NEGOTIATED WITH NEIGHBOURING VILLAGES, ON THE 3D MODEL USING STRINGS AND NAILS (REFERENCE TO THE PREVIOUS TOOLBOX).

HOW TO TAKE A 3D MODEL PHOTO

ONCE THE BOUNDARY NEGOTIATION IS OVER, AND EVERYONE AGREES WITH THE BOUNDARY SET-UP, A PHOTOGRAPH OF THE 3D MODEL IS TAKEN. AN "USUAL" CAMERA IS ENOUGH. THE 3D MODEL IS FLAT ON A TABLE, AND THE PHOTOGRAPHER SHOULD BE AT AROUND 1M40 HIGHER THAN THE 3D MODEL HOLDING THE CAMERA HORIZONTALLY. SOMEONE STANDING IN FRONT OF THE PHOTOGRAPHER CAN CHECK THE LEVEL OF THE CAMERA. THE CAMERA ANGLE SHOULD BE LARGE ENOUGH TO INCLUDE THE WHOLE 3D MODEL (NOT ONLY THE VILLAGE AREA) AS IT WILL EASE THE GEOREFERENCING. BELOW A PHOTO OF THE VILLAGE 3D MODEL WITH DARK STRING USED TO DELINEATE THE VILLAGE BOUNDARY.



THE PHOTOGRAPH IS THEN COPIED IN THE VILLAGE FOLDER, IN THE FOLDER NAMED "BOUNDARY".

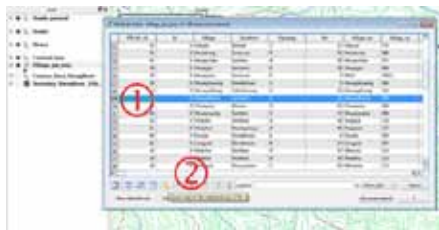
- ZOOM THE MAP TO THE TARGET VILLAGE LOCATION USING OTHER LAYERS. OPEN

4. CREATE THE POLYGON OF THE VILLAGE BOUNDARY

PHOTO GEOREFERENCING

THE ATTRIBUTE TABLE (RIGHT CLICK ON THE LAYER AND SELECT **OPEN ATTRIBUTE TABLE**) OF A LAYER CONTAINING THE TARGET VILLAGE LOCATION (HERE THE LAYER VILLAGES_PTS_PROJ). THEN LEFT CLICK ON THE IDENTIFICATION NUMBER ① OF THE LINE CONTAINING THE TARGET VILLAGE LOCATION. THEN CLICK ON THE MAGNIFYING GLASS ICON ②.

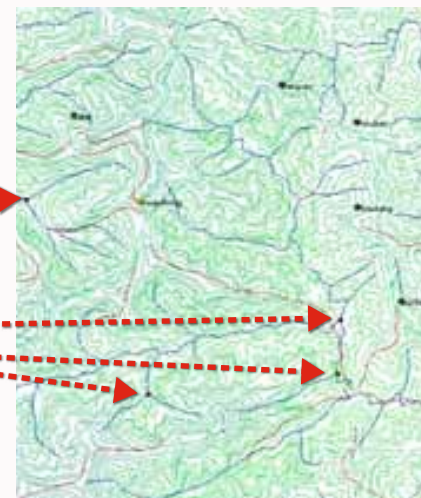
- CLICK ON **PLUGINS/GEOREFERENCER/GEOREFERENCER**



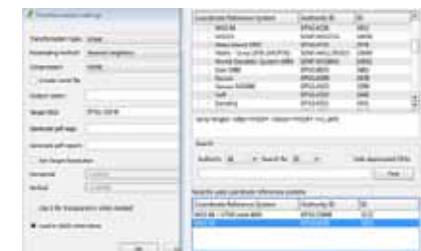
- CLICK ON **ADD RASTER** AND OPEN THE FOLDER WHERE THE PHOTO IS LOCATED
- LEFT CLICK ON THE PICTURE ON A REFERENCE POINT (VILLAGE, RIVER CROSSING...)
- ON THE WINDOW POPPING-UP, CLICK ON **'FROM MAP CANVAS'**



- LEFT CLICK ON THE SAME POINT FROM THE EXISTING LAYERS (VILLAGE, RIVER...)
- PRESS **OK** AND REPEAT THE PROCESS AT LEAST 3-4 TIMES



- A FEW RULES TO IMPROVE THE ACCURACY OF THE GEOREFERENCING:
 1. HAVE A LARGE NUMBER OF POINTS (BUT NOT TOO MUCH OTHERWISE IT CAN TAKE TIMES)
 2. HAVE POINTS SPREAD FROM ONE ANOTHER.
- WHEN DONE, CLICK ON **START GEOREFERENCING**.
- PRESS **OK** ON THE POP-UP WINDOW
- SET A LINEAR TRANSFORMATION TYPE
- SELECT A LOCATION FOR YOUR OUTPUT RASTER.
- DEFINE THE REFERENCE SYSTEM (**UTM/WGS84 ZONE 48N**)



- TICK **LOAD** IN QGIS BOX
- PRESS **OK**
- THEN THE RASTER IS NOW ADDED TO THE LAYER TOOLBAR.

4. CREATE THE POLYGON OF THE VILLAGE BOUNDARY

CREATION OF A BOUNDARY POLYGON

- CREATE A NEW SHAPE FILE LAYER ①



- SELECT **POLYGON** IN TYPE



- MAKE SURE THE COORDINATE SYSTEM IS **WGS 84/UTM ZONE 48N** FOR LAOS
- NEW ATTRIBUTE CAN BE ADDED BY ENTERING A NAME ①, AND THE ATTRIBUTE TYPE ②.



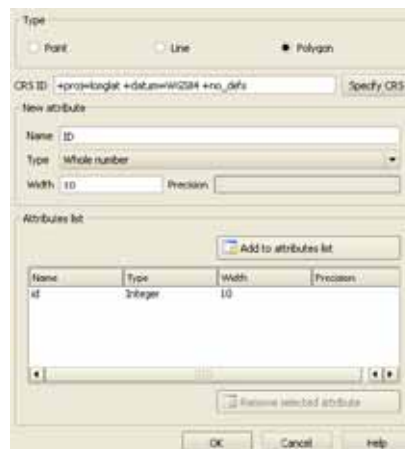
- THREE TYPES OF ATTRIBUTES CAN BE CREATED.



- THE 3 TYPES OF ATTRIBUTE CHARACTERISTICS ARE SUMMARIZED IN THE FOLLOWING TABLE.

TYPE	CHARACTERISTICS	EXAMPLES
TEXT DATA	CONTAINS ONLY CHARACTERS	LAND USE TYPE
WHOLE NUMBER	INTEGER NUMBERS	IDENTIFICATION NUMBER (ID)
DECIMAL NUMBER	DECIMAL NUMBERS	LAND USE AREA

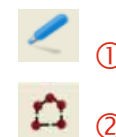
- THE NUMBER OF MAXIMAL CHARACTERS IS INDICATED IN "WIDTH".
- FOR THE BOUNDARY, THE LAYER WILL CONTAIN ONLY ONE ITEM: THE POLYGON OF THE BOUNDARY. THEREFORE, THERE IS NO NEED TO ADD ATTRIBUTES. HOWEVER QGIS ASKS FOR AT LEAST ONE ATTRIBUTE. YOU THEREFORE NEED TO ADD ID IN **NAME** ① AS A **WHOLE NUMBER** ②.



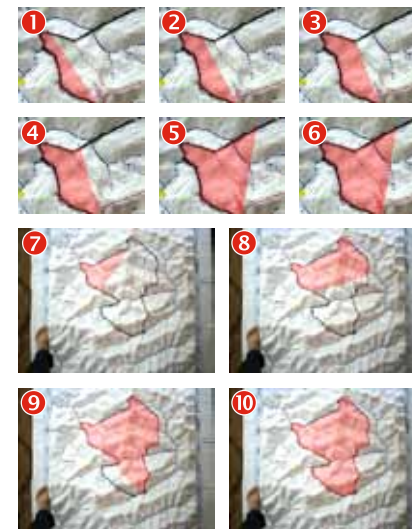
- PRESS OK.
- REORGANISE THE LAYERS SO THAT THE **BOUNDARY LAYER** IS ABOVE THE **BOUNDARY RASTER** (PHOTO).



- START EDITING BY CLICKING ON **TOGGLE EDITING** ①, AND THEN ON **CAPTURE POLYGON** ②.



- DESIGN A POLYGON BY SUCCESSIVE LEFT CLICKS ON THE BORDER AS SHOWN BELOW



- LITTLE BY LITTLE THE WHOLE AREA IS COVERED.

4. CREATE THE POLYGON OF THE VILLAGE BOUNDARY

CREATION OF A BOUNDARY POLYGON

- TO BE ACCURATE THE USER SHOULD NOT FOLLOW THE STRING BUT THE PROJECTION OF THE STRING ONTO THE 3D MODEL AS SHOWN BELOW.



- ONCE FINISHED, RIGHT CLICK AND A WINDOW POPS-UP AND REQUESTS FILLING IN THE ATTRIBUTES OF THE POLYGON.



- ENTER THE NUMBER OF THE POLYGON ID OR ANY OTHER INFORMATION THAT WILL ALLOW ITS IDENTIFICATION. AND CLICK **OK**.
- CLICK ON THE EDITING BUTTON AGAIN AND SAVE THE CHANGES.

MODIFY THE BOUNDARY

- ONCE FINISHED, A POLYGON CAN BE MODIFIED.
- START EDITING BY CLICKING ON **TOGGLE EDITING** ①, AND THEN ON **NODE TOOL** ②.



- RIGHT CLICK ON A NODE, AND MOVE IT. IN THE ABOVE EXAMPLE, THE BOUNDARY HAS BEEN MODIFIED TO FIT WITH A TAKEN GPS POINT.



