Expansion of maize feeder road networks in upland production areas:

Impacts on landscapes and livelihoods in Huaphan Province

EFICAS annual workshop, March 27th 2017, Luang Prabang

Outline

- Introduction
- Conceptual framework
- Objectives
- Methods
- Results
- Lessons learnt
- Conclusion

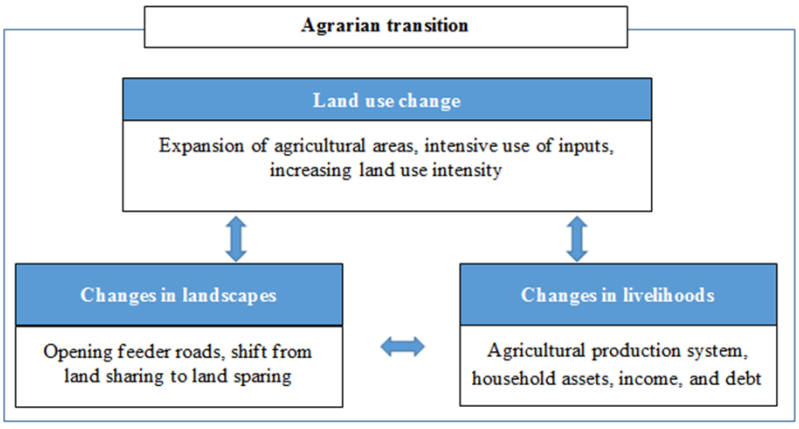



Introduction

- Roads construction and agriculture expansion are the main factors altering landscape structures in northern upland Laos
- Main roads are constructed by the government, but for secondary roads within the village territory (feeder roads), villagers invest themselves to reach production areas more easily.
- This research analyses the patterns of maize expansion in relation with the construction of feeder roads with the two questions below:
  - How feeder road expansion has impacted spatial arrangement in land use and land cover at the village level?
  - How has feeder road expansion impacted on livelihood in terms of agricultural production system, household assets, and income?

EFICAS project

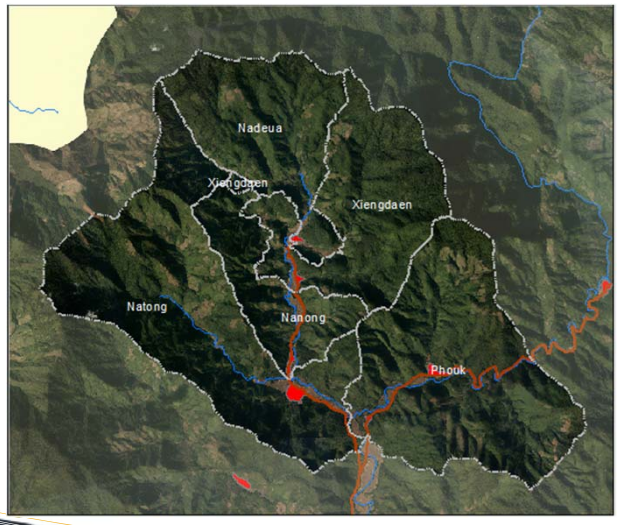
Conceptual framework



Research Objectives

1. To quantify the impacts of the feeder road construction on spatial arrangement in land use and land cover at the village level.
2. To quantify the impacts of the feeder road construction on livelihood in terms of agricultural production system, household assets, and income.

Study site



EFICAS project

Method: data

- **Geographical data**
  - Landsat imagery: The United States Geological Survey- USGS
  - SPOT7 and Aerial Photo: EFICAS project
- **Socio-economic data**
  - field survey from the 27th of March to the 4th of April, 2016

