

# Enhancing ethnographic research using remote sensing data

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Indiana University

## *Structure of the presentation:*

→ General discussion on applications

→ Basic ethic issues

→ Accessible data and software

→ Examples and illustrative applications

→ Preparing material for the field and using images during interviews



## *Some common applications:*

→ Land use trajectories

→ Agricultural change and food production

→ Resource distribution, seasonality, and uses

→ Settlement and territories

→ Historical events

→ Urbanization

→ Infrastructure and networks

→ Biophysical data:

.Vegetation, drainage and topography

→ Participatory and local mapping

→ Policy, management and monitoring of  
Indigenous territories

## *Some methodological contributions:*

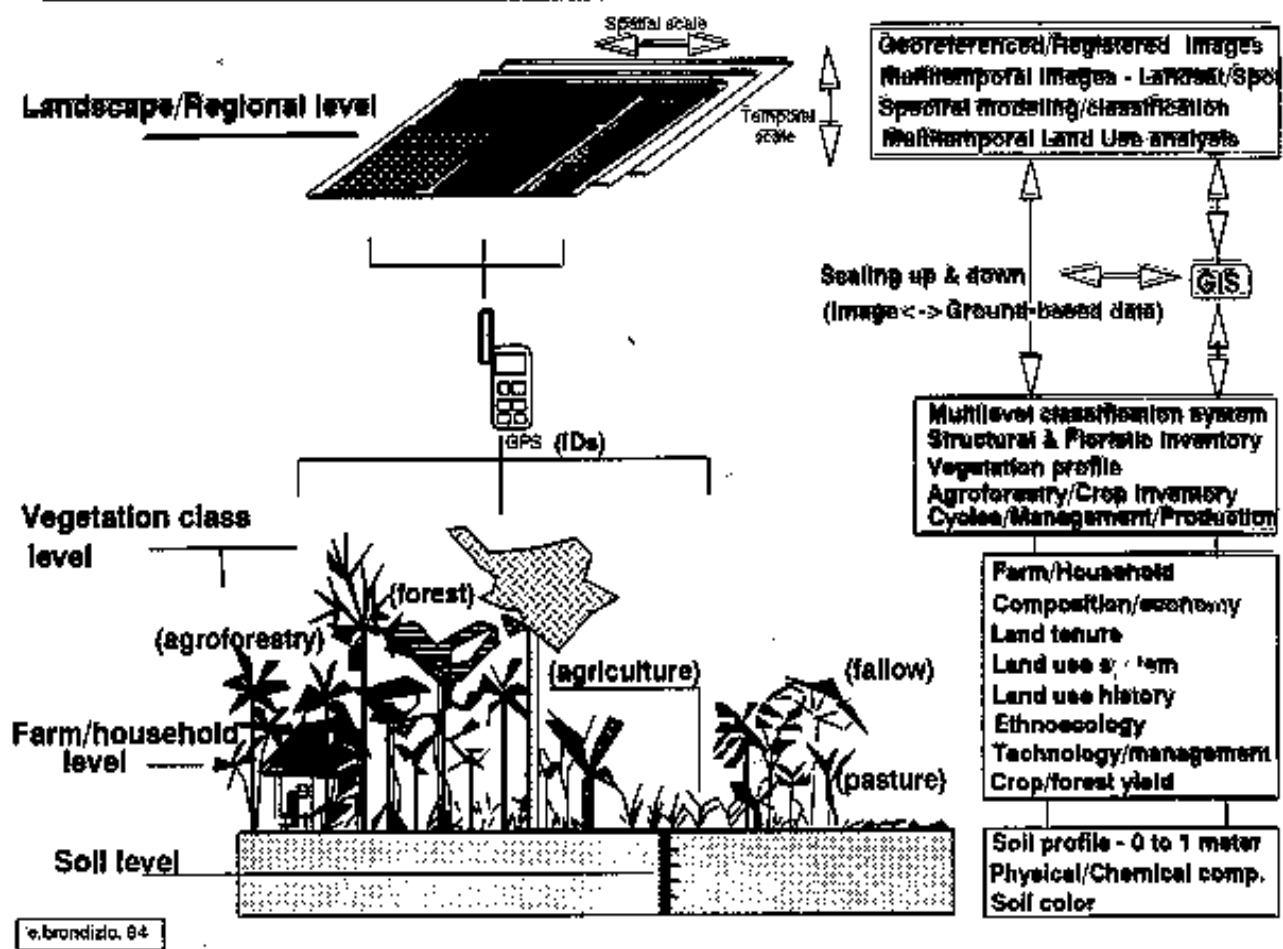
- **Define boundaries and units of analysis**
- **Planning fieldwork and Sampling**
- **Comparative research**
- **Cross-sectional analysis**
- **Longitudinal analysis**
- **Reveal large-scale phenomena**
- **Contextualize, nesting units of analysis**

- **Enhance interviews**
- **Measurements**
- **Hypothesis testing**
- **Provide products to communities**
- **Serve as historical record**

## *Some relevant ethic issues:*

- Professional Ethics, Data confidentiality, and Data sharing
- Sharing interpretation knowledge (e.g., tutorial manual)
- Mediating use of data in participatory mapping (problem of reinforcing local political powers)
- Representation of people and land tenure
- (Geo) Politically sensitive areas

# METHOD OF MULTILEVEL ANALYSIS OF LAND USE/LAND COVER CHANGE

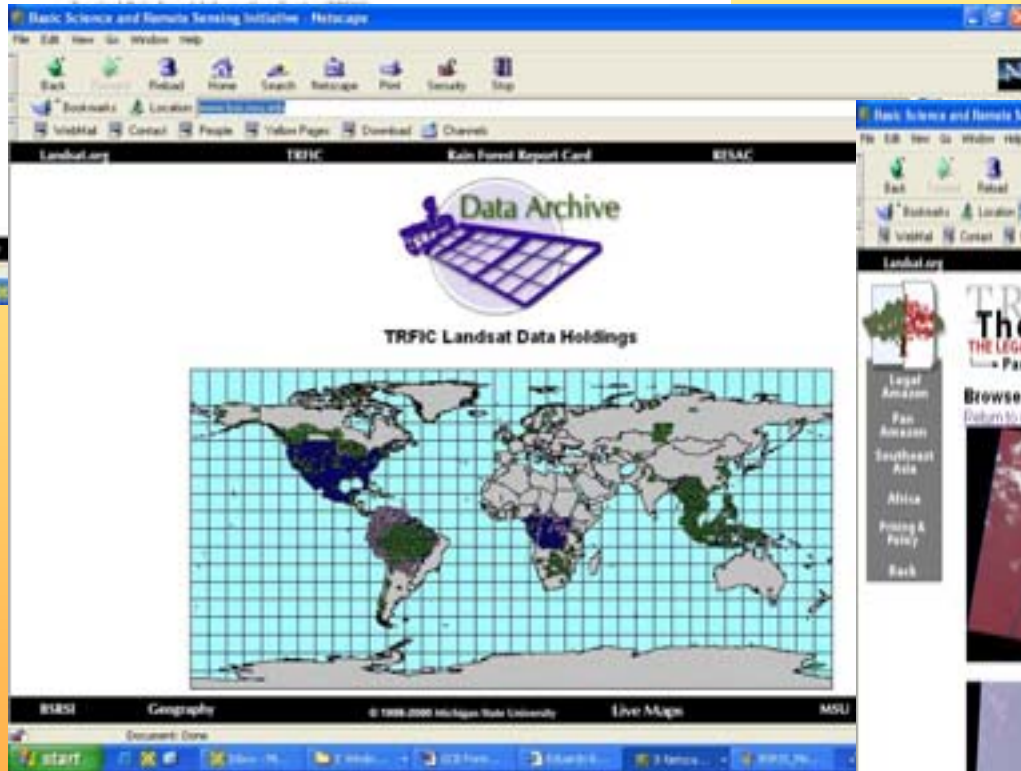


**ACCESSIBLE DATA,**

**TUTORIALS AND TRAINING**

**SOFTWARES**

# BSRSI – TRFIC at Michigan State

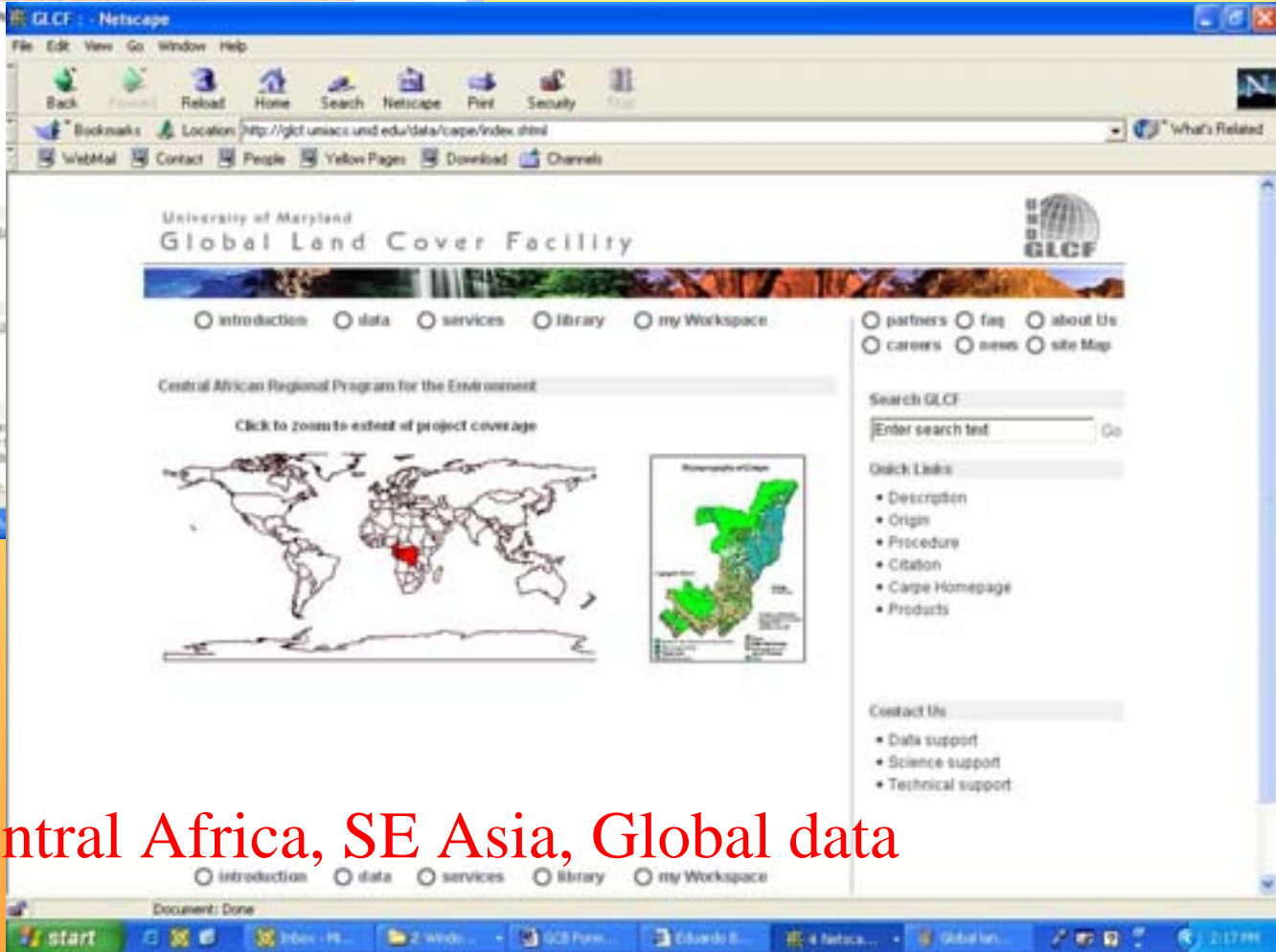


Amazonia, Central Africa, SE Asia

Eduardo S. Brondizio, Indiana  
University, 2002.