WHEN THE VILLAGE BOUNDARY HAS ALREADY BEEN DELINEATED

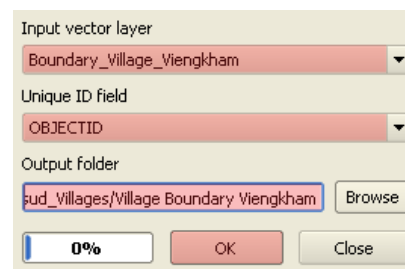
- WHEN THE VILLAGE BOUNDARY HAS BEEN DELINEATED, IT IS NOT NECESSARY TO FOLLOW THE STEPS DESCRIBED IN THE FIRST PARAGRAPH. ONLY A SHAPEFILE OF THE BOUNDARY OF THE TARGET VILLAGE NEEDS TO BE CREATED. IF SHAPEFILES OF THE BOUNDARIES OF SEVERAL VILLAGES EXIST, THE USER NEED EXTRACT ONLY THE BOUNDARY OF THE TARGET VILLAGE IN A NEW SHAPEFILE. IN THE FOLLOWING EXAMPLE, WE WILL EXTRACT A VILLAGE BOUNDARY FROM THE LAYER CALLED VIENGHAM_BOUNDARY_VILLAGES (SHOWN RIGHT).



- CLICK ON **VECTOR/DATA MANAGEMENT TOOLS/SPLIT VECTOR LAYER**



- FIRST SELECT THE INPUT VECTOR LAYER .



THIS IS THE LAYER YOU WANT TO SPLIT.

ENTER THE ATTRIBUTE OF THE LAYER (ENTERED ABOVE) CONTAINING A UNIQUE IDENTIFICATION (MOST OF THE TIME THE IDENTIFICATION NUMBER).

CHOOSE A DIRECTORY.

CLICK **OK**

- THEN CLICK ON **ADD A VECTOR LAYER**

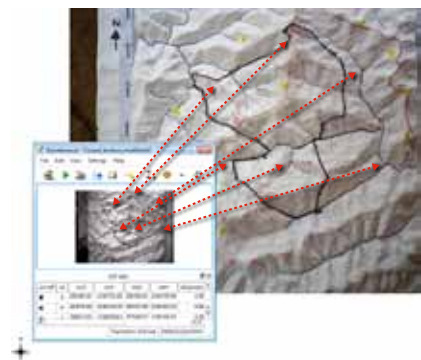


- AND OPEN THE SHAPEFILES OF THE TARGET VILLAGE. IF NECESSARY, RENAME THE SHAPEFILES.

5. CREATING ZONES FOR LAND USE PLANS

ZONING THE CURRENT LAND USE

- A PHOTOGRAPH OF THE 3D MODEL ON WHICH COMMITTEE HAS DELINEATED THE CURRENT LAND USE ZONES, IS TAKEN AND COPIED TO THE SUB-FOLDER NAMED THE 'CURRENT LAND USE' IN THE VILLAGE FOLDER.
- THE PHOTOGRAPH NEEDS TO BE GEO-REFERENCED. THE RASTER CAN BE EASILY GEO-REFERENCED USING FEATURES FROM THE **BOUNDARY** RASTER AS DONE IN THE EXAMPLE ABOVE.



SAVE THE FILE IN THE CURRENT LAND USE FOLDER AND NAME IT. **current_land_use.shp**

SELECT THE **WGS 84/UTM ZONE 48N** COORDINATE SYSTEM.

CLICK **OK** WHEN FINISHED

- ONCE GEO-REFERENCED, THE BOUNDARY LAYER SHOULD BE COPIED. RIGHT CLICK ON THE BOUNDARY LAYER, CLICK SAVE AS. NOW THAT THE CURRENT_LAND_USE VECTOR HAS BEEN CREATED, IT NEEDS TO BE OPENED.

- CLICK ON **ADD A VECTOR LAYER**



- AND OPEN THE CURRENT_LAND_USE VECTOR.

- TO MAKE THE FOLLOWING STEPS EASIER, HIDING THE BOUNDARY LAYER IS ADVISABLE TO.



- RIGHT CLICK ON THE CURRENT_LAND_USE LAYER, CLICK ON **PROPERTIES/SYM-**

BOLOGY.

- IN **FILL OPTIONS** SELECT ANY PATTERN ①, IN **OUTLINE OPTIONS**, SELECT A BRIGHT COLOUR ②, AND A **WIDTH** ③.



- REORGANISE THE LAYERS SO THAT THE VECTOR CURRENT LAND USE IS ABOVE THE RASTER (PHOTO) CURRENT LAND USE.



- NOW THE CURRENT LAND USE MAP IS DISPLAYED ON THE 3D MODEL TOGETHER WITH THE POLYGON OF THE CURRENT LAND USE MAP AS SHOWN BELOW.



5. CREATING ZONES FOR LAND USE PLANS

HOW TO CREATE ZONES WITH QGIS

- NOW, ZONES MADE ON THE 3D MODEL WILL BE CREATED ON THE LAYER CURRENT LAND USE. AT THE MOMENT, THERE IS ONLY ONE POLYGON IN THE VILLAGE, NAMELY THAT SHOWING THE WHOLE VILLAGE AREA. THE GOAL IS TO CREATE AS MANY POLYGONS AS ZONES CREATED BY THE VILLAGERS ON THE 3D MODEL DURING CURRENT LAND USE ZONING.
- ZONES CAN BE CREATED IN TWO WAYS WITH THE **SPLIT FEATURES** TOOL (THE "SCISSOR ICON" IN THE **ADVANCED DIGITALIZING** TOOLBAR): THESE ARE (I) WHEN A ZONE IS NOT INCLUDED IN ANOTHER ZONE AND (II) WHEN THE ZONE TO BE CREATED IS INCLUDED IN ANOTHER ZONE.

HOW TO CREATE ZONES NOT INCLUDED IN ANOTHER ZONE

- WE WANT TO CUT OUT THE ZONE INDICATED BY THE ARROWS.



- CLICK ON THE CURRENT LAND USE LAYER.
- CLICK ON **TOGGLE EDITING** ①, AND THEN ON **SELECT FEATURES** ②.



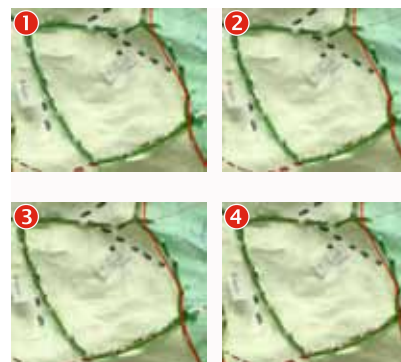
- SELECT THE ZONE THAT CONTAINS THE ZONE THAT NEEDS TO BE "CUT". ONCE SELECTED, THE ZONE IS COLOURED DIFFERENTLY.



- THEN CLICK ON **SPLIT FEATURES**.



- YOU NEED TO DELINEATE THE ZONE, STARTING FROM OUTSIDE SHOWN BY ① BELOW AND FINISHING AT ④ OUTSIDE THE ZONE YOU SELECTED.



- ONCE THE DELINEATION IS FINISHED, LEFT CLICK. THE ZONE SHOULD THEN APPEAR.



5. CREATING ZONES FOR LAND USE PLANS

HOW TO CREATE ZONES WITH QGIS

HOW TO CREATE ZONES INCLUDED IN ANOTHER ZONE

- SOMETIMES, THE ZONE TO BE CREATED IS ISOLATED FROM OTHER ZONES. FOR EXAMPLE, THE ZONE DELINEATED BY BLUE STRING IN THE EXAMPLE SHOWN BELOW.



- IN THIS PARTICULAR CASE, THE ZONE CREATION PROCESS IS DIFFERENT.

STAGE 1

- YOU NEED FIRST TO CREATE A ZONE USING THE SAME TECHNIQUE AS THAT DESCRIBED IN THE PARAGRAPH 0. HOWEVER IN THIS CASE THE WHOLE ZONE IS NOT DELINEATED AS SHOWN BELOW.



STAGE 2

- THEN YOU NEED TO "CUT" THE ZONE THAT HAS NOT YET BEEN DELINEATED. TO DO SO SELECT THE ZONE



TIP

Sometimes, unwanted artefacts appear such as the line in the following example. In this case it should be removed. To do so, use the Node Tool.



By clicking on any "bothersome points", they can be easily moved and merged with another line to hide them.



5. CREATING ZONES FOR LAND USE PLANS

HOW TO CREATE ZONES WITH QGIS

- AND THEN, CUT "IT".



STAGE 3

- THE ZONE HAS NOW BEEN CREATED. HOWEVER THE SURROUNDING ZONE IS NOW INTO TWO FEATURES! CLICK ON **SELECT FEATURES**, HOLDING THE **CTRL** BUTTON OF THE KEYBOARD, SELECT THE TWO FEATURES OF THE ZONES.



- THEN CLICK ON **MERGE SELECTED FEATURES**.



- THE WORK IS OVER.

MODIFY ZONES

- ONCE CREATED, A ZONE CAN BE MODIFIED. CLICK ON THE LAYER CONTAINING THE ZONE TO BE MODIFIED. THEN CLICK ON THE **TOGGLE EDITING** ① AND THEN THE **NODE TOOL** ②.

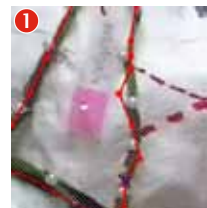


①



②

- THEN, RIGHT CLICK ON THE NODE TO BE MOVED ①, MOVE THE NODE ②, AND THEN CLICK ON **TOGGLE EDITING** TO SAVE.



- IT IS ALSO POSSIBLE TO MERGE ZONES USING THE **MERGE SELECTED FEATURES TOOL**.