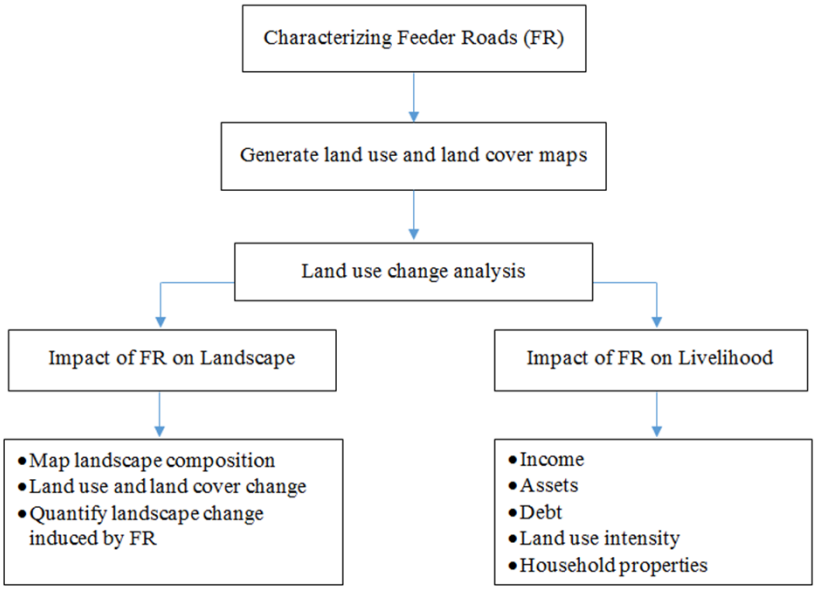
Villages	Total HH in the village (registered)	Number of the village organization committee	Focus Group	Rapid Survey	Details Survey
Nadeau	50	18	8	59	30
Nanong	48	18	0	47	24
Natong	109	18	7	113	24
Phouk	107	18	7	112	21
Xiengdaen	35	18	8	37	19
Total	349	90	30	368	118

EFICAS project

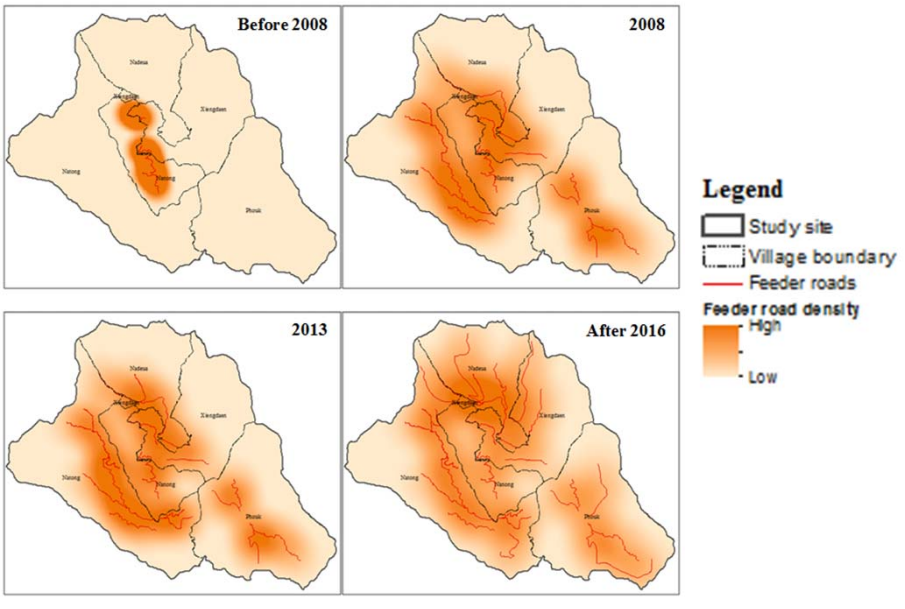
Method: data collection

project

Method: data analysis



Results: expansion patterns of feeder roads



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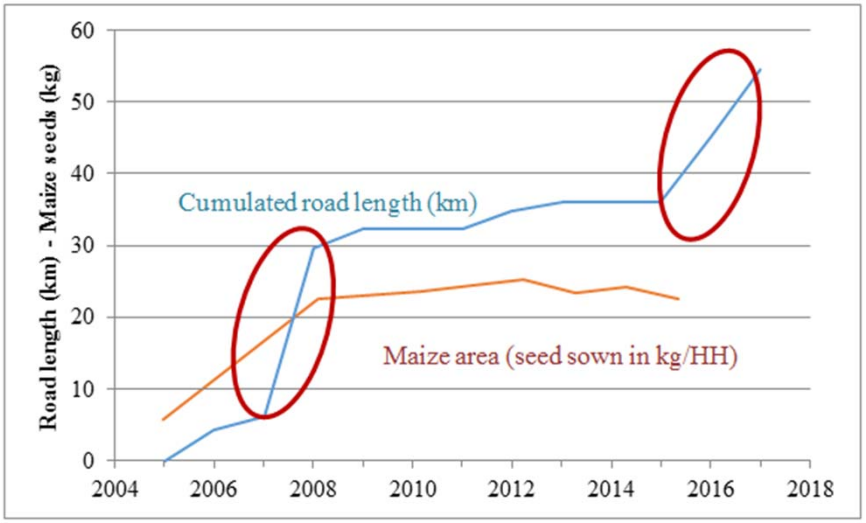