# GECF at U. of Maryland



US, Amazonia, Central Africa, SE Asia, Global data

# NLAPS, North America Landsat Program

Landsat4u, LLC  
Landsat 4, 5, and 7 (soon)  
Cloud Free data of the Southwestern United States and Northern Mexico

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ER Mapper 6.2  
ASTERIMAGES.com  
PETERS GEOSCIENCES

Eduardo S. Brondizio, Indiana  
University, 2002.

# GEO-GRATIS



**Canadian data**

# Earth Explorer: Primary/General Search engine

The screenshot shows a Netscape browser window displaying the Earth Explorer website. The browser's address bar shows the URL <http://edc.srs17.cr.usgs.gov/earthExplorer/>. The website header features the USGS logo with the tagline "science for a changing world" and the text "Earth Resources Observation Systems (EROS) Data Center". Navigation links for "SITE MAP" and "SITE SEARCH" are visible. The main heading is "EarthExplorer".

Below the heading, a paragraph explains that users can query and order satellite images, aerial photographs, and cartographic products through the U.S. Geological Survey. It mentions login options for guests and registered users, and notes the use of session cookies and Java applets. A link for "Customer Services" is provided.

A red text prompt states: "First time users please read-->[Minimum Requirements](#) for running EarthExplorer."

A yellow-bordered box contains the announcement: "The Declassified Satellite Imagery collected from KH-7 and KH-9 satellites will be available on EarthExplorer November 21, 2002."

The registration section includes the text "Enter as a: Guest Or Register as: U.S. Non-U.S." Below this, it asks for login information from existing users, with input fields for "Enter User Name:" and "Enter Password:", and "LOGIN" and "RESET" buttons.

A red text prompt suggests: "Just looking for a photo or a map? Try [MapFinder](#) or [PhotoFinder](#)."

At the bottom, a navigation bar contains links for "DOI", "USGS HOME", "Biology", "Geology", "Mapping", "Water", and "EROS HOME". The footer includes the text "U.S. Department of the Interior | U.S. Geological Survey (USGS)". The browser's status bar at the bottom shows the URL <http://www.usgs.gov> and the system clock displays "2:11 PM".

# African Data Dissemination Service

**ADDs**

**AFRICA DATA DISSEMINATION SERVICE**

[Home](#) | [Data](#) | [Software Tools](#)

[Project Overview](#) | [Data Providers](#)

**USGS** **USAID**

The U.S. Agency for International Development (USAID) Famine Early Warning System Network (FEWS NET) is an information system designed to identify problems in the food supply system that potentially lead to famine, flood, or other food-insecure conditions, in sub-Saharan Africa. FEWS NET is a multi-disciplinary project that collects, analyzes, and distributes regional, national and sub-national information to decision makers about potential or current famine or flood situations, allowing them to authorize timely measures to prevent food-insecure conditions in these nations. Countries with FEWS NET representatives are Burkina Faso, Chad, Eritrea, Ethiopia, Kenya, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Somalia, (southern) Sudan, Tanzania, Uganda, Zambia, Zimbabwe.

**Other Resources**

# University of New Hampshire, Pathfinder Program (EOS-Webster)

UNH EOS-WEBSTER - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Address <http://eos-webster.sr.unh.edu/> Go Links

**Collection**

**Welcome**

**User Services**

**News**

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**About EOS-WEBSTER**

**View Previous Orders**

**Educational Image Subsets**

Landsat image subsets provided for educational use as part of the Forest Watch program and other educational programs which make use of satellite remote sensing data. Data are sorted by state and spectral type (6-band multispectral, 2-band thermal, 1-band panchromatic). The image subsets are served in the ERDAS Imagine (.img) format and can be opened by Multispec and other image processing software.

[Detailed Info & Data Policy](#)

[Get Data](#)

**GOES 8 LBA Data**

One, four, and eight km resolution GOES 8 Imager data in five spectral bands, available separately, for the Amazon region. Data was provided by the Florida State University. Data are from March, 1998 through February, 2001.

[Detailed Info & Data Policy](#)

[Get Data](#)

**IKONOS Data**

Satellite images for the tower and field sites for the Large-scale Ecosystem Atmosphere Experiment in Amazonia (LEA) project. Data has a 1-4 m resolution and currently spans 4/30/2000 through 2/9/2002. Data access is restricted based on the Data Policy statement and requires separate registration (please see the User Services Page).

[Detailed Info & Data Policy](#)

[Get Data](#)

**Landsat Data**

This collection houses full scenes of Landsat 7 ETM+ data, Landsat 5 TM data, and Landsat 4/5 MSS data. The collection is broken down into three searchable repositories: 1) Scenes within the United States, 2) Scenes of Russia and surrounding regions, provided by Woods Hole Research Ctr., and 3) Scenes from other regions of the world. Data resolution varies based on the spectral type, sensor type, and processing. Data are provided in ERDAS Imagine (.img) and band sequential (.bq) formats. If you would like us to distribute your Landsat data to others please contact User Support.

[Detailed Info & Data Policy](#)

[Get Data](#)

**MODIS Data**

Spatially aggregated MODIS tiles for specific regions of the globe and for specific MODIS products. EOS-WEBSTER has created these MODIS products for the Amazon Basin/LBA region: 8-day 500 m Surface Reflectance (MOD09A1 full product), 16-day 250 m NDVI (MOD13Q1 subset), and 1 km Thermal Anomalies/Fire Prediction 8-day time series (MOD14A1 reformatted). All data products have

[Detailed Info & Data Policy](#)

Internet

US, Amazonia, Central Africa, SE Asia, Global

Eduardo S. Brondizio, Indiana

University, 2002.

# UNEP GRID

GRID-Arendal: Online GIS and Maps Database

GIS Datasets: Table of contents

**Table of contents**

Conditions of use: These datasets may be used freely for educational or non-profit purposes, provided that proper credit is given to GRID-Arendal and to the original data source(s).

Also check our special collection: [Baltic drainage basin data](#) [Nordic / Baltic extractions.](#)

(.) shows number of datasets in each category  
Click on (.) to get a dataset listing

Regions	Africa	Arctic	Global
<b>Themes</b> (33)	(6)	(22)	(1)
<a href="#">Base maps (15)</a>	-	(12)	(1)
<a href="#">Biodiversity (2)</a>	-	(2)	-
<a href="#">Human population (2)</a>	(1)	-	(1)
<a href="#">Population (4)</a>	(4)	-	-
<a href="#">Protected areas (8)</a>	-	(8)	-
<a href="#">Terrestrial geography (1)</a>	(1)	-	-
<a href="#">Wilderness (1)</a>	-	-	(1)

Was this page useful to you?  
 Yes  A little  No

General data, GIS layers

# EMBRAPA's BRASIL FROM SPACE

CD Brasil visto do Espaço - Microsoft Internet Explorer

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Address <http://www.cnpm.embrapa.br/cdbrasil/index.html> Go Links

**Ministério da Agricultura,  
Pecuária e Abastecimento**

**Embrapa**

**GOVERNO  
FEDERAL**  
Trabalhando em todo o Brasil

## CD Brasil Visto do Espaço

Pela primeira vez é possível observar claramente a real situação da Amazônia brasileira e de todo o Nordeste do Brasil. Um mosaico inédito, a partir de mais de 350 imagens recentes do satélite Landsat 7, foi produzido pela Embrapa Monitoramento por Satélite. Ele permite ver com detalhes como está cada um dos 17 Estados dessas regiões. Eles totalizam mais de 6.300.000 Km<sup>2</sup>, ou seja, cerca de 75% do território nacional.

O trabalho foi editado em 9 Cd's, um para cada estado da Amazônia. Em breve estarão disponíveis os Cd's do Nordeste.

Para adquiri-lo(s) ou para saber mais, basta acessar os dados via Internet:

Acre Amazonas Amapá Maranhão Mato Grosso Pará Rondônia Roraima Tocantins

Start Exploring - Hawa AAA\_Workshop CD Brasil visto d 3:51 PM

Landsat data, Brazilian states



# Purdue's Multispec Image processing software: FREEWARE!

The image displays a screenshot of the MultiSpec software interface. On the left, a Microsoft Internet Explorer browser window shows the MultiSpec website. The main application window, titled "MultiSpec Windows Application - Select Field", features a menu bar (File, Edit, View, Project, Processor, Palette, Options, Window, Help) and a toolbar. The main workspace shows an "Untitled Project" with a file named "P91atm.lan (chs. 4 3 2)" open, displaying a false-color satellite image of a landscape with red, green, and cyan areas. A "Selection Graph" window is overlaid on the image, showing a line graph of "Value" (0 to 90) versus "Channel" (0 to 6). The graph displays a peak at channel 4. A "Sele..." window on the right provides options for selection, including "Class: New", "Polygon Enter", "Edit Selection...", "Add To List", and "Coordinates (L,C)" with a table showing values 175, 412, 190, and 418.

MultiSpec Windows Application - Select Field

File Edit View Project Processor Palette Options Window Help

Untitled Project

P91atm.lan (chs. 4 3 2)

Selection Graph

Lines: 175-190, Columns: 412-418 Data Values  
[Average, +Std Dev, Min-Max]

Channel	Value
0	~55
1	~35
2	~25
3	~20
4	~75
5	~55
6	~15

Sele...

Class: New

Polygon Enter

Edit Selection...

Add To List

Coordinates (L,C)

175	412
190	418

Ready

Great image processing software.