- ONCE MERGED, THE ZONES ARE EASIER TO MODIFY.

SAVING

- ONCE ALL THE ZONES HAVE BEEN CREATED, CLICK ON **TOGGLE EDITING**, AND THEN SAVE..
- IT IS ALSO ADVISABLE TO SAVE THROUGHOUT THE ZONE CREATION PROCESS.

IMPORTANT POINT

\$area gives a result in square meters. Therefore in \$area/10000 the units are hectares.

The area calculation is not updated automatically when zone areas change. Therefore the area calculation should be done when all the zones have been created correctly made.

IMPORTANT POINT

It is easier to associate a land use type with the zones by looking directly at the 3D model zones.

5. CREATING ZONES FOR LAND USE PLANS

CALCULATE THE AREA OF EACH ZONE AND EACH LAND USE TYPE

CALCULATE THE AREA OF EACH LAND USE ZONE

- RIGHT CLICK ON THE LAYER AND OPEN THE ATTRIBUTE TABLE, CLICK ON THE **TOGGLE EDITING MODE** BUTTON.



- AND CLICK ON **FIELD CALCULATOR**.



- IN **NEW FIELD**, WRITE "AREA" IN **OUTPUT FIELD NAME**, IN **OUTPUT FILED TYPE** SELECT **DECIMAL NUMBER (REAL)**, IN **OUTPUT FIELD WIDTH**, LEAVE 10. IN **FIELD CALCULATOR EXPRESSION**, WRITE "\$AREA/10000".

ASSOCIATE EACH ZONE WITH ITS LAND USE TYPE

- TO ASSOCIATE EACH ZONE WITH ITS CORRESPONDING LAND USE TYPE, RIGHT CLICK ON THE LAYER AND OPEN THE ATTRIBUTE TABLE, CLICK ON THE **TOGGLE EDITING MODE** BUTTON.

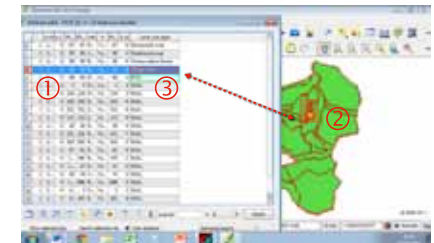


- AND CLICK ON **NEW COLUMN**



- IN **NAME**, WRITE LAND_USE_TYPE, IN **TYPE**, SELECT **TEXT (STRING)**, AND IN **WIDTH**, 30. CLICK ON **OK**.

- THEN SELECT ① THE FEATURES OF THE LAYER ② LOCATE IT ON THE MAP AND ③ WRITE THE NAME OF THE ASSOCIATED LAND USE TYPE IN THE CORRESPONDING COLUMN.



5. CREATING ZONES FOR LAND USE PLANS

CALCULATE THE AREA OF EACH ZONE AND EACH LAND USE TYPE

- TO CALCULATE THE AREA OF EACH LAND USE TYPE, THE SUM OF ALL THE AREAS NEED TO BE CALCULATED USING THE FOLLOWING FORMULA:

$$\text{Area land use type } \alpha = \sum_{\text{Zones } \alpha} \text{Area}$$

CALCULATE THE LAND USE TYPES TOTAL AREA USING A PIVOT TABLE

- TO DO SO, SELECT ALL THE FEATURES OF THE LAYERS (HOLDING THE **SHIFT** BUTTON OF THE KEYBOARD, SELECT THE FIRST AND THEN THE LAST FEATURE OF THE ATTRIBUTE TABLE), CLICK ON **COPY SELECTED ROWS TO THE CLIPBOARD**.



- THEN PAST THE CLIPBOARD TO AN EXCEL SHEET. CREATE A PIVOT TABLE, GIVING THE TOTAL AREA FOR EACH LAND USE TYPE (SEE BELOW).

	A	B	C
1			
2			
3	Land use types	Sum	
4	Conservation Forest	165,17	
5	Improved pasture	122,54	
6	Livestock area	552,10	
7	Permanent crops	27,62	
8	Plantation	312,22	
9	Production Forest	351,25	
10	Protection Forest	455,01	
11	Reserve land	251,78	
12	Rotational crops	1577,08	
13	Settlement area	12,34	
14	Total village area	3827,11	

CALCULATE THE LAND USE TYPES TOTAL AREA MANUALLY

- USING A PIECE OF PAPER AND A CALCULATOR, FOR EACH LAND USE TYPE CALCULATE THE SUM OF THE AREAS OF THE CORRESPONDING ZONES.
- THE TOTAL AREA OF EACH LAND USE TYPE NEEDS TO BE GIVEN TO THE FACILITATORS AND THE PERSON IN CHARGE OF CALCULATING THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF THE LAND USE PLAN.
- FOR EACH NEW LAND USE FOLLOW THE STEPS GIVEN IN PARAGRAPH 0. HOWEVER, EACH TIME COPY THE PREVIOUS LAND USE PLAN, AND RENAME IT.



EXAMPLE

The following table provides an example of land zone presentation for inclusion in the PLUP agreement

	A	B	C	D	E	F
1	ລຳດັບ	ປະເພດດິນ	ຈຳນວນຫອມ	ຊື່ຕີງ	ເນື້ອທີ່ແຕ່ລະຫອມ (ເສດ)	ເນື້ອທີ່ລວມ (ເສດ)
2	1	ປ່າສະຫງວນ	2	ເສດກິ່ວຕາລອງເກາະ	90,51	165,17
3	2			ເສດຄ່ວນຕິງບັງ	74,66	
4	3	ດິນບູກຄົນຊ່າງສັດ	1	ເສດອຳຄົວຍາກ	122,54	122,54
5	4	ເສດຊ່າງສັດ	1	ເສດບ້ານເຮືອນຳພັນ	552,10	552,10
6	5	ດິນບູກຄົນຕີງສີ່	1	ເສດດິນບູກຄົນຕີງ	27,82	27,82
7	6	ສວນບູກຄົນໄມ້	3	ເສດຄ່ວນມິ່ງຍ່າ	69,95	312,22
8	7			ດິນສີນສູນັກຂອງ	7,97	
9	8			ສີນສູນັກຍ່າ	234,30	
10	9	ປ່າຊົມໃຊ້	2	ເສດບູກຄົນຄວາຍ	67,95	351,25
11	10			ເສດອ່ອນມ່າຍ	283,30	



5. CREATING ZONES FOR LAND USE PLANS

ZONING THE LAST LAND USE PLAN

- FOR THE LAST LAND USE PLAN, THE STEPS UNDERTAKEN ARE THE SAME AS IN PARAGRAPH 0. HOWEVER THE LOCATION OF EACH PLOT NEEDS TO BE DEFINED.

ADD LOCATION TO EACH PLOT

- RIGHT CLICK ON THE LAYER, OPEN THE ATTRIBUTE TABLE, CLICK ON THE **TOGGLE EDITING MODE** BUTTON.



- AND CLICK ON **NEW COLUMN**



- IN **NAME**, WRITE LOCATION, IN **TYPE**, SELECT **TEXT (STRING)**, AND IN **WIDTH**, 50. THEN CLICK ON **OK**.
- THEN SELECT FIRST THE FEATURES OF THE LAYER, LOCATE THEM ON THE MAP, AND THEN WRITE THE NAME OF THE ASSOCIATED LOCATION IN THE LOCATION COLUMN.

EXPORT THE TABLE

- TO DO SO, SELECT ALL THE FEATURES OF THE LAYERS (HOLDING THE **SHIFT** BUTTON OF THE KEYBOARD, SELECT THE FIRST AND THEN THE LAST FEATURE OF THE ATTRIBUTE TABLE), CLICK ON **COPY SELECTED ROWS TO THE CLIPBOARD**



- THEN PASTE THE CLIPBOARD TO AN EXCEL SHEET. CREATE A PIVOT TABLE, GIVING THE TOTAL AREA OF EACH LAND USE OR CALCULATE IT MANUALLY. CLASSIFY THE ZONE PER LAND USE TYPE. FROM THIS TABLE, CREATE A TABLE IN EXCEL WITH THE FEATURES PRESENTED IN THE FOLLOWING TABLE.

TYPE	CHARACTERISTICS
COLUMN 1	IDENTIFICATION CODE PER ZONE (PLOT) CLASSIFIED PER LAND USE TYPE
COLUMN 2	LAND USE TYPE NAME (MERGED CELL)
COLUMN 3	NUMBER OF PLOTS PER LAND USE TYPE (MERGED CELL)
COLUMN 4	LOCATION
COLUMN 5	AREA OF THE PLOT
COLUMN 6	AREA OF THE LAND USE ZONE (MERGED CELL)

6. THE LAND USE MAPS

MAP LAYERS PREPARATION

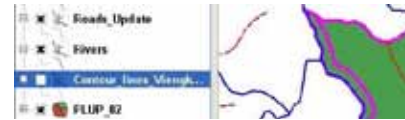
- ONCE CONSENSUS ON A FINAL LAND USE PLAN HAS BEEN REACHED, MAPS NEED TO BE DESIGNED. FOR THE PLUP AGREEMENT, MAPPING OF THE FINAL LAND USE PLAN IS NEEDED, AND FOR THE VILLAGE MONOGRAPH, MAPPING OF BOTH THE CURRENT LAND USE AND THE FINAL LAND USE PLAN ARE NEEDED.
- THE STEPS FOR MAPPING ARE GIVEN BELOW.

SHOW THE LAYERS NECESSARY FOR THE MAP

- THE MAP NEEDS TO INCLUDE: ROADS, RIVERS, AND STREAMS, BOUNDARIES, AND GPS POINTS. COLOURS OF THESE LAYERS, AND THEIR RELATIVE POSITIONS NEED TO BE SET-UP.
- THE EXAMPLE SHOWS THE HOUAYTHONG MAP IN QGIS BEFORE EXPORT TO THE IMAGE MAP



- IF NECESSARY UNSELECT THE OTHER LAYERS. IN THE EXAMPLE BELOW THE LAYER **CONTOUR_LINES** IS HIDDEN.