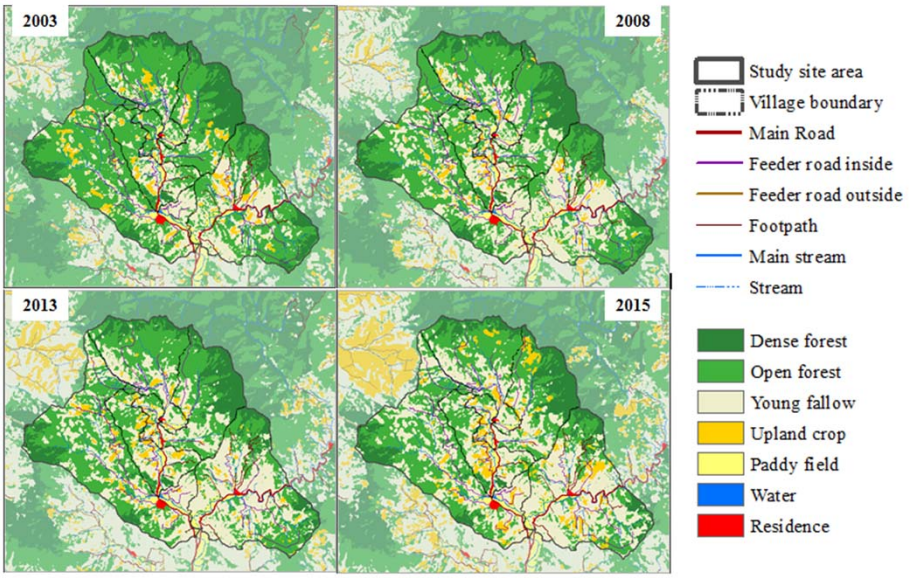
Cumulative length of feeder roads and expansion of maize areas

Results: feeder road construction processes

Since 2014, feeder road construction process:

- Villagers usually agree on which plot they would like to grow maize,
- Decide where they would like to open a feeder road,
- Villagers who have land around this production area contact the trader to present their plan and negotiate a price,
- The road project is further presented to the village head and committee,
- The village head introduces the project to 3 district line agencies,
- The district authorities may survey the field prior to issuing official agreement,
- The village head is allowed to sign a contract with the maize trader,
- The investor starts construction, then maintain the roads every year at harvest time during the period of the contract,
- Villagers reimburse in cash (about 15MLAK/km) or in kind 100LAK per kg maize sold over a period defined in the contract.

Results: LULC changes from 2003 - 2015



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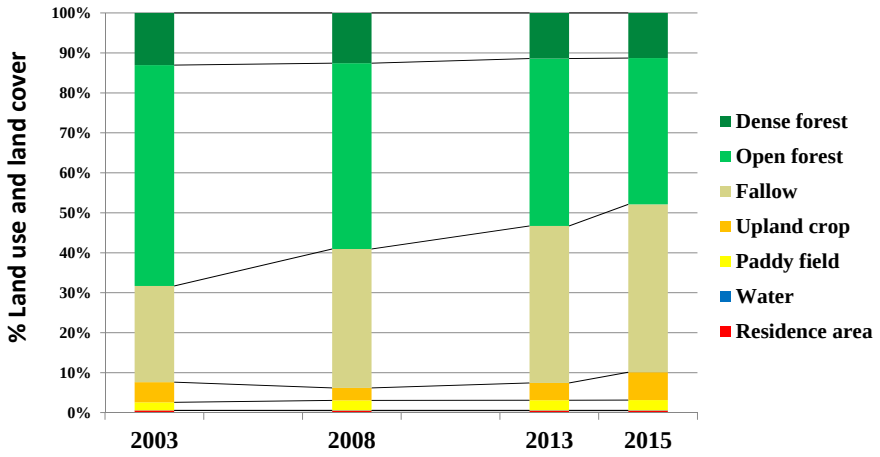