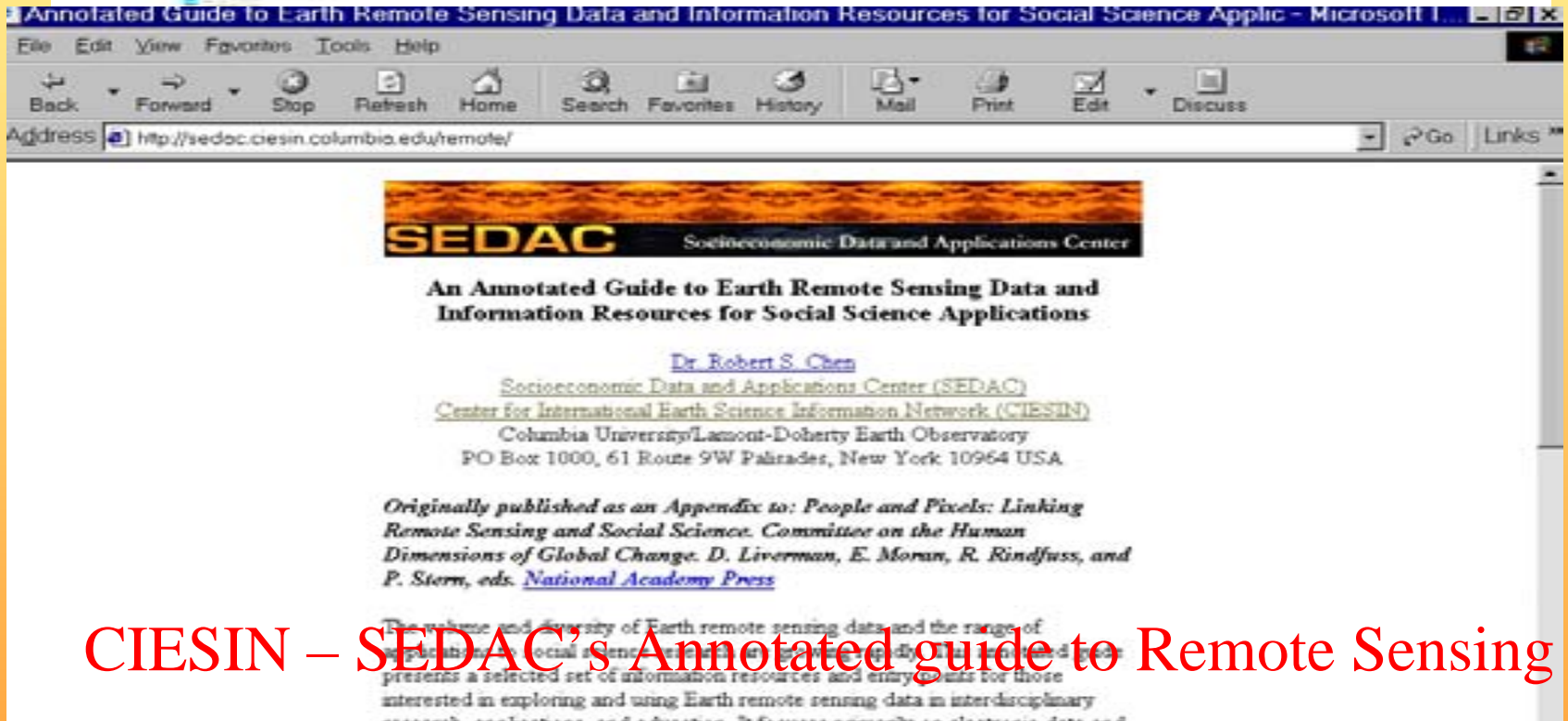
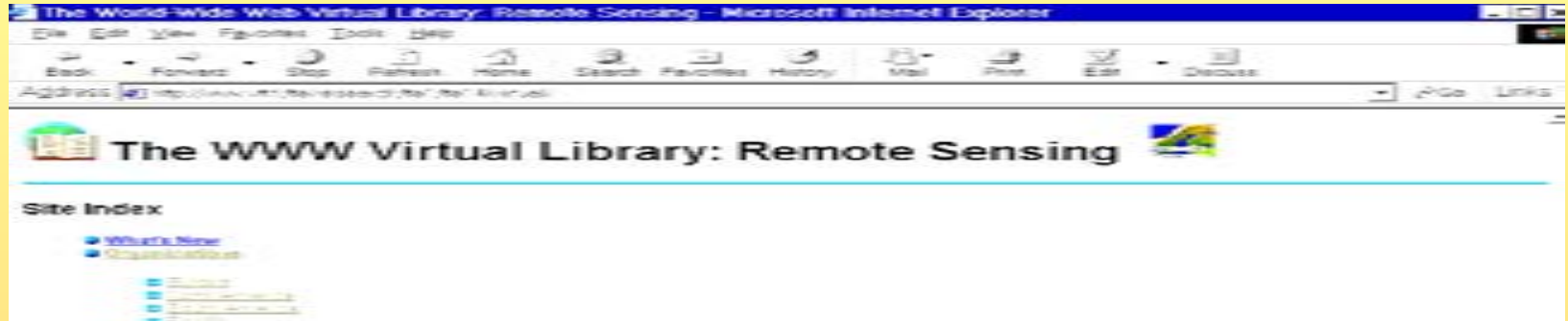
## Learning about Remote Sensing



## NASA's Remote Sensing Tutorial

Eduardo S. Brondizio, Indiana University, 2002.

# Learning about Remote Sensing



CIESIN – SEDAC's Annotated guide to Remote Sensing

# Learning about Remote Sensing

Indiana State INTERACTIVE CD teaching remote sensing.

Environmental Remote Sensing - Microsoft Internet Explorer

File Edit View Favorites Tools Help

ADDRESS http://baby.indstate.edu/gers/irs.html

Vigo County Schools  
Indiana State University  
NASA Grant # NAG 13-34

## Environmental Remote Sensing

Interactive CD-ROMs  
for grades 7-12

Related Links

CD-ROM Features

Teacher Utilities

Remote Sensing

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Hands-on

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CD Features: Remote Sensing

Introduction

This CD-ROM features remote sensing applied to wetland restoration. In this CD, wetland issues and concepts are presented and discussed in detail along with a thorough discussion on remote sensing technology and its use. A final project concludes this CD in which remote sensing is used to locate potential sites for wetland restoration. The project is conducted using a simulated version of Erdas Imagine.

Activities

There are fourteen hands-on activities in the CD. Activities range from virtual trip to wetland sites to drag and drop

Quizzes

The quiz questions are either true false, or multiple choice. Each quiz is comprised of four or five questions for each section. The students are given immediate feedback on the correctness of their answers. At the end of the

National Space Agencies

NASA Home

CCRS Home

CNES Home

CSIRO Home

ESA Home

INPE Home

NRSA Home

NASDA Home

Tutorials

Remote Sensing Tutorial

Remote Sensing: Canada

RS Core Curriculum

NASA Observatorium

Multispec

Data

TM Data Description

SPOT Data Description

Radar Data

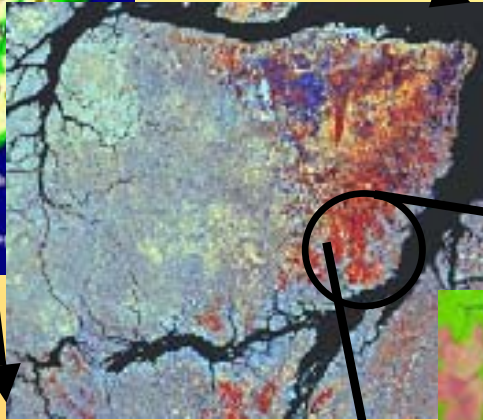
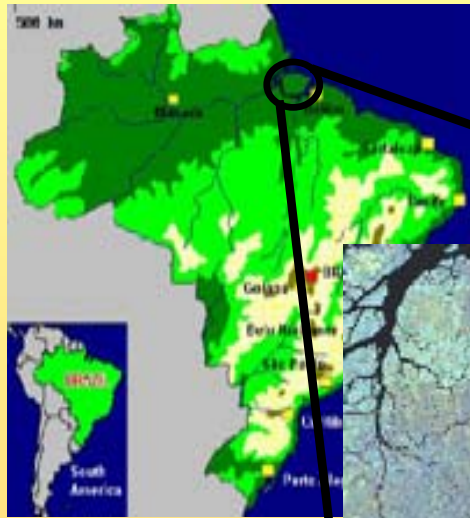
Start | Exploring - P... | AAA Works... | Environme... | Microsoft Ph... | Internet | 4:25 PM

Excellent introduction from history to classification!

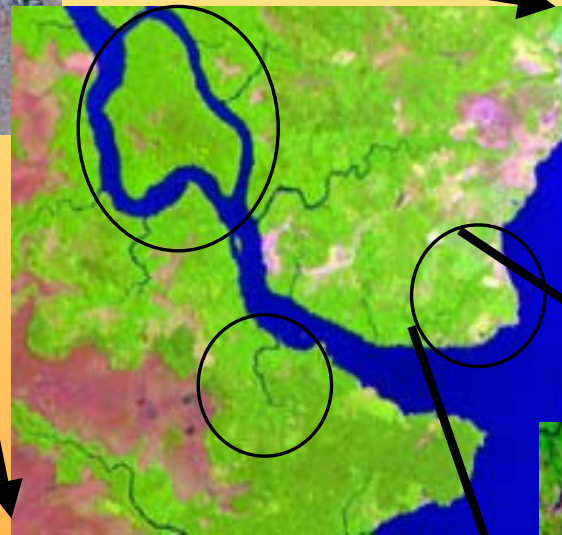
Eduardo S. Brondizio, Indiana  
University, 2002.