ADD THE COLOURS FOR EACH LAND USE TYPE

- LEFT CLICK ON THE LAYER FINAL LAND USE PLAN ①, AND THEN **PROPERTIES/SYMBOLOLOGY** ②. IN THE **LEGEND TYPE**, SELECT **UNIQUE VALUE** ③, AND IN **CLASSIFICATION FIELD**, SELECT THE **LAND_USE_TYPE** ATTRIBUTE ④. THEN **CLASSIFY** ⑤. EACH LAND USE WILL BE AUTOMATICALLY ASSOCIATED WITH COLOURS (SEE BELOW). HOWEVER TO BE CONSISTENT, A SPECIFIC COLOUR SHOULD BE ASSOCIATED WITH EACH LAND USE.



- TO CHANGE THE COLOUR OF A LAND USE TYPE, CLICK ON THE LAND USE TYPE ①, IN **FILL OPTIONS**, SELECT THE COLOUR DEDICATED TO THE LAND USE TYPE ②, IN **OUTLINE OPTIONS**, SELECT **NONE** ③. ONCE EACH THE LAND USE TYPE IS ASSOCIATED WITH THE CORRECT COLOURS, CLICK ON TAB **APPLY** ④/**OK** ⑤.



ADD THE BOUNDARY AND SELECT THE COLOUR

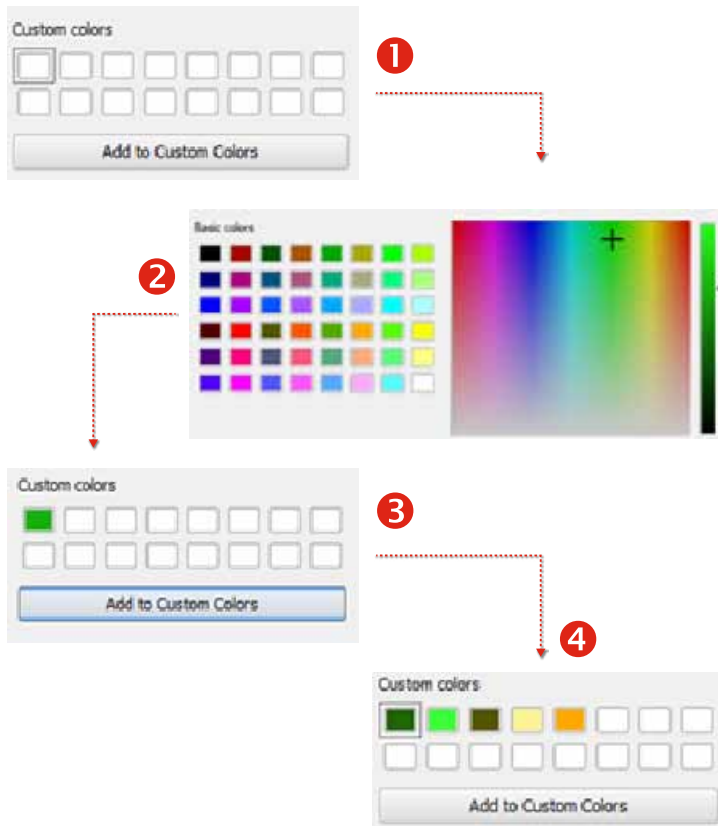
- CLICK ON **ADD VECTOR LAYER** ①/ **BROWSE** ②, FIND THE SHAPEFILES OF THE BOUNDARY. THEN **OPEN** ③ AND **OPEN** AGAIN.



TRICK

To make sure that the same colour is used, Custom Colours can be used. Select a location in the custom colour ①, choose a colour ②, and click on Add to Custom Colour ③. Associate a colour with each land use, ④.

From now on, the colours of the custom base can be used for all the new layers.



IMPORTANT POINT

To save time, associating land use types with colours can be done using Style. Once the association is finished, save the style by clicking on Save Style, and save the Layer Style File in the appropriate directory. Instead of associating land use type with an appropriate colour each time, the style can be opened using Load Style. However to use a style again with a different layer, the classification field needs to include exactly the same content as the classification field in the original layer (same number, same spelling). We therefore do not advise the use of Style.

6. THE LAND USE MAPS

MAP LAYERS PREPARATION

- AS THE POLYGON OF THE BOUNDARY IS ABOVE THE COLOURS OF THE LAND USE TYPE, LEFT CLICK ON THE BOUNDARY LAYER ① AND **PROPERTIES**. CLICK ON **NONE** IN **FILL OPTIONS**. THEN IN **OUTLINE OPTIONS**, SELECT A DASHED LINE, A DARK LINE COLOUR, AND THE LINE WIDTH ③. THEN CLICK ON **APPLY/OK**



6. THE LAND USE MAPS

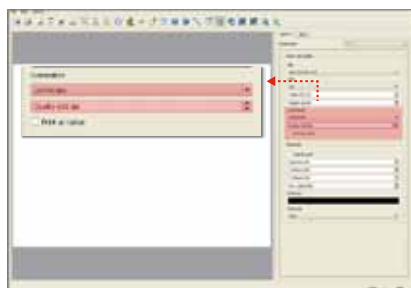
EXPORT THE IMAGE MAP

ADD THE MAP

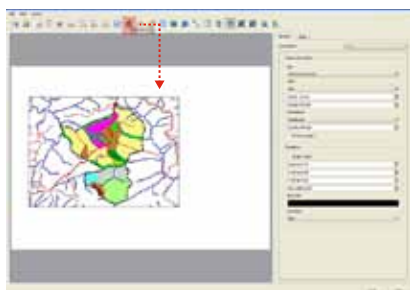
- CLICK ON **FILE/NEW PRINT COMPOSER** AND, THE SCREEN OF THE COMPOSER POPS-UP.



- ON THE RIGHT, IN **GENERAL**, SET THE **ORIENTATION** (LANDSCAPE OR PORTRAIT) AND THE **QUALITY** AT **600 DPI**.



- CLICK ON **ADD NEW MAP**, AND DRAW A RECTANGLE IN THE PAGE.



- TO MOVE THE MAP ITEM USE THE **SELECT/MOVE ITEM** TOOL.



- HOWEVER, TO MOVE THE MAP CONTENT WITHIN THE ITEM, USE THE **MOVE ITEM CONTENT** TOOL.

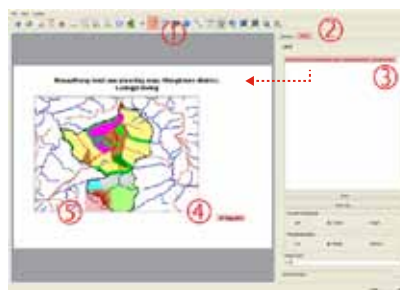


- TO CHOOSE THE SCALE, IN **ITEM** MODIFY THE BOX **SCALE**.

ADD THE TITLE AND DATE

- CLICK ON **ADD LABEL** ①. IN **ITEM** ②, CHANGE THE MAP TITLE ③. TO WRITE IN LAO, CHANGE TO **LAO FONT** AND REWRITE THE TITLE. TO REMOVE THE FRAME LINE OF THE TITLE BOX CLICK ON **GENERAL OPTIONS/FRAME COLOURS**, SELECT **WHITE COLOUR** AND THEN PRESS **OK**.

- DO THE SAME TO ADD THE DATE ④ AND THE GPS POINT IDENTIFICATION NUMBERS ⑤.



ADD THE LEGEND

- CLICK ON **ADD NEW VECTOR LEGEND** ① AND CLICK ON **THE PAGE** ②). THE LEGEND CAN BE UPDATED IN **ITEM** ③. TO CHANGE THE NAME CLICK ON **EDIT** ④, **REWRITE THE NAME** ⑤, THEN **OK** ⑥. TO REMOVE THE LINE OF THE TITLE BOX CLICK ON **ITEM OPTIONS** ⑦ / **FRAME COLOURS** / **SELECT WHITE COLOUR / OK**.

- TO REMOVE THE LEGEND, CLICK ON



- TO MOVE THE LEGEND POSITION, CLICK ON



ADD NORTH AND LOGOS

- CLICK ON **ADD IMAGE** ①, CLICK ON THE PAGE ② AND WAIT UNTIL THE BOX APPEARS, THEN SELECT A NORTH ARROW ③. TO REMOVE THE LINE OF THE TITLE BOX CLICK ON **GENERAL OPTIONS** ④/**FRAME COLOURS/SELECT WHITE COLOUR/OK**.
- DO THE SAME TO ADD LOGOS. HOWEVER THE LOGOS NEED TO BE BROWSED ⑤.

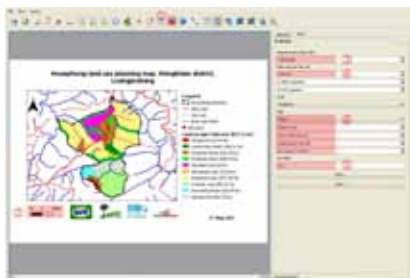


6. THE LAND USE MAPS

EXPORT THE IMAGE MAP

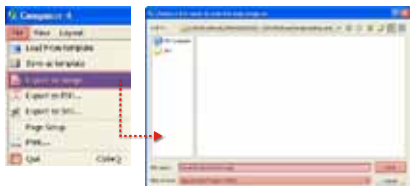
ADD THE SCALE

- CLICK ON **ADD NEW SCALEBAR** ①, CLICK ON THE PAGE, **SEGMENT SIZE (MAP UNITS) = 1000** ②, **MAP UNITS PER BAR UNIT = 1000** ③, **UNIT LABEL = KM** ④, THEN MODIFY THE SIZE AS NEEDED ⑤.