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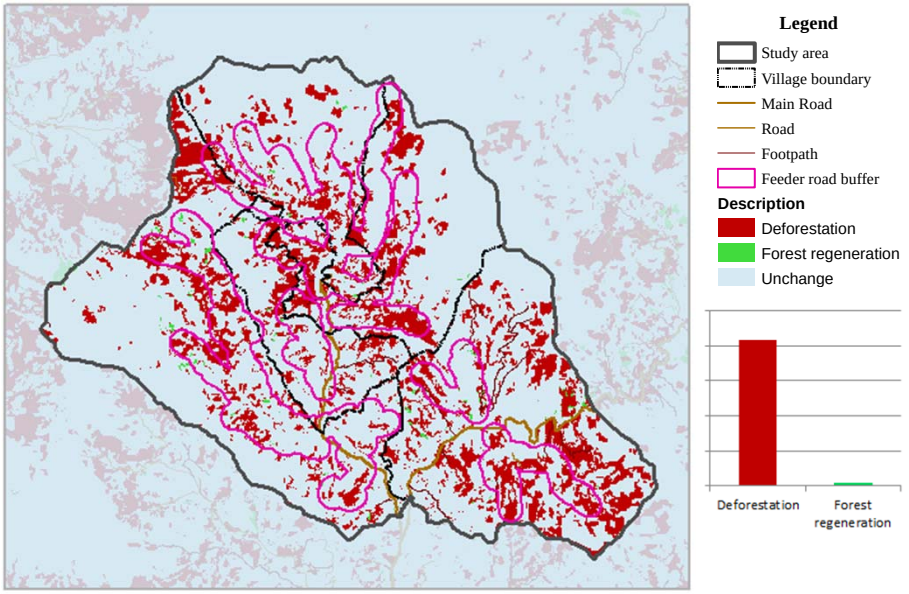
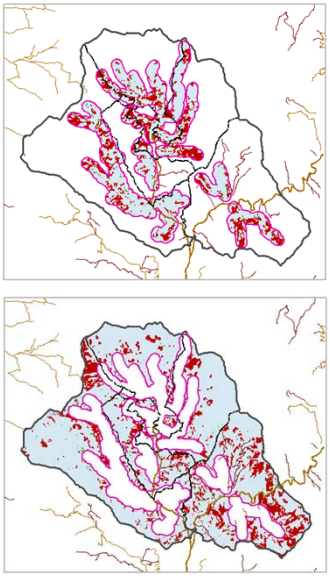
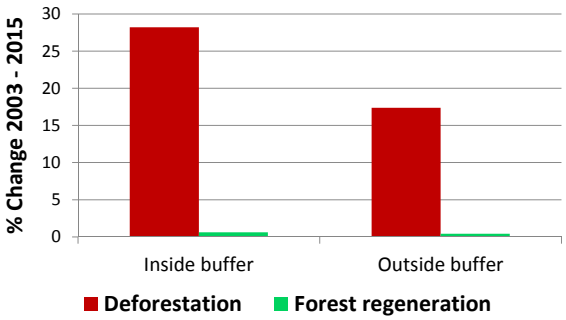
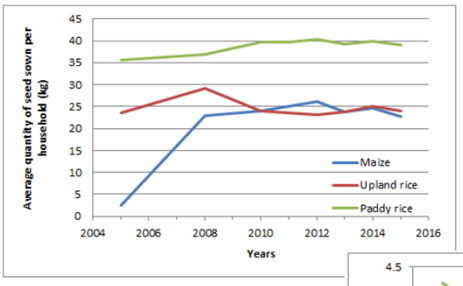