# → **Examples and illustrative applications**

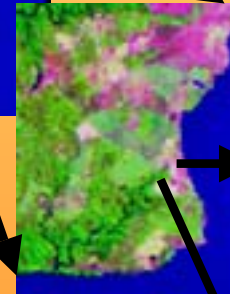
# Local-Regional contextualization



**Marajo Island,  
Amazon Estuary**



**Ponta de Pedras, Para State**



**Community**

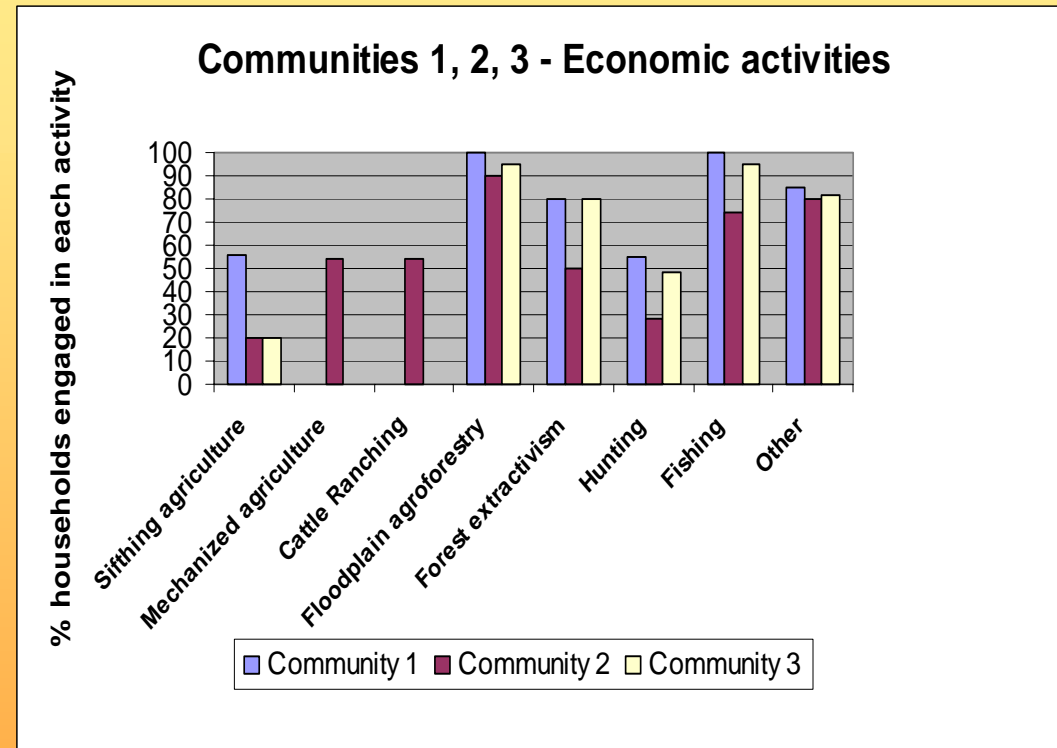
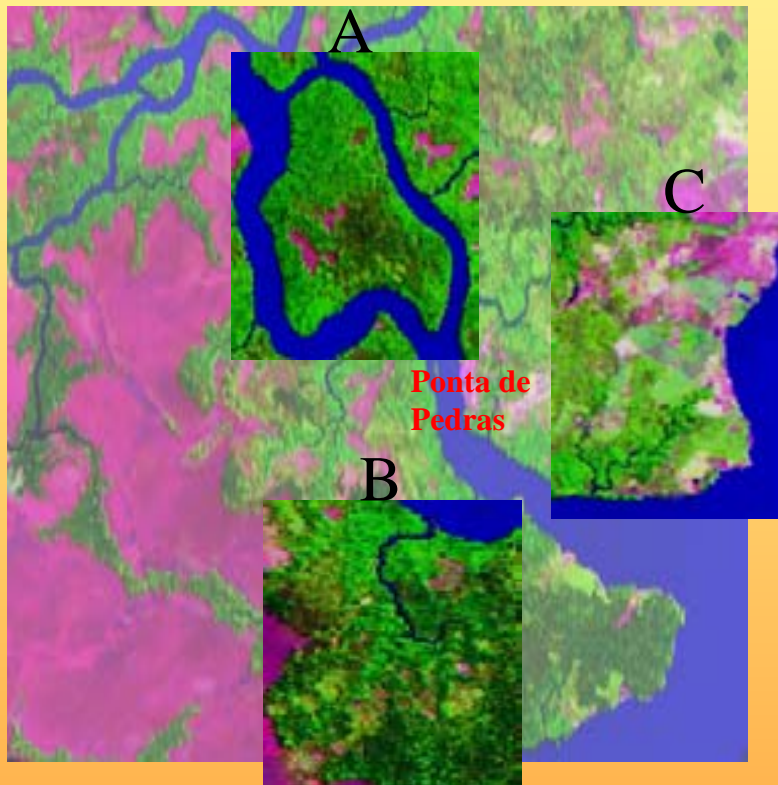


**Farmer**

Eduardo S. Brondizio, Indiana University, 2002.

# Economic activities, land use systems, and landscape patterns

Can you relate economic activities (Communities 1,2,3) & landscapes (A, B, C)?



(Brondizio et al 1994: Patterns of Caboclo settlement and landscape management. Human Ecology)

# Bringing local production systems (&producers!) into a regional perspective

## Management and Planting of Açaí agroforestry

Unmanaged



Intensive Managed

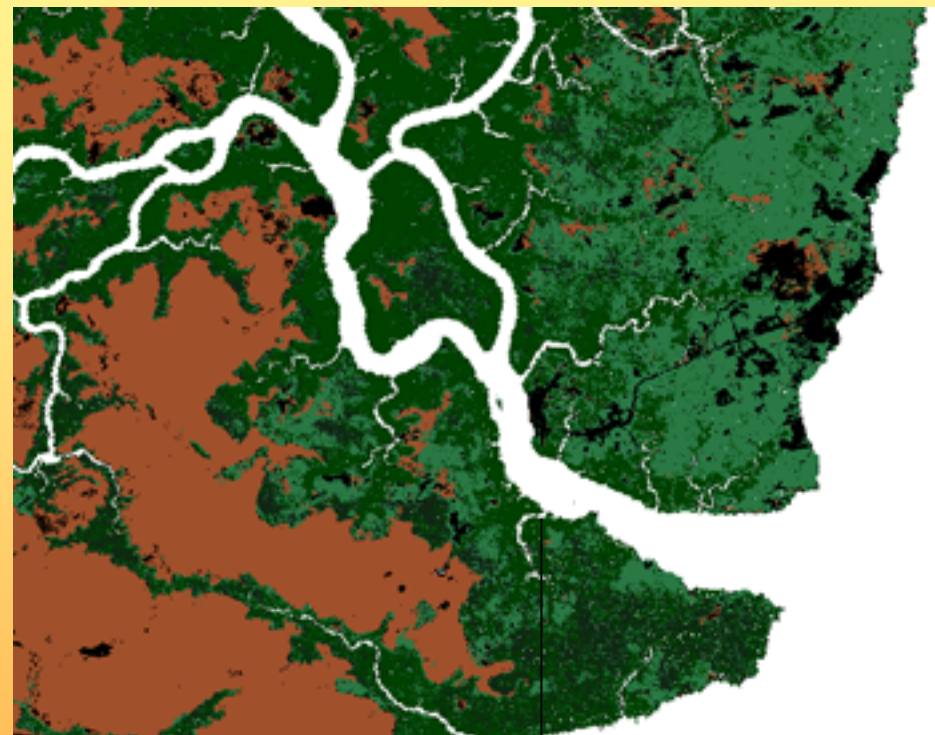


IKONOS image  
[Yellow: Açaí agroforestry]

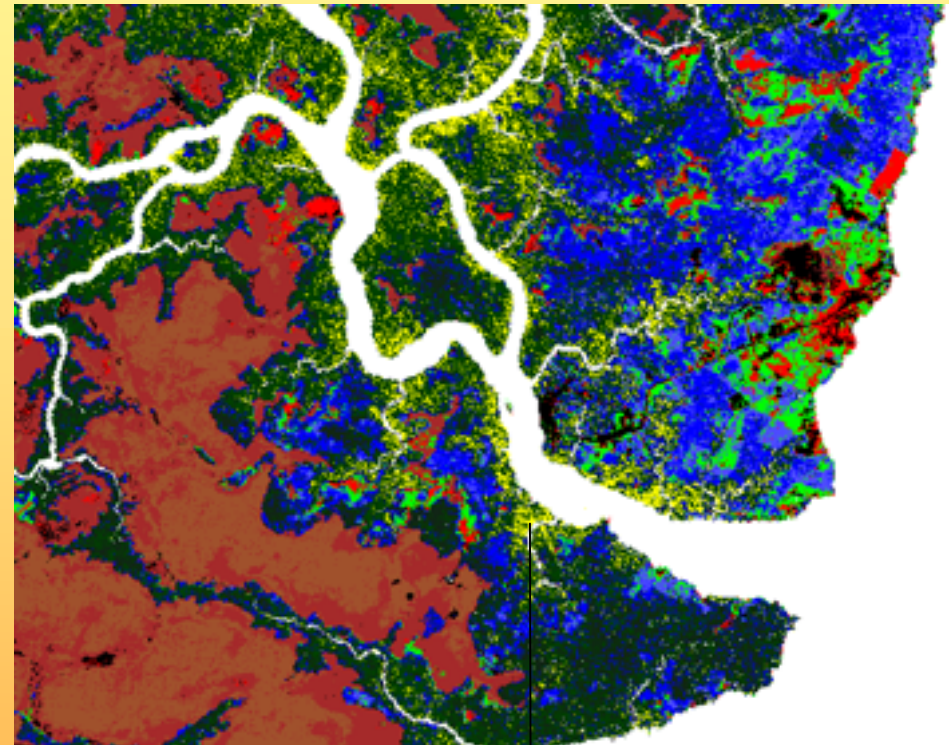
Brondizio and Siqueira (1997). *From Extractivists to forest farmers*.  
Research in Economic Anthropology vol 18



## Ethnographic work bringing detail to the remote sensing data



*as forest*



*as intensive agroforestry*

“Invisible producer” → into → most significant regional land use system!

Brondizio et al. (1996, 2001). *Integrating RS, botanical, historical data*. PE&RS

Eduardo S. Brondizio, Indiana  
University, 2002.

# Factors influencing settlement pattern and variability in land use systems



Acaricuara



Yapu

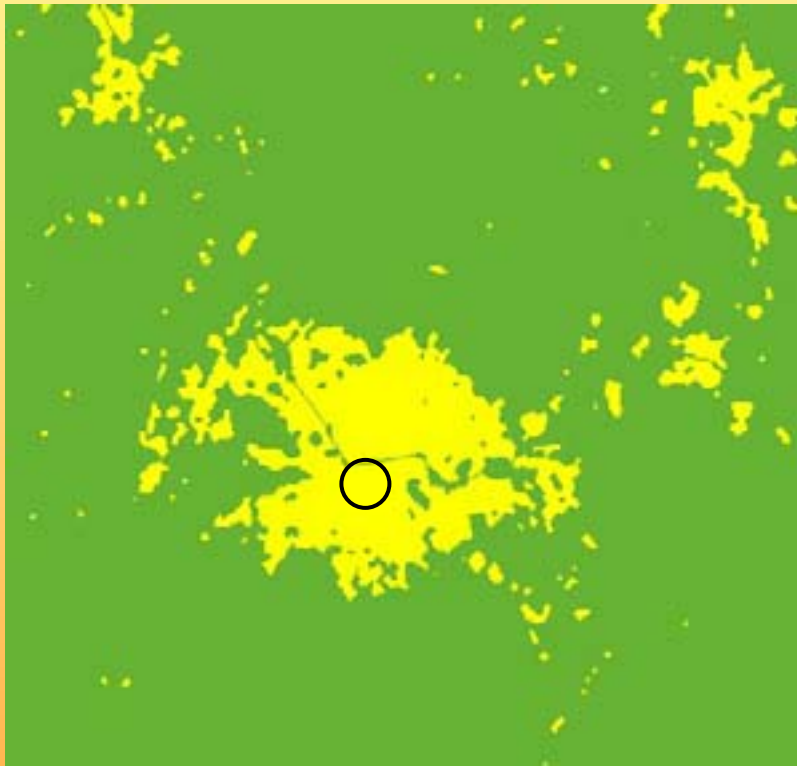
**Tukanoan Indigenous communities (neighbors) Vaupes basin , Colombia/Brasil**

**What explains differences in landscape configuration across two similar land use systems and settlement pattern?**

(from Castro and Brondizio in preparation; Brondizio, Castro, Batistela 2000):

# Vaupes, Indigenous Communities, Long-Fallow Manioc Agriculture

What explains differences in landscape configuration across two similar land use systems and settlement pattern?