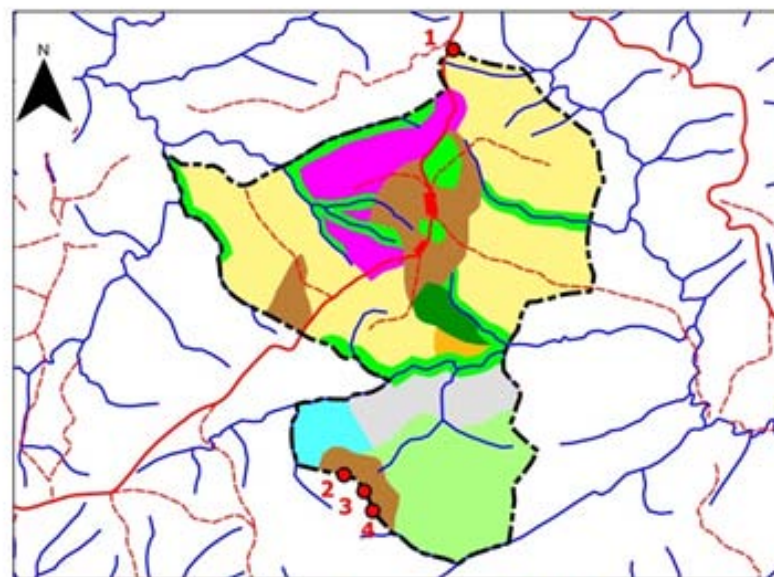
CREATE THE IMAGE MAP

- WHEN THE MAP EDITING IS FINISHED, CLICK ON **FILE, EXPORT AS IMAGE**, SAVE THE MAP IN YOUR COMPUTER. ENTER THE NAME, IN **FILES OF TYPE** SELECT **JPEG FORMAT (*.JPEG)**. THEN CLICK ON **SAVE**.



THE COMPLETE MAP

Houaythong land use planning map, Viengkham district, Luangprabang



Legend

- Houaythong boundary
- Main road
- Soil road
- River and stream
- GPS point

Land use type (Total area 3827.11 ha)

- Village area (12.34 ha)
- Conservation forest (165.17 ha)
- Production forest (351.25 ha)
- Protection forest (455.01 ha)
- Plantation (312.22 ha)
- Permanent crops (27.62 ha)
- Rotational crops (1577.08 ha)
- Livestock area (552.10 ha)
- Improved pasture (122.54 ha)
- Reserve land (251.78 ha)

0 1 2 Km



27 May 2011

7. QGIS FOR P3DM

HOW TO EXTRACT CONTOUR LINES TO BUILD A 3D MODEL?

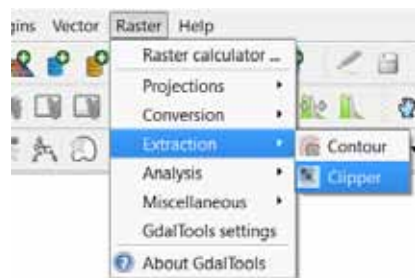
1. START QUANTUM GIS
2. ADD A RASTER BY CLICKING ON THE 'ADD RASTER LAYER' BUTTON:



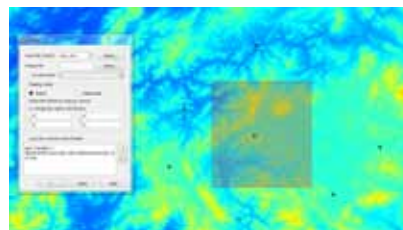
3. SELECT A DIGITAL ELEVATION MODEL (DEM) RASTER FILE (E.G. BY DEFAULT, THE RASTER OF THE WHOLE COUNTRY).
4. ZOOM IN TO THE STUDY AREA OF INTEREST BY USING THE 'ZOOM IN' BUTTON:



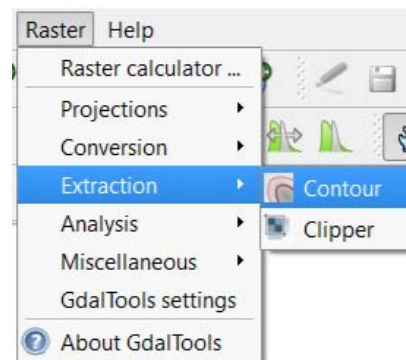
5. AS VILLAGE BOUNDARIES ARE USUALLY UNKNOWN AT THIS STAGE, IT IS ADVISED TO ADD THE LOCATION OF THE TARGET VILLAGES WITH THE 'ADD VECTOR LAYER' TOOL:
6. SELECT THE CLIPPER TOOL UNDER RASTER/EXTRACTION:



- THE CLIPPER TOOL IS USED TO CREATE A DEM FOCUSED ON YOUR STUDY AREA. IN THE CLIPPER WINDOW, THE INPUT FILE IS THE DEM RASTER FILE. THE OUTPUT FILE IS THE RESULT OF THE CLIP FUNCTION. CLICK ON SELECT TO DEFINE ITS DESTINATION. WITH THE CLIPPING MODE ON EXTENT, DRAG A SQUARE AROUND THE VILLAGE POINT(S) OF INTEREST IN ORDER TO INCORPORATE THE BORDERS (SEE EXAMPLE BELOW):



- TICK LOAD INTO CANVAS WHEN FINISHED AND PRESS OK.
7. NOW THAT THE DEM RASTER CORRESPONDING TO THE TARGET AREA HAS BEEN CREATED, CLICK ON RASTER/EXTRACTION/CONTOUR TO CREATE CONTOUR LINES:



HOW TO EXTRACT CONTOUR LINES TO BUILD A 3D MODEL?

- INPUT THE NEW RASTER FILE. DEFINE THE LOCATION OF THE OUTPUT AND THE INTERVAL BETWEEN LINES (40M BY DEFAULT), TICK THE TWO BOXES (ATTRIBUTE NAME AND LOAD INTO CANVAS); PRESS OK.



- DOUBLE CLICK ON THE CONTOUR LINE SHAPEFILE AND DISPLAY THE LABEL SECTION:



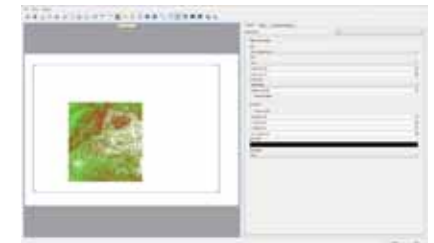
- SET THE FONT SIZE (HERE 50 IN MAP UNITS) ACCORDING TO YOUR MAP EXTENT.

- TO CHANGE THE COLORS OF THE CONTOUR LINES, DOUBLE CLICK ON THE CONTOUR LINES SHAPEFILE, AND IN THE STYLE SECTION, UPDATE THE LEGEND TYPE TO CONTINUOUS COLOR AND THE CLASSIFICATION FIELD TO ELEV (BY DEFAULT):



- HERE THE COLORS RANGE FROM GREEN (MINIMUM VALUE) TO RED (MAXIMUM VALUE).

- TO SAVE AND OR/PRINT THE CONTOUR LINES, CLICK ON NEW PRINT COMPOSER:



- CLICK ON ADD NEW MAP AND DRAG A SQUARE ON THE BLANK PAGE TO DISPLAY THE CONTOUR LINES.
- IT IS POSSIBLE TO MODIFY THE EXTENT OF THE REPRESENTATION AND CHANGE THE QUALITY OF THE OUTPUT.
- WHEN DONE, CLICK ON FILE / EXPORT AS IMAGE OR PDF.

SYNTHESISING PLUP KNOWLEDGE IN A VILLAGE MONOGRAPH

This toolbox describes how to synthesise and display all the knowledge generated through the Participatory Land Use Planning (PLUP) process in the village monograph. The village information in Excel files is shown in charts and tables which can be easily exported to Publisher files.

This toolbox explains how to compute the data, and extract the main information from the Excel files.



FOR MORE INFORMATION

Please see the monographs of the villages of Boumavan, Hat Houng, Hat Kor, Hat Lao, Houay Kou, Houay Thong, Nam Xoy and Phonkham.

Category	Value
1. ການປະມວນຜົນ	100.0
2. ການປະມວນຜົນ	100.0
3. ການປະມວນຜົນ	100.0
4. ການປະມວນຜົນ	100.0
5. ການປະມວນຜົນ	100.0
6. ການປະມວນຜົນ	100.0
7. ການປະມວນຜົນ	100.0
8. ການປະມວນຜົນ	100.0
9. ການປະມວນຜົນ	100.0
10. ການປະມວນຜົນ	100.0

1. ENTERING DATA

THE DATA (HOUSEHOLD SURVEY, PROBLEM CENSUS, HISTORY, POPULATION GROWTH) GATHERED FROM THE INITIAL VILLAGE DIAGNOSIS MUST FIRST BE ENTERED IN THE EXCEL FILE NAMED THE 'VILLAGE NAME'_DIAGNOSIS_DATA FOR COMPUTATION. A SEPARATE FILE MUST BE CREATED FOR EACH VILLAGE. EACH EXCEL VILLAGE FILE WILL GENERATE THE PARAMETERS FOR INPUT TO THE PLUP PROCESS AND BE EXPORTED TO ANOTHER EXCEL NAMED THE 'VILLAGE NAME'_PLUP_PARAMETERS (I.E. TOOLBOX 2). PLUP DATA IS USED TO PROVIDE INFORMATION FOR CREATING THE VILLAGE MONOGRAPH.

1.1 COMPUTING THE VILLAGE DIAGNOSIS DATA

- ALL THE DATA GATHERED FROM THE INITIAL VILLAGE DIAGNOSIS IS COMPUTED IN THE EXCEL NAMED THE 'VILLAGE NAME'_DIAGNOSIS_DATA. THERE ARE FOUR SHEETS IN THIS FILE NAMED: THE "DATA SURVEY", "POP GROW", "HIST" AND "PRB_CE" SHEETS WHICH ARE DESCRIBED BELOW.