Results: feeder roads and land use changes



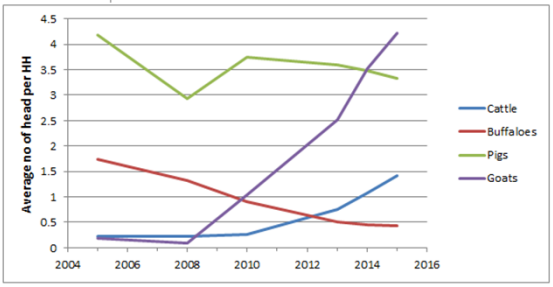


Results: changes in agriculture

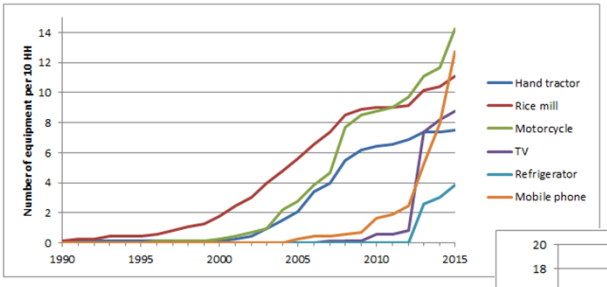


Crops

Livestock

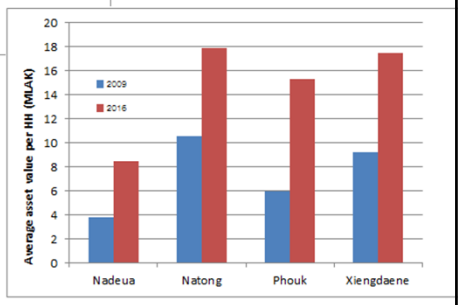


Results: change in agricultural practices

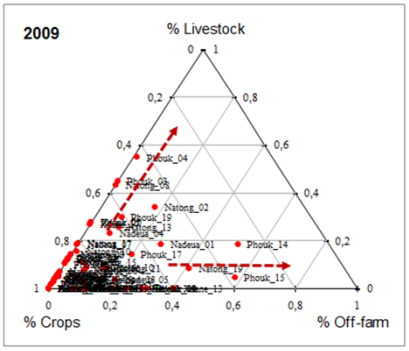


Time of equipment purchase

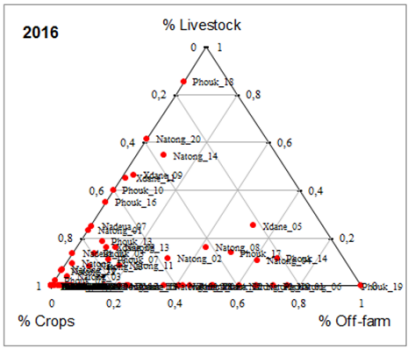
Average HH asset in 2009 and 2016



Results: changes in income generation patterns



Contribution of crops, livestock and off-farm activities to household incomes in 2009 and 2016



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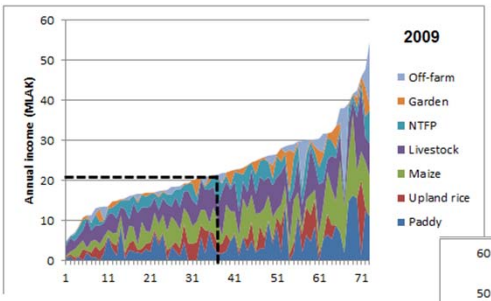
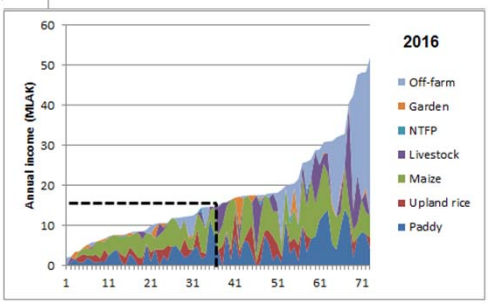
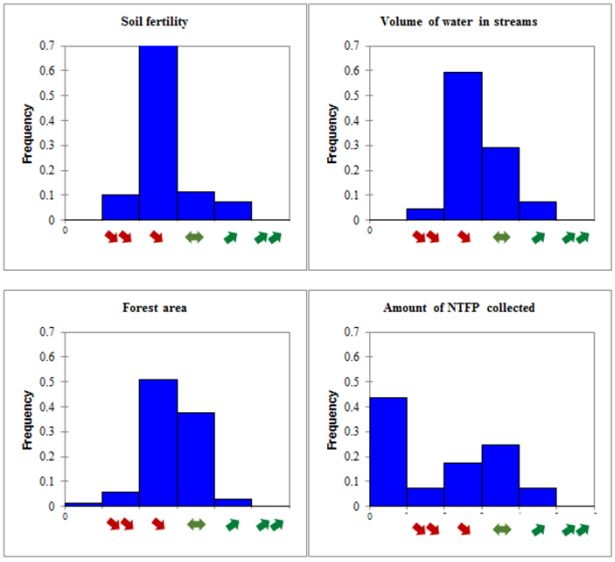