Concentric



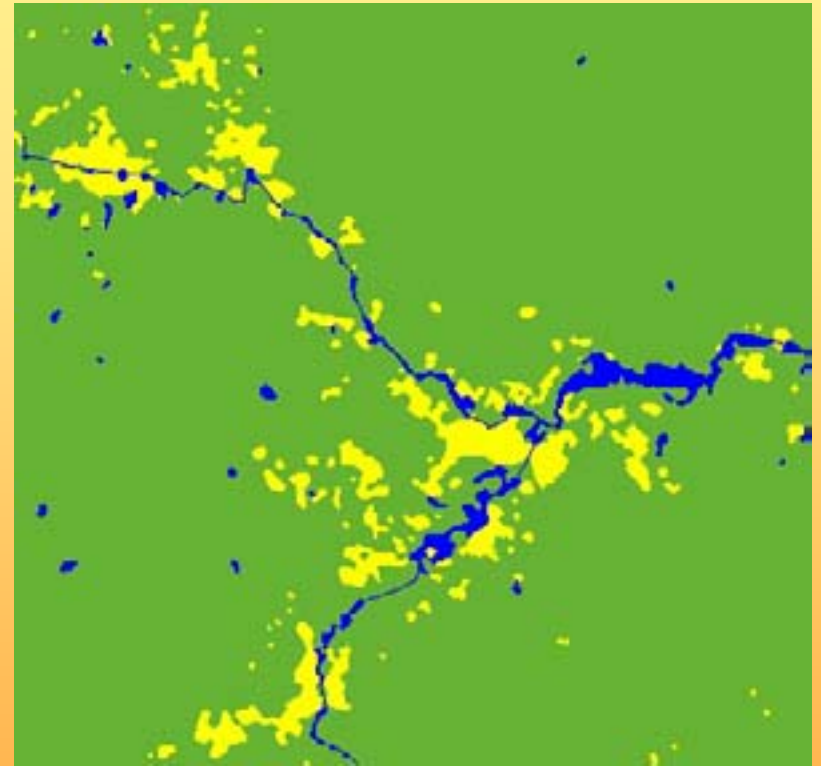
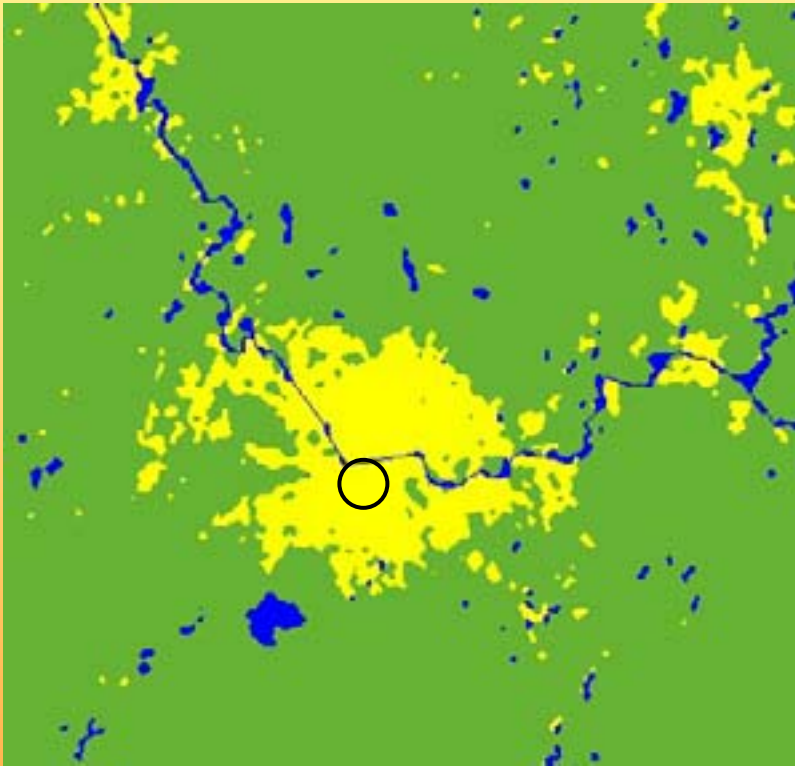
Dendritic

○ Village

■ *Areas in use*

Eduardo S. Brondizio, Indiana  
University, 2002.

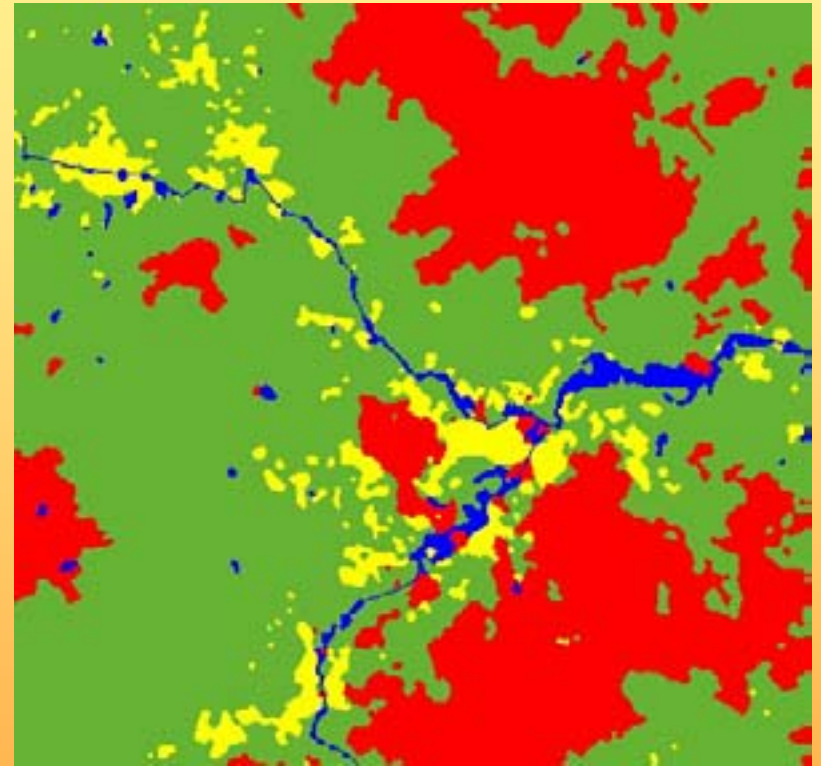
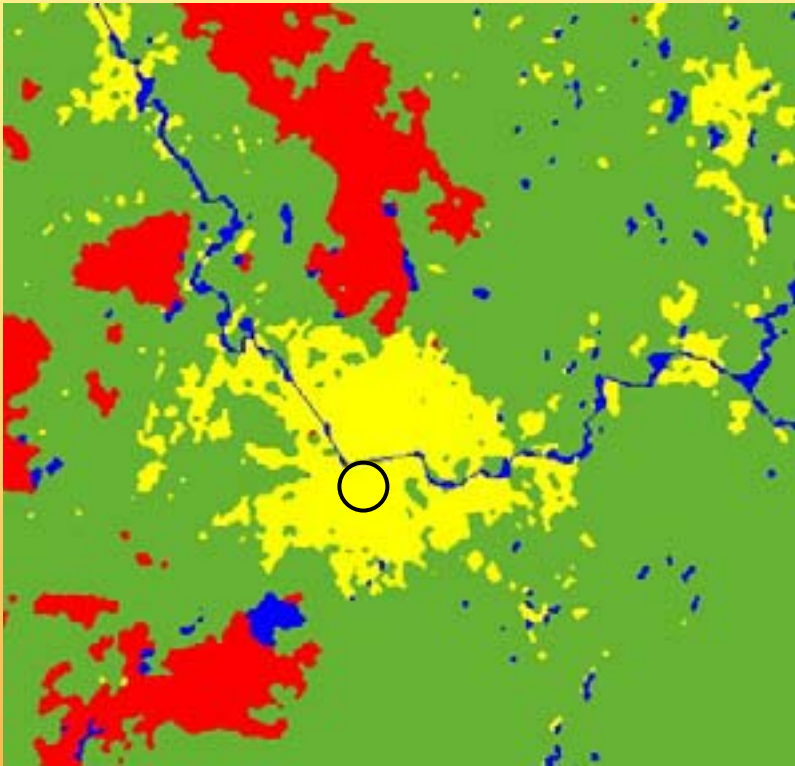
# River access as a biophysical opportunities



○ Village       *Areas in use*       *Waterways*

Eduardo S. Brondizio, Indiana  
University, 2002.

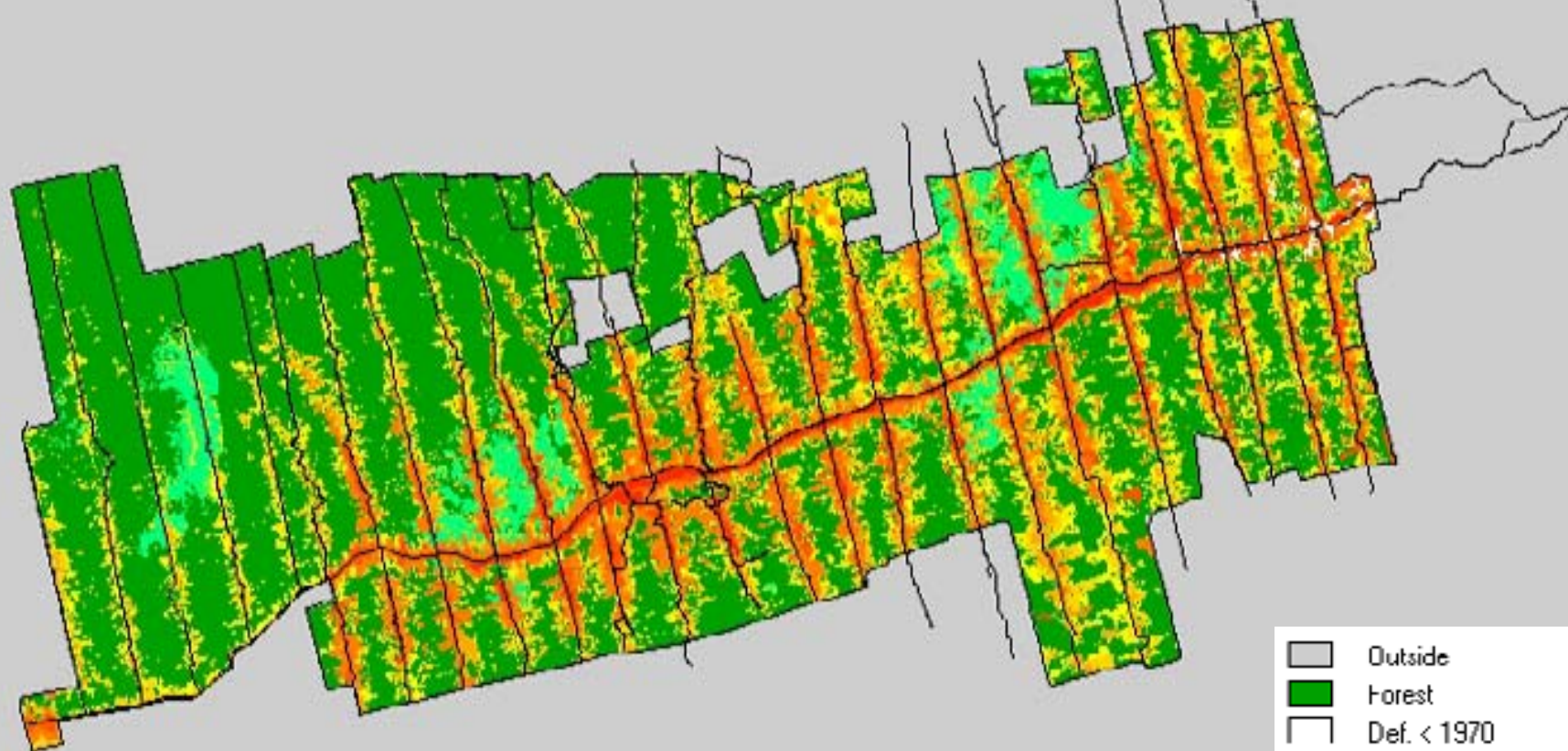
# Land cover and soil type as a biophysical constrain