1.1.1 "DATA SURVEY" SHEET

- INFORMATION FROM THE VILLAGE CENSUS IS COMPUTED IN THE "DATA SURVEY" SHEET IN WHICH EACH ROW REPRESENTS ONE HOUSEHOLD, AND EACH COLUMN IS A SINGLE VARIABLE.

1.1.2 "POP GROW" SHEET

- THE "POP GROW" SHEET COMPUTES INFORMATION ON THE POPULATION GROWTH WHICH INCLUDES BIRTHS, DEATHS AND MIGRATIONS OVER THE PREVIOUS SIX YEARS.

1.1.3 "HIST" SHEET

- THE "HIST" SHEET COMPUTES THE NUMERICAL DATA (OUTLINED IN GREY BELOW) AND SUMMARISES THE VILLAGE HISTORY (OUTLINED IN BLUE BELOW).

Date	1966-1974	1975-1983	1984-1990	1991-2011
Cow	14	22	42	250
Buffalo	0	0	16	183
Goat	0	0	0	38
Pig	0	0	0	334
Households	89	38	85	92
Yield (ton)	1,6	1,6	1,5	1,5
Rotation	9	5	4	4

Product	1966-1974	1975-1983	1984-1990	1991-2011
Population	Population description in the survey sheet. It is the total population of the village.	Population description in the survey sheet. It is the total population of the village.	Population description in the survey sheet. It is the total population of the village.	Population description in the survey sheet. It is the total population of the village.
Subsistence production	Subsistence production in the survey sheet. It is the total area of land used for subsistence production.	Subsistence production in the survey sheet. It is the total area of land used for subsistence production.	Subsistence production in the survey sheet. It is the total area of land used for subsistence production.	Subsistence production in the survey sheet. It is the total area of land used for subsistence production.
Area under forest	Area under forest in the survey sheet. It is the total area of land used for forest.	Area under forest in the survey sheet. It is the total area of land used for forest.	Area under forest in the survey sheet. It is the total area of land used for forest.	Area under forest in the survey sheet. It is the total area of land used for forest.
Changes in pasture	Changes in pasture in the survey sheet. It is the total area of land used for pasture.	Changes in pasture in the survey sheet. It is the total area of land used for pasture.	Changes in pasture in the survey sheet. It is the total area of land used for pasture.	Changes in pasture in the survey sheet. It is the total area of land used for pasture.
Remarks	Remarks in the survey sheet. It is the total area of land used for remarks.			

1.1.4 "PRB_CE" SHEET

- THE "PRB_CE" SHEET LISTS AND SUMMARISES THE PROBLEMS IDENTIFIED BY THE VILLAGE MEN AND WOMEN IN THE PROBLEM CENSUS.

Problem	Area	Source	Impact	Proposed solution
1. Lack of water for irrigation	1.5	1.5	1.5	1.5
2. Lack of electricity	1.5	1.5	1.5	1.5
3. Lack of roads	1.5	1.5	1.5	1.5
4. Lack of health services	1.5	1.5	1.5	1.5
5. Lack of schools	1.5	1.5	1.5	1.5
6. Lack of extension services	1.5	1.5	1.5	1.5
7. Lack of credit facilities	1.5	1.5	1.5	1.5
8. Lack of market facilities	1.5	1.5	1.5	1.5
9. Lack of information services	1.5	1.5	1.5	1.5
10. Lack of social services	1.5	1.5	1.5	1.5

1.2 EXPORTING PARAMETERS TO PLUP PARAMETERIZATION

- THE DATA DISPLAYED IN THE PLUP_DATA EXCEL FILE (OUTLINED IN YELLOW BELOW) MUST BE COPIED AND PASTED TO THE PARAMETERS SHEET OF THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE (OUTLINED IN GREEN BELOW).

Population description	
Data to export into the PLUP parameters EXCEL files	
Number of labour force	266
Population growth	0,02
Average number of member in the family	7,5
Average number of labour force in a family	2,9

Area of the village			
Area of each land use type from HH survey for comparison with the area given through PLUP mapping			
Total area of rotational crops in the village (that survey)	Total area of paddy land in the village (that survey)	Total area of permanent crops in the village (that survey)	Total area of plantation (that survey)
921,4	0	53,4	13,35

- TO DO THIS, OPEN BOTH THE PARAMETERS SHEET OF THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE AND THE DATA_PLUP SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE AT THE SAME TIME, THEN COPY THE RANGE C8:D11 FROM THE DATA_PLUP SHEET AND PASTE THIS TO THE RANGE A4:A1 OF THE PARAMETERS SHEET. THIS IS ILLUSTRATED IN THE FIGURE BELOW.

- ONCE THIS IS DONE, THE DATA ON THE VILLAGE AREA IN THE PLUP_DATA SHEET, WHICH ARE COLLECTED FROM INDIVIDUAL HOUSEHOLD SURVEY, MUST BE COMPARED WITH THOSE PRODUCED DURING THE PLUP PROCESS, FROM MAPPING OF CURRENT LAND USE SYSTEM ON THE 3D MODEL.

Population description	
Data to export into the PLUP parameters EXCEL files	
Number of labour force	266
Population growth	0,02
Average number of member in the family	7,5
Average number of labour force in a family	2,9

DATA_PLUP SHEET OF 'VILLAGENAME'_DIAGNOSIS_DATA

Area of the village			
Area of each land use type from HH survey for comparison with the area given through PLUP mapping			
Total area of rotational crops in the village (that survey)	Total area of paddy land in the village (that survey)	Total area of permanent crops in the village (that survey)	Total area of plantation (that survey)
921,4	0	53,4	13,35

PARAMETERS SHEET OF 'VILLAGE NAME'_PLUP_PARAMETERS

- ONCE THE LAND ZONING PROCESS IS FINISHED, THE DATA FROM THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE NEED TO BE EXPORTED TO THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE. TO DO THIS, COPY AND PASTE THE INFO FOR MONOGRAPH SHEET OF THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE TO THE DATA_TO_IMPORT FROM PLUP DATA SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE AS SHOWN BELOW.

1. ENTERING DATA

1.3 IMPORTING DATA FROM LAND ZONING

- ONCE THE LAND ZONING PROCESS IS FINISHED, THE DATA FROM THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE NEED TO BE EXPORTED TO THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE. TO DO THIS, COPY AND PASTE THE INFO FOR MONOGRAPH SHEET OF THE 'VILLAGE NAME'_PLUP_PARAMETERS FILE TO THE DATA_TO_IMPORT FROM PLUP DATA SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE AS SHOWN BELOW.

DATA_PLUP SHEET OF 'VILLAGENAME'_DIAGNOSIS_DATA

PARAMETERS SHEET OF 'VILLAGE NAME'_PLUP_PARAMETERS

2. PRODUCING A MONOGRAPH

- ALL THE CHARTS, DATA, TABLES NEEDED TO PRODUCE A MONOGRAPH CAN BE FOUND IN THE 'VILLAGE NAME'_DIAGNOSIS_DATA EXCEL FILE.
- THE INFORMATION IN ENGLISH IS ON THE SHEETS MO_P1_EN, MO_P2_EN, MO_P3, MO_P4_EN, AND IN LAO ON THE SHEETS MO_P1_LA, MO_P2_LA, MO_P3, MO_P4_LA. THE ITEMS ARE CLASSIFIED BY PAGE (I.E. P1 FOR PAGE 1 OF THE MONOGRAPH, P2 FOR PAGE 2 AND SO ON).

2.1 CREATING PAGE 1

1. EXPORT THE DATA TO THE FIRST PAGE OF THE 'VILLAGE NAME'_MONOGRAPH PUBLISHER FILE

2. COMPLETE THE GENERAL INFORMATION ABOUT THE VILLAGE

- OPEN THE MO_P1 SHEET OF THE EXCEL FILE NAMED 'VILLAGE NAME'_DIAGNOSIS_DATA (OUTLINED IN ORANGE BELOW). THE TABLE CONTAINS ALL THE INFORMATION NEEDED.

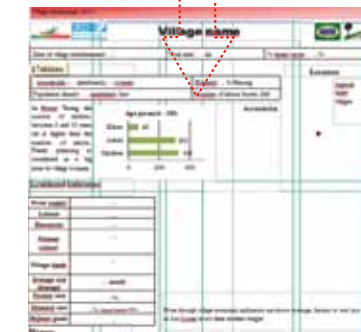
THIS INFORMATION SHOULD BE TRANSFERRED TO THE MONOGRAPH PUBLISHER FILE BY FILLING IN THE APPROPRIATE EMPTY CELLS:

- VILLAGE NAME
- DATE OF ESTABLISHMENT
- TOTAL VILLAGE AREA
- PERCENTAGE (%) OF FOREST COVER
- TOTAL NUMBER OF HOUSEHOLDS, OF PEOPLE AND OF WOMEN
- POPULATION DENSITY
- ETHNICITY
- NUMBER OF LABOUR FORCE UNITS

OTHER INFORMATION SUCH AS:

- DATE OF INSTALLATION OF WATER SUPPLY
- DATE OF INSTALLATION OF LATRINES
- DATE OF INSTALLATION OF ELECTRICITY NETWORK
- DESCRIPTION OF CLASSES OF PRIMARY SCHOOL AND DATES OF CREATION
- DESCRIPTION OF VILLAGE FUNDS AND DATES OF CREATION CAN BE EXTRACTED FROM THE FOCUS GROUP ON HISTORY.