Income composition of the same 73 households surveyed in 2009 and 2016

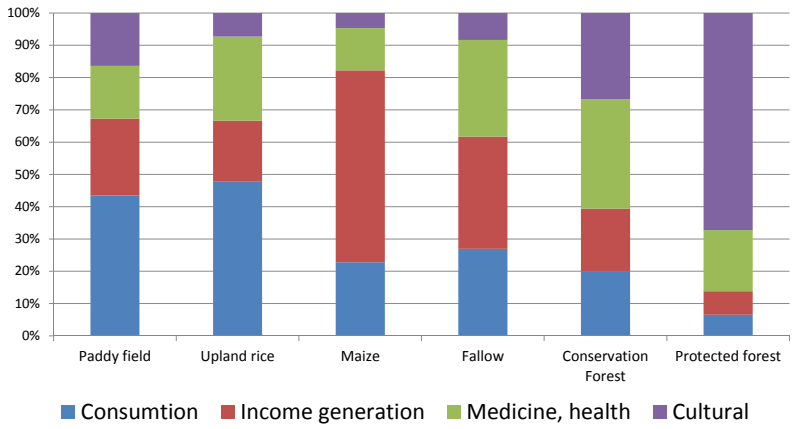


Results: farmers' perception of environmental changes



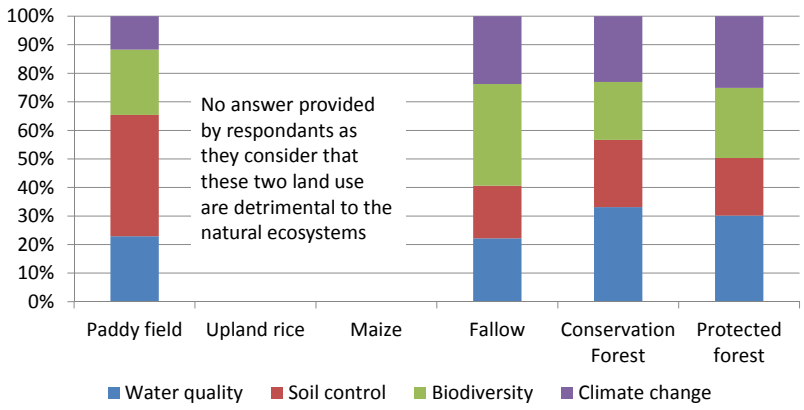
Perception of environmental changes over the past decade from 118 households surveyed in 2016

Results: farmers' perception of environmental changes



Perceived value for local livelihoods of the different land use types

Results: farmers' perception of environmental changes



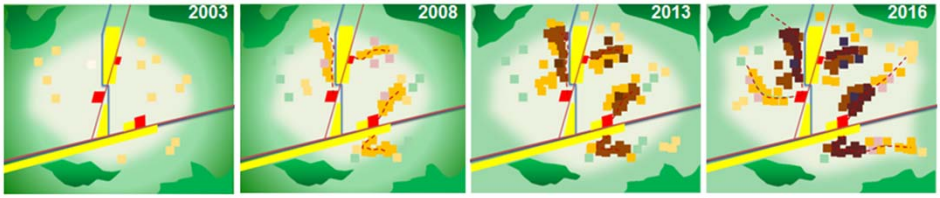
Perceived environmental value of the different land use types

Lessons learnt

- Two successive periods can be described in relation with opening of the feeder roads:
  - a first one of *contraction of the agricultural space* along theses feeder roads that provide easy access to formally remote fields combined with and *intensification of land use* in these new agricultural areas until land degradation reach a level that makes the cultivation system not profitable anymore, and then
  - a second one of expansion of the feeder roads to more remote, forested environments that were relatively preserved during the previous period and where a similar process of contraction and intensification of land use starts as for the first batch of feeder roads.