○ Village       *Areas in use*       *Waterways*       *'Bananas' (spodosols)*

# Reconstructing the history of colonization Landscapes

## Deforestation trajectory: 1970-1996

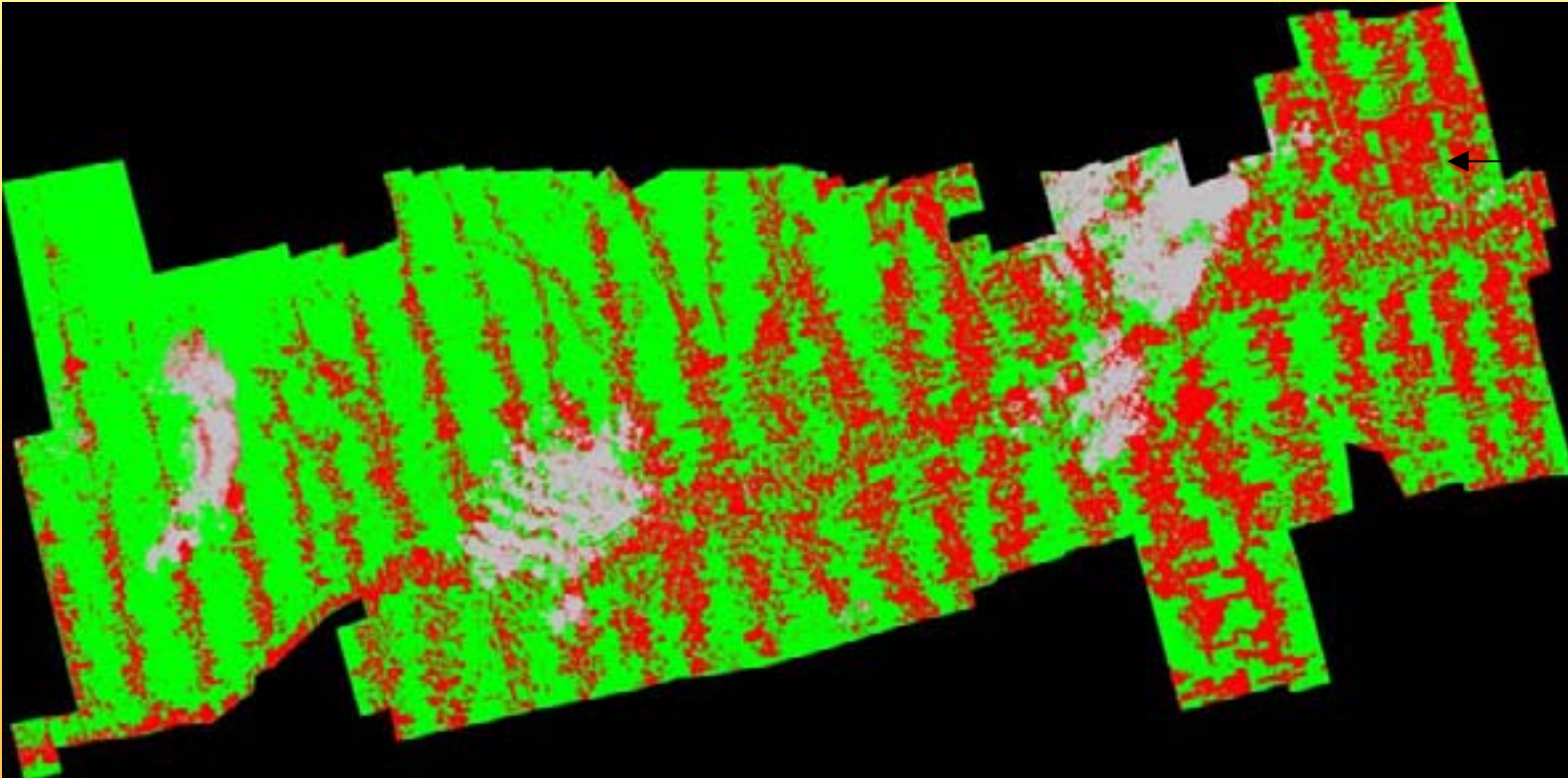


Brondizio et al 2002; Moran et al 2002, McCracken et al 1999, 2002; Boucek et al 2002

Eduardo S. Brondizio, Indiana  
University, 2002.

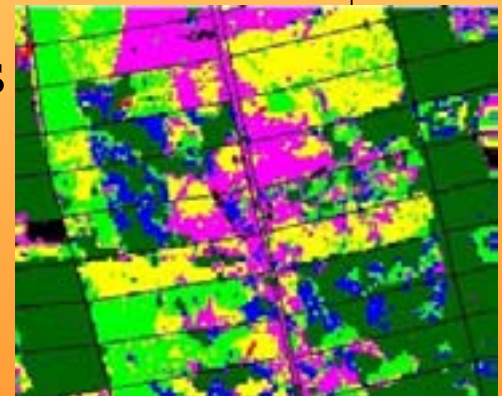
1996

Colonization landscape



Brondizio et al 2002

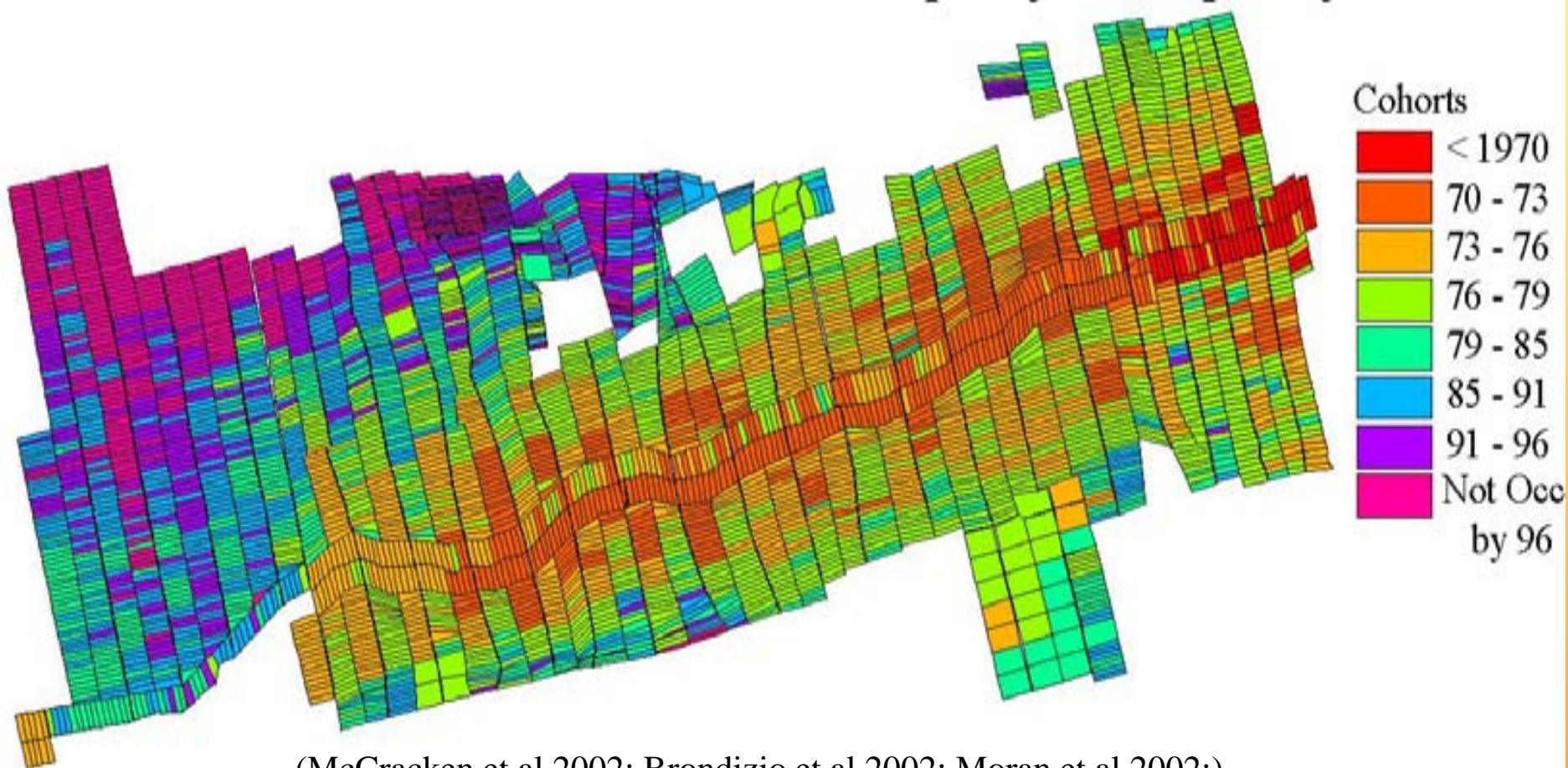
Farm lots



Eduardo S. Brondizio, Indiana  
University, 2002.