Total area in the village	3 827
Percentage of forest cover	14.6
Total number of households	93
Total number of people	696
Total number of women	318
Percentage of Khmu households	0%
Percentage of Lao Loum households	0%
Percentage of Hmong households	100%
Population density	18
Average rice shortage	0.9
Number of full time labor force	208
Number of half time labor force	97
Number total of labour force	296
Poverty rate	32%



2. PRODUCING A MONOGRAPH



IMPORTANT POINT

Once an item has been copied and pasted, re-sizing or changing the position of certain items (title, legend, etc.) may be necessary. To do this, double click on the item, and then resize it, and move other terms to different positions. If the user does not double click on the item first, the scale will be modified.

Sometimes certain items may be superimposed. In this case their relative positions can be changed using the position tools



4. TO COPY THE PYRAMID AGE CHART:

1. OPEN SHEET MO_1 OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA FILE
2. COPY THE PYRAMID AGE CHART
3. RIGHT CLICK IN THE 'VILLAGE NAME'_MONOGRAPH PUBLISHER FILE AND PASTE
4. LEFT CLICK ON THE PASTED ITEM AND THEN DRAG IT TO THE CORRECT PLACE ON THE SHEET

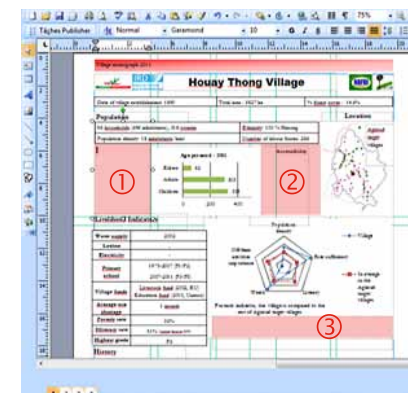
■ THE SPIDER CHART CAN BE COPIED IN THE SAME WAY.

5. ADD MORE INFORMATION ON VILLAGE ACCESSIBILITY, THE PYRAMID AGE CHART AND THE SPIDER CHART

1. THE PYRAMID AGE CHART: THIS SHOWS THE RELATIVE NUMBERS OF ADULTS, ELDERS AND CHILDREN IN THE VILLAGE. AND TRY TO ROUGHLY DEDUCE THE STAGE OF THE VILLAGE IN TERMS OF THE DEMOGRAPHIC TRANSITION. LEFT CLICK IN THE WRITING ZONE NEAR THE CHART, AND ENTER THE INFORMATION.
2. VILLAGE ACCESSIBILITY: IS THERE A PATH/ROAD? IF YES, IS IT ACCESSIBLE BY ROAD THROUGHOUT THE YEAR? HOW MANY HOURS DOES IT TAKE TO REACH

THE VILLAGE BY ROAD? IF THE VILLAGE IS NOT ACCESSIBLE BY ROAD, IS THERE A RIVER? HOW MANY HOURS DOES IT TAKE TO REACH THE VILLAGE BY BOAT? LEFT CLICK IN THE WRITING ZONE "ACCESSIBILITY" IN THE PUBLISHER FILE AND ENTER THE INFORMATION.

3. THE SPIDER CHART: THE INDICATORS COMPARE THE VALUES FOR THE DISTRICT WITH THOSE FOR THE VILLAGE. THE BIGGER THE PENTAGON, THE MORE DEVELOPED THE VILLAGE. IF THERE IS A BIG DIFFERENCE IN AN INDICATOR, THEN MARK IT AND TRY TO EXPLAIN REASON FOR THE DIFFERENCE. LEFT CLICK IN THE WRITING ZONE UNDER THE SPIDER CHART, AND ENTER THE INFORMATION.

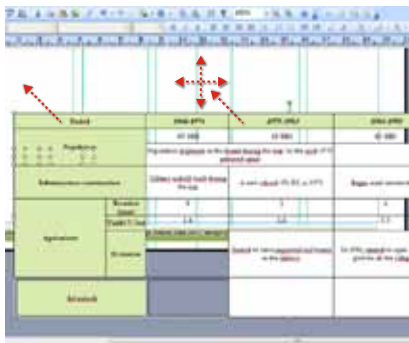


2. PRODUCING A MONOGRAPH

6. ADD THE HISTORY TABLE

■ RIGHT CLICK AND COPY THE HISTORY TABLE FROM THE SAME EXCEL FILE (SHEET MO_1 OF 'VILLAGE NAME' DIAGNOSIS_DATA), AND THEN PASTE THIS IN THE LOWER PART OF THE OF THE 'VILLAGE NAME'_MONOGRAPH PUBLISHER FILE.

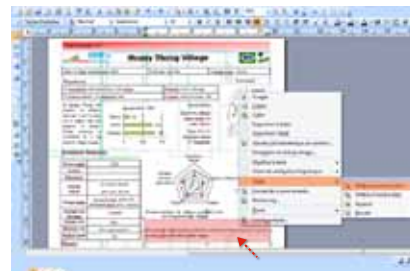
1. DRAG THE TABLE TO THE CORRECT POSITION ON THE PUBLISHER PAGE
2. IF NECESSARY, ADJUST THE TABLE SIZE



7. REARRANGE ITEMS IN THE PUBLISHER FILE

■ SOMETIMES CHART, WRITING AND IMAGE ZONES MAY BE SUPERIMPOSED ON EACH OTHER. TO PUT A ZONE BEHIND ANOTHER ZONE, PROCEED AS FOLLOWS:

1. RIGHT CLICK ON THE ZONE TO BE MOVED TO BRING IT TO THE FOREGROUND, SELECT ORDER THEN LEFT CLICK ON PUT ON THE FOREGROUND
2. TO PUT IT IN THE BACKGROUND, SELECT ORDER THEN LEFT CLICK ON PUT ON THE BACKGROUND



2. PRODUCING A MONOGRAPH

2.2 CREATING PAGE 2

- FOLLOW THE STEPS BELOW TO COMPLETE THE SECOND PAGE OF THE 'VILLAGE NAME'_MONOGRAPH PUBLISHER FILE
1. ADD COMMENTS ON THE SCHOOL ENROLMENT CHART: AT WHICH LEVEL DID THE MAJORITY OF CHILDREN STOP THEIR STUDIES? IS THERE A BIG DIFFERENCE BETWEEN GIRLS AND BOYS? INFORMATION FROM THE VILLAGE HISTORY CAN BE USED FOR THIS COMMENT.
 2. ADD A PHOTOGRAPH OF THE SCHOOL
 3. ADD THE "ASSETS OWNED" CHART FROM THE MO_P2 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA



4. ADD COMMENTS ON THE "ASSETS OWNED" CHART: USE THE COMPARISON WITH THE AVERAGE OF THE 25 AGRISUD TARGET VILLAGES. LINK THE NUMBER OF MOTORCYCLES TO THE PRESENCE OR ABSENCE OF A ROAD AND THE WEALTH OF THE VILLAGE. LINK THE NUMBER OF TELEVISIONS AND TURBINES TO THE

PRESENCE OR ABSENCE OF ELECTRICITY IN THE VILLAGE.

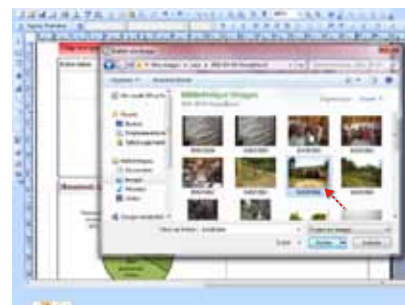
5. ADD A PHOTOGRAPH OF THE VILLAGE HOUSES OR TURBINES.
6. ADD COMMENTS ON THE "HOUSE TYPE" CHART: WHAT IS THE MAIN TYPE OF HOUSE? LINK THIS TO THE WEALTH AND ACCESSIBILITY OF THE VILLAGE.
7. ADD THE "% OF HOUSEHOLDS WITH AN OFF-FARM ACTIVITY" CHART ON THE MO_P2 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA.



8. ADD THE TABLE OF THE OFF-FARM ACTIVITIES SHOWING THE THREE RESULTS AS PERCENTAGES.
9. COMMENT ON THE IMPORTANCE TO THE VILLAGE OF OFF-FARM ACTIVITIES: WHY DO PEOPLE ENGAGE IN THESE OFF-FARM ACTIVITIES? IS IT TO EARN MONEY TO FEED THEIR FAMILY BECAUSE OF RICE INSUFFICIENCY OR TO BUY GOODS SUCH AS TELEVISIONS OR MOTORCYCLES? IF THE FAMILIES COLLECT A LOT OF NTFPS, NAME THE MAIN KINDS COLLECTED.

ADD AN IMAGE IN PUBLISHER

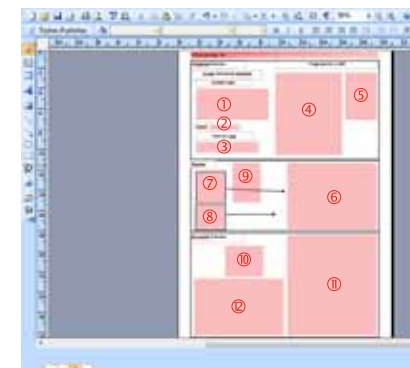
- LEFT CLICK ON THE BUTTON ADD A PICTURE IN THE LEFT PANEL AND THEN LEFT CLICK ON FROM A FOLDER. CLICK ON THE ZONE ON THE SHEET WHERE THE PHOTOGRAPH IS TO BE INSERTED, AND THEN SELECT THE FOLDER CONTAINING THE DESIRED PHOTOGRAPH. LEFT CLICK ON THE PHOTOGRAPH IN THE FOLDER AND IT WILL APPEAR IN THE SELECTED ZONE.