Lessons learnt

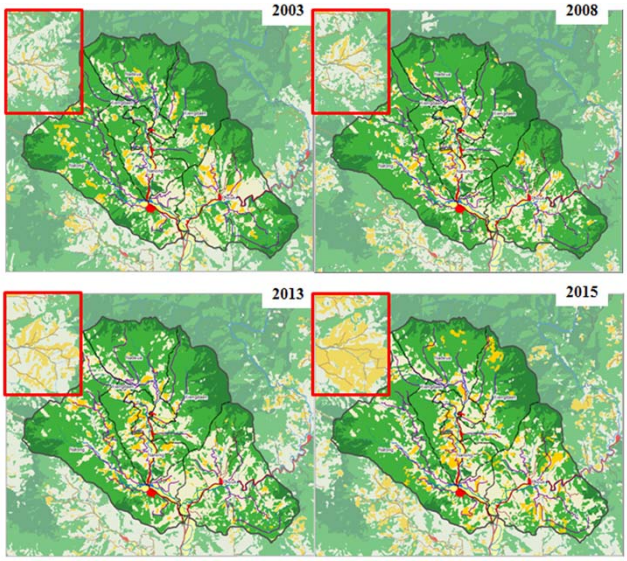
Process of land use intensification induced by maize expansion



2003	2008	2013	2016
• Subsistence agriculture based on a combination of paddy fields cropped 2 cycles per year and upland rice under shifting cultivation, • Collective paddy fields are redistributed among households every 3 to 5 years and upland fields are rotating with a 5 years fallow.	• Maize expansion as a cash crop following the opening of feeder roads, • Upland rice fields far from villages were abandoned and the one close to feeder roads cultivated in priority. • Some farmers still combine upland rice and maize in the same fields.	• Maize is cropped several successive years in the same fields along the feeder roads especially, • Traditional shifting cultivation systems are moved at the periphery of the village as land use is intensified along the feeder roads.	• Land around the feeder roads is saturated and fertility is degrading rapidly, • Villagers extend the feeder roads to reach more fertile lands, • They combine maize and upland rice wherever possible or more upland rice fields to remote areas, closer to the remaining forest.

Dense forest
Open forest
Fallow
Upland rice
Paddy field
Maize (mixed with upland rice)
Maize (1st year)
Maize (2nd year)
Maize (3rd year)
Maize (permanent)
Legend
Residential area
River
Main road
Feeder road

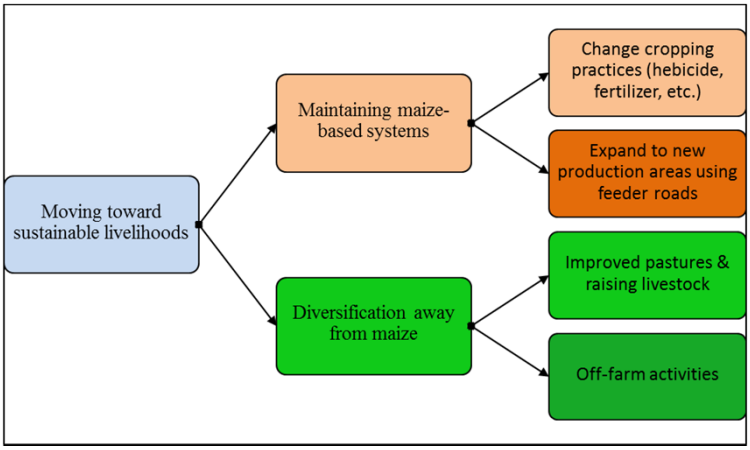
Lessons learnt



A similar process was observed across the border to Vietnam

Conclusion: scenarios exploration towards more sustainable livelihoods

In a context of high environmental and economic pressure what are the possible options for local communities to maintain their livelihood status?



Conclusion: feeder roads expansion has both positive and negative impacts

- Positive impacts:
  - –allowed engaging remote communities into the market economy through intensive cropping of maize,
  - –provided basic livelihood assets such as better house, motorcycles for transportation, cash for children schooling, etc.,
  - –provided opportunities for off-farm activities that provide a significant part of household income at present.
- Negative impacts :
  - –caused forest degradation and reduction of income from NTFP,
  - –soil erosion and land degradation that reduce the yields in the upland fields and force villagers to use more inputs,
  - –more debts and more economically risky activities as compared with the previous decade.