# Reconstructing the arrival of families and formation of farms

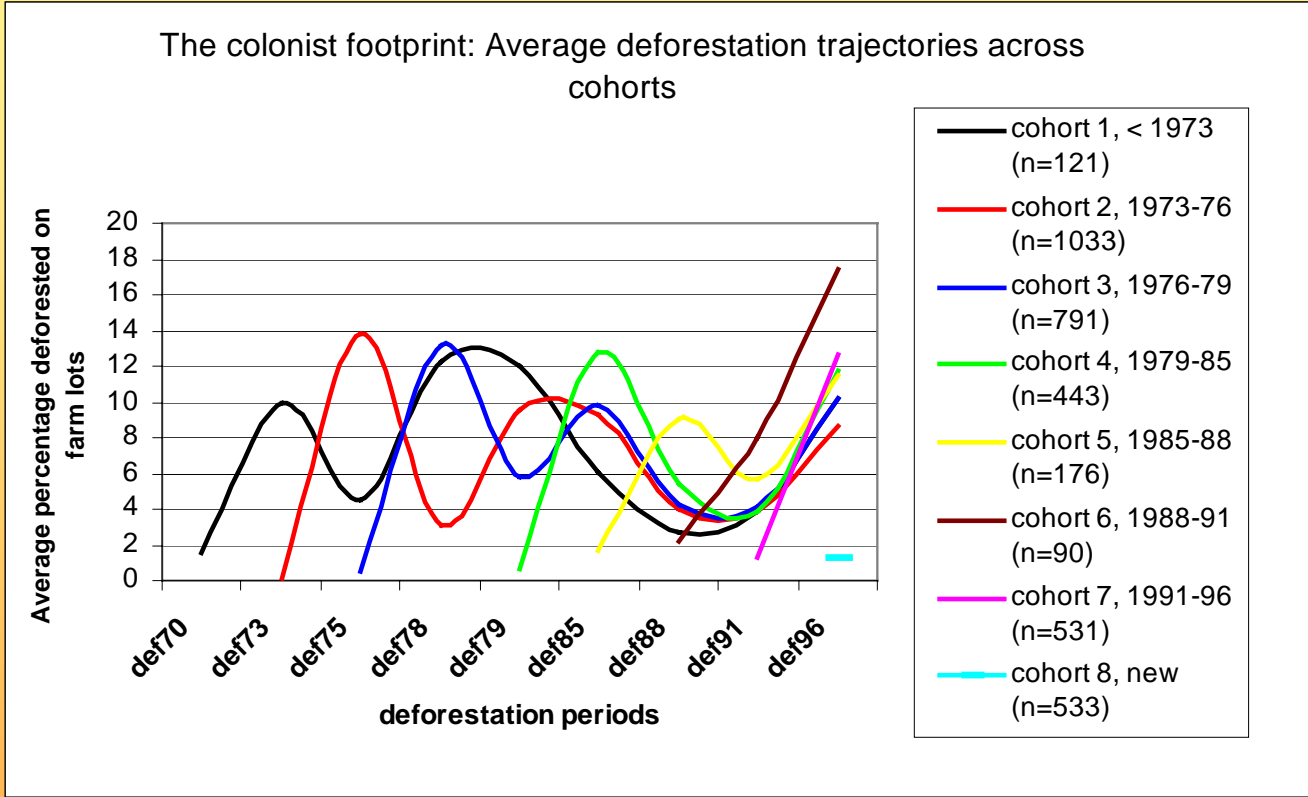
## Cohort of Farm Property Occupancy



(McCracken et al 2002; Brondizio et al 2002; Moran et al 2002;)

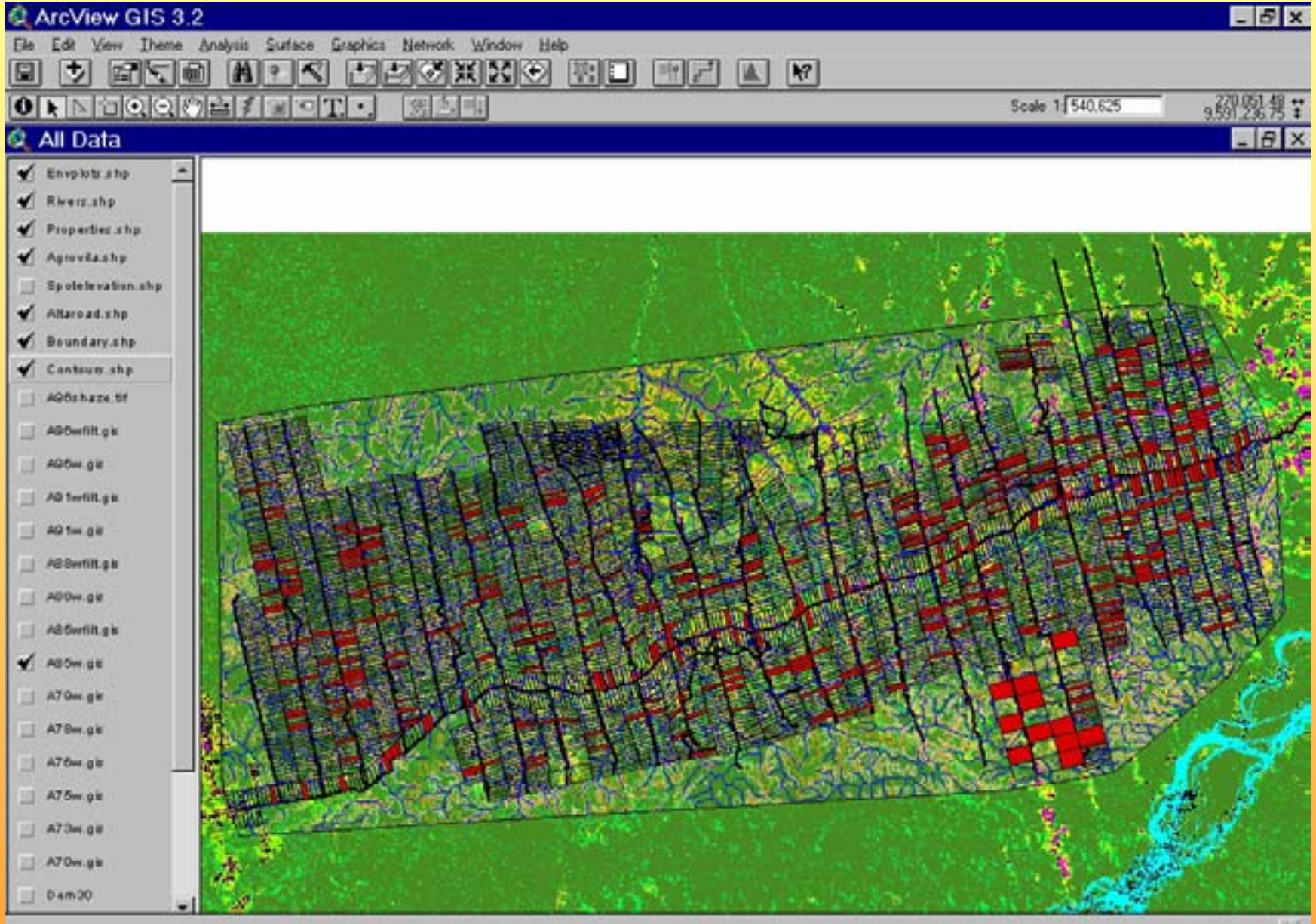


# The formation of a farm lot in a colonization area: by Cohort of arrival



From: Brondizio et al 2002. *The Colonist footprint*. In C. Wood and R. Porro. Land use Change in Amazonia. UPF.

# Integrating household and other spatial data: infrastructure, vegetation, drainage, etc



Eduardo S. Brondizio, Indiana  
University, 2002.

# **PREPARATION AND USE OF IMAGES FOR FIELDWORK**

## **.Sensitivity to local interpretation**

*.Color composite (resemble 'real world')*

*.Scale (capture 'human view' of the landscape)*

## **.Training procedures and manuals**

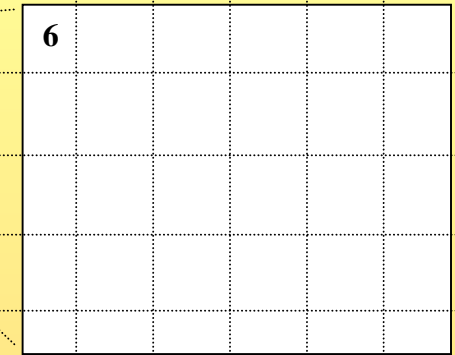
(Example Extractivist reserve in Acre, Brazil)

# Preparing images for the field: Different demands

## 1. Systematic coverage

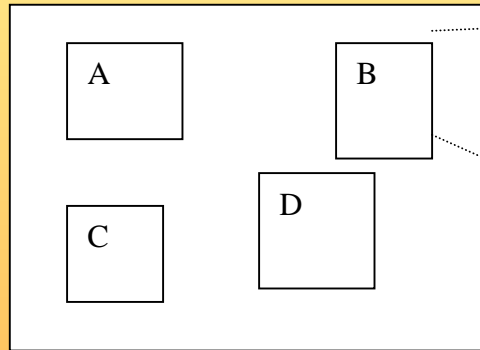
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Index image map

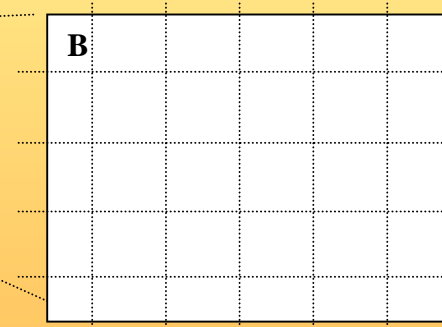


Map # 6 of 30

## 2. Oriented coverage I (community, land cover type)

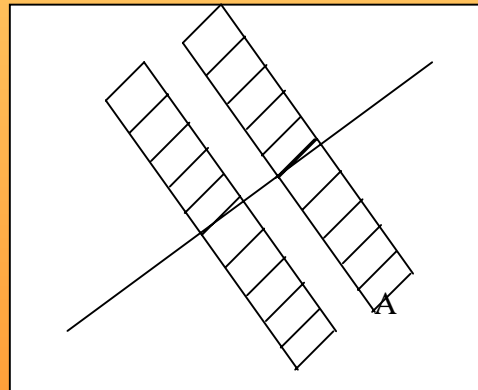


Index image map

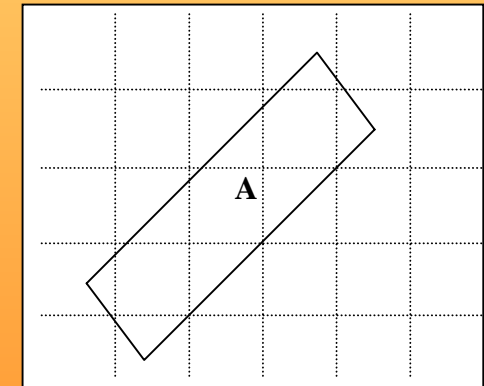


Map community B

## 3. Oriented coverage II (property, inventory plot)



Index image map



Farm lot A

Brondizio, E. S. 1999/2002:  
E400/600: Remote Sensing for the  
Social Sciences. Department of  
Anthropology, Indiana University