2.3 CREATING PAGE 3

- THE STEPS TO COMPLETE THE THIRD PAGE ARE AS FOLLOW:

1. DRAW THE "AVERAGE LAND USE PER HOUSEHOLD" DIAGRAM.
2. DESCRIBE THE AVERAGE PERMANENT CROP USE PER HOUSEHOLD
3. INSERT THE 'CURRENT LAND USE' MAP FROM QGIS
4. COPY THE TABLE SHOWING THE NUMBER OF HECTARES FOR EACH LAND USE FROM THE MO_P3 SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA EXCEL FILE
5. COPY AND PASTE THE "DISTRIBUTION OF INCOME GENERATING ACTIVITIES" CHART FROM THE MO_P3 SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA EXCEL FILE



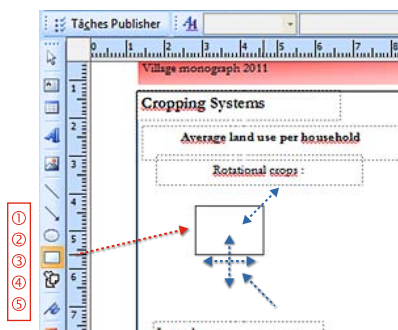
6. ADD A COMMENT ON PLANTATIONS. (DO THESE REPRESENT A LARGE PART OF THE INCOME? WHAT ARE KINDS OF TREES (TEAK, AGARWOOD, FRUIT) ARE GROWN?)
7. ADD A COMMENT ON THE LIVESTOCK SYSTEM (WHICH ANIMAL YIELDS THE HIGHEST/LOWEST INCOME?)

2. PRODUCING A MONOGRAPH

8. ADD A PHOTOGRAPH OF A VILLAGE PLANTATION OR ANIMALS.
9. ADD THE TABLE FROM THE MO_P3 SHEET OF THE 'VILLAGE NAME'_DIAGNOSIS_DATA EXCEL FILE WHICH DETAILS THE NUMBER OF THE VARIOUS ANIMALS
10. ADD THE "LIVING LIVESTOCK CAPITAL PER HOUSEHOLD TYPE" CHART FROM THE MO_P3 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA
11. ADD THE CHART "EVOLUTION OF THE LIVESTOCK HERD" FROM THE SHEET MO_P3 OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA

CREATE SHAPES IN PUBLISHER TO CREATE THE DIAGRAM "AVERAGE LAND USE PER HOUSEHOLD"

- DIFFERENT SHAPES (LINES, ARROWS, ELLIPSES, RECTANGLES AND OTHERS) CAN BE CREATED IN PUBLISHER BY LEFT CLICKING ON THE DESIRED SHAPE AND THEN LEFT CLICKING ON THE MONOGRAPH SHEET AT THE DESIRED POSITION. ITS POSITION CAN BE CHANGED BY CLICKING ON IT AND DRAGGING. ITS SIZE CAN BE MODIFIED BY LEFT CLICKING ON THE CORNERS. THE SCREEN SHOT BELOW SHOWS THE DIFFERENT SHAPES IN THE OVAL OUTLINED IN RED AND THE CHANGE OF POSITION AND SIZE.



- THE COLOUR INSIDE A SHAPE AND THAT OF THE BORDER CAN BE CHOSEN BY CLICKING ON THE COLOUR BUTTONS AS SHOWN BELOW:



- TO ADD TEXT TO THE SHAPE, RIGHT CLICK INSIDE AND WRITE THE TEXT.

COLOURS FOR THE TABLE SHOWING THE NUMBER OF HECTARES FOR EACH LAND USE.

- THE COLOURS OF THE TABLE SHOWING THE NUMBER OF HECTARES FOR EACH LAND USE MUST CORRESPOND TO THE COLOURS USED ON THE MAP. IN ORDER TO DO THIS, FOLLOW THESE STEPS:

1. LEFT CLICK ON THE 'COLOUR FILL' BUTTON; CHOOSE THE OPTION EXAMPLE OF PADDING COLOUR BY LEFT CLICKING ON IT.



2. THE CURSOR CHANGES FROM AN ARROW SHAPE TO A KIND OF PIPETTE. DRAG THIS TO THE AREA OF THE MAP WITH THE COLOUR YOU WANT. LEFT CLICK ON THE COLOUR. (SEE ILLUSTRATION)



- THEN FOLLOW THESE STEPS:

1. LEFT CLICK IN THE CELL CORRESPONDING TO THE CHOSEN COLOUR. THE CURSOR CHANGES FROM AN ARROW SHAPE TO A KIND OF PIPETTE. DRAG THIS TO THE AREA OF THE MAP WITH THE COLOUR YOU WANT. LEFT CLICK ON THE COLOUR. (SEE ILLUSTRATION)
2. LEFT CLICK ON THE COLOUR FILL BUTTON

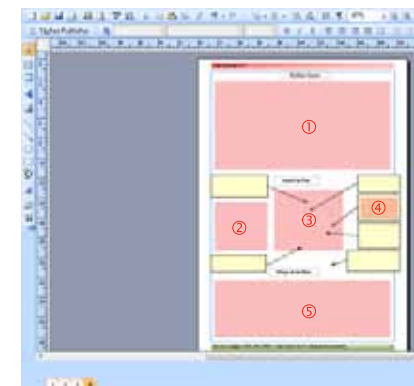
- DO THE SAME FOR ALL THE LAND USES

2. PRODUCING A MONOGRAPH

2.4 CREATING PAGE 4

THE STEPS FOR COMPLETING THE FOURTH PAGE FOLLOW:

1. COPY AND PASTE THE PROBLEM CENSUS TABLE FROM THE MO_P4 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA. CHANGE THE SIZE.
 2. COPY AND PASTE THE TABLE GIVING THE NUMBER OF HECTARES FOR EACH LAND USE OF THE FINAL LAND USE PLAN FROM THE MO_P4 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA
 3. COPY AND PASTE THE MAP FROM QGIS OF THE FINAL LAND USE PLAN
 4. IN THE TEXT BOXES, ADD COMMENTS FOR THE DIFFERENT LAND USES (WHY DID THE VILLAGERS PUT THIS LAND USE HERE? WHAT DO THEY INTEND TO DO?...). THE ARROW HEAD CAN BE MOVED BY LEFT CLICKING ON IT AND LINK A LAND USE TO A COMMENT.
 5. COPY AND PASTE THE VILLAGE ACTION PLAN TABLE THE MO_P4 SHEET OF THE EXCEL FILE 'VILLAGE NAME'_DIAGNOSIS_DATA. CHANGE THE SIZE.
- DO THE SAME AS FOR THE SHEET NUMBER 3: PUT THE CORRESPONDING COLOUR IN THE TABLE OF THE NUMBER OF HECTARES FOR EACH LAND USE.
- IN THE SAME WAY, PUT THE CORRESPONDING COLOUR IN THE VILLAGE ACTION PLAN TABLE.



Village monograph 2011

Problem Census				
Problem census	Rank	Cause	Impact	Proposed solution
Not enough water in the village	1	The village location is higher than the big stream, the streams beside are too small, there is no water supply	•Women and children spend a lot of time and energy to collect water. •Not enough water for a good hygiene.	Build a tank, 1 km from the village or install a water supply 12 km away.
Livestock diseases	2	Vaccination are not done properly and not enough animals are vaccinated as there are remaining frucht in the forest	The people lose money and some have a lot of debt	Training to good care of livestock and support from a veterinary
Not enough place in the school	3	•The number of pupils increase every year. •There is not enough money in the village to build a new classroom	•There are a lot of pupils in one class room. •Many children do not go to school, especially the poorest families. Some must go to school in other villages.	Build a new classroom
Women have too many babies	4	Do not know how to control the birth	Women spend less time in the fields and productive activities. They do not have enough money for food, clothes and education	Training on family planning from district health services
No electricity in the village	5	The village is located far from the big town and main road and the stream is too small to use water turbines	Life is difficult on the evening. They have to buy gas for the light and candles. They felt as an under develop town.	Connect to the electricity grid as soon as possible
Rice yield is decreasing	5	Soil fertility is decreasing every year as population pressure increases	•Rice production is not sufficient. •Some people work as waged worker in the neighbouring village. The people become poorer.	Promotion of commercial crops that would fit to the actual market demand.

Plantation area is higher than the current use as plantation will provide an important source of income to villagers in the future.

Land Use Plan	Area (ha)
Plantation forest	165.17
Protection forest	455.01
Rotational crop	351.25
Permanent crop	1577.08
Platanica	27.62
Livestock area	312.22
Village area	552.1
Reserve Land	12.34
Improved pasture	251.78
Improved pasture	132.54

An improved pasture area will allow villagers to intensify animal husbandry.

Land Use Plan

Protection forests surround the stream to prevent soil erosion and water pollution.

Protection forest prevent fire from shifting cultivation in the neighbouring rotational area to spread and destroy conservation forest.

This area is dedicated to permanent crops; banana will be grown and later on pineapple and banana if market demand increases.

The livestock area is higher than the current area as they plan to increase the number of large ruminants.

Village Action Plan

Land Use	Planned activities	Suggested support
Permanent crops	Increase the area dedicated to pineapple and banana if market demands.	
Plantation	Increase plantation such as castor bean, rubber tree, coffee, jamropha, rambutan, orange at the condition that the market is secure.	Villagers do not need support, they already have enough seeds.
Improved pasture	Grow forage such as <i>Brachiaria ruginosa</i> and guinea grass for the large ruminants Villagers will open one big field all together in 2011 and try forage (or multiply it for next year if the seeds arrive late).	ADB could provide <i>Brachiaria ruginosa</i> and guinea grass seeds.
Livestock area	Grow crops such rice bean, maize, soybean/maize, sorghum for feeding the little livestock.	Agriaid will support 15 families in maize/rice bean association crops and sorghum/soybean/maize association crops.
	Improve livestock health.	Agriaid is training two Veterinary Village Workers who will support vaccination, and will support village pharmacy.

Data source: Agriaid, NAFRI, IIRD, CIFOR - Village Action Plan 2011, except otherwise indicated

This screen shot shows Page 4 of the completed monograph for Houay Thong Village.