Indiana

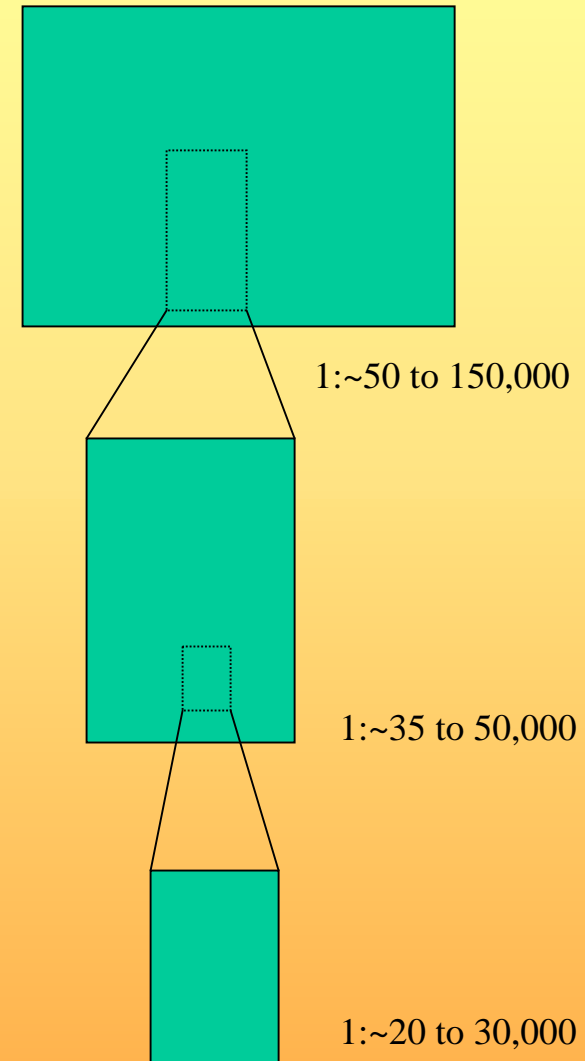
University, 2002.

# Field image preparation:

1. General index images

2. Feeder road image

3. Sampled Lot images



Brondizio, E. S. 1999/2002:  
E400/600: Remote Sensing for the  
Social Sciences. Department of  
Anthropology, Indiana University

Eduardo S. Brondizio, Indiana  
University, 2002.

.Color composite (TM 5,4,3)

.UTM grid 1 km x 1 km

.Laminated

# Three stages image interview:

## 1. Regional introduction and context

- . Color composite: forest, soil, water, uses
- . Land marks, roads, locations, names



## 2. Feeder road

- .Surroundings recognition
- .Neighbors and land ownership



## 3. Farm Lot

- .Multi-temporal
- .Color composite & thematic classification



Brondizio, E. S. 1999/2002:  
E400/600: Remote Sensing for the  
Social Sciences. Department of  
Anthropology, Indiana University

Eduardo S. Brondizio, Indiana  
University, 2002.

# Integrating remote sensing and interview material: Lot sketch (time of arrival & current) →

1998- ANOTAR NA PLANTA A LOCALIZAÇÃO DESTAS (Não a que vão formar em 1999, mas as que tem em 1998) (em ha)

a) Pasto 35 ha      b) Lav. Branca       c) Mandioca       d) Hortaliças   
 e) Café 00      f) Pimenta       g) Cacau  h) Cana   
 i) Out. cult. perenes 05      j) Madeira Plantada       k) Frutas       l) Out culturas   
 m) Juqueira Nova       n) Juqueira Velha 20 ha (p) Juqueirão   
 (< 6 anos)      (6-10 anos)      (11+ anos)  
 p) Floresta/Mata      q) Area Onde Tirou Madeira      r) Consorcio      s) Casa

Relacionar localizações com as imagens anteriores – especialmente a de 1991

24 Qual é o tempo médio que o senhor deixa uma área em posio?  
 \_\_\_ anos em terra roxa?      ~~X~~ 8. N/A  
 \_\_\_ anos em outros solos?      ~~X~~ 8. N/A

24.1 Qual o critério que o senhor utiliza para decidir quando uma capoeira/juqueira está pronta para ser cortada/utilizada novamente?  
 1. \_\_\_ altura da árvore      5. \_\_\_ idade da capoeira  
 2. \_\_\_ tamanho do tronco      6. ~~X~~ não tem critério  
 3. \_\_\_ espécie árvore      7. \_\_\_ outros  
 4. \_\_\_ tipo do solo

24.2. Quando é preferível cortar uma capoeira/juqueira em vez de uma área de floresta?  
 1. \_\_\_ conservação da floresta      4. \_\_\_ aspecto legal (IBAMA)  
 2. ~~X~~ facilidade do trabalho/ mão de obra      5. \_\_\_ formar a propriedade  
 3. \_\_\_ produtividade da atividade após a derruba

Como é feita a queimada?  
 25.1. queima depois da primeira chuva      ~~X~~ Sim      \_\_\_ Não  
 25.2. queima antes da primeira chuva      \_\_\_ Sim      ~~X~~ Não  
 25.3. faz aceiros      ~~X~~ Sim      \_\_\_ Não  
 25.4. outros \_\_\_\_\_      ~~X~~ N/A

(FAZER UM RISCO NA TABELA ABAIXO EM CIMA DO ANO DA CHEGADA NO LOTE) (Acima do risco, anotar a área em ha de todas as culturas/pasto floresta encontradas). CONTINUAR COM ESSA TABELA perguntando sobre se, e quando, começou cada item da tabela, sempre anotando a área envolvida em cada atividade)

.Visit lot:

.Discuss land use



.Collect ground truth data with GPS

rondizio, Indiana  
University, 2002.

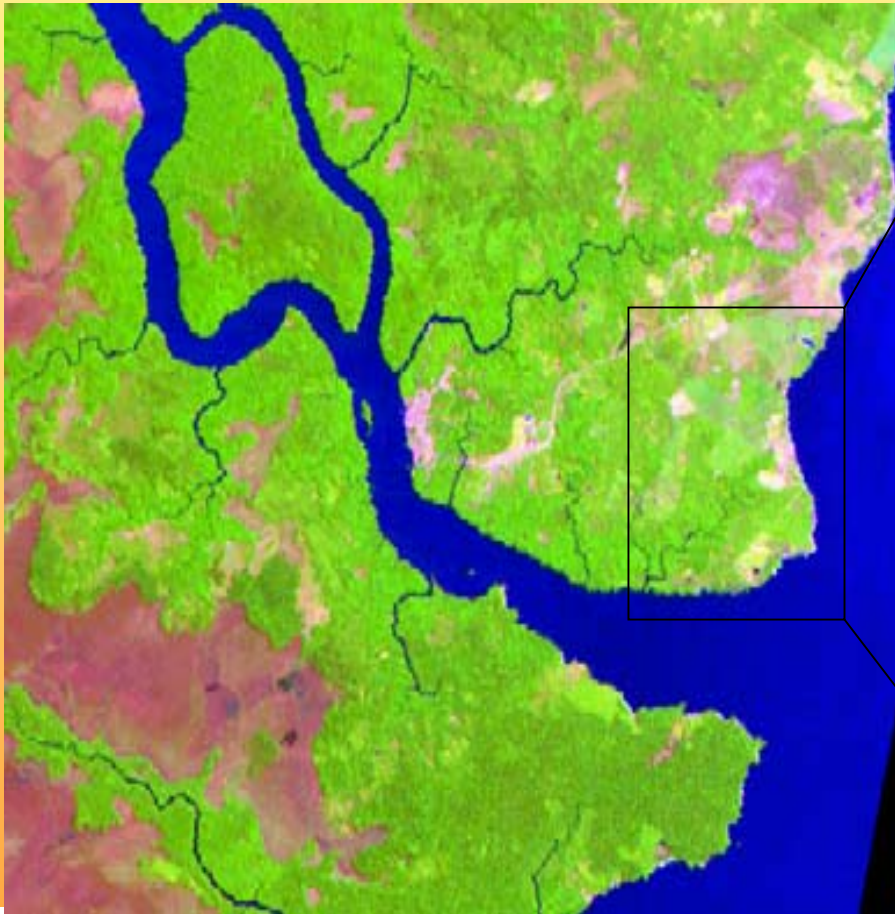


# Integrating remote sensing and interview material: Land use time-table

Ano	Área de Floresta Derrubada /ano	Pasto	Pasto em Mata ou Capoeira M=mata C=capoeira DL=depois lavoura	Lavoura Branca (Arroz, Feijão, Milho)	Anuais em Mata ou Capoeira? M=mata C=capoeira	Mandioca	Mand. Em Mata ou Cap.? M=mata C=capo.	Cacau	Cacau em Mata ou Capoeira? M=mata C=capo.	Pimenta	Pimenta em Mata ou Capoeira? M=mata C=capo.	Outras Culturas	Em Mata ou Capoeira? M=mata C=capoeira DL=depois lavoura	Outras Culturas	Em Mata ou Capoeira? M=mata C=capoeira DL=depois lavoura	No. de Gado	Madeira (Nde* arvores cortadas para madeira)
70																	
71																	
72																	
73																	
74																	
75																	
76																	
77																	
78																	
79																	
80																	
81																	
82																	
83																	
84	100	30	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85		+10	C	0	0	0	0	0	0	0	0	0	0	0	0	10	
86									0								
87								0	C								
88																	
89																+30	
90																	
91																	
92																+05	
93																	
94																	
95																	
96																+15	
97																+12	
98																	
99	100	40		0		0		0		0	0					72	0
TOTAL																	

# Incorporating standard ethnographic data: Calendar of Activities

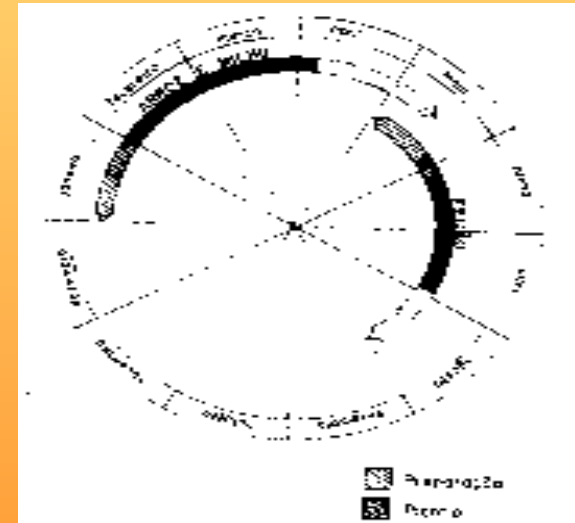
- Preparation of land cover classification system
- Support during classification
- Interpretation of land use spatial patterns



**Ponta de Pedras, Riverine communities, Amazon estuary**



Coconut plantation, agroforestry, and forest products



Upland Mechanized agriculture (rice, corn, beans)

**Some final considerations:**

**Share your images, knowledge, interpretation results!**

Individual farmers

Communities

Local and regional institutions

Formal mechanisms of data dissemination.