United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

Community-based forest management: how to mitigate farmer's infiltration in protected forests in Cote d'Ivoire?

UNU-INRA Visiting Scholars Programme 2011

Wadjamsse B. DJEZOU, PhD
University of Cocody-Abidjan/CIRES

United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

Content

- Context of the study
- Research question
- Objective
- Methodology and materials
- Expected Results and output
- Expected Outcomes
- Work Plan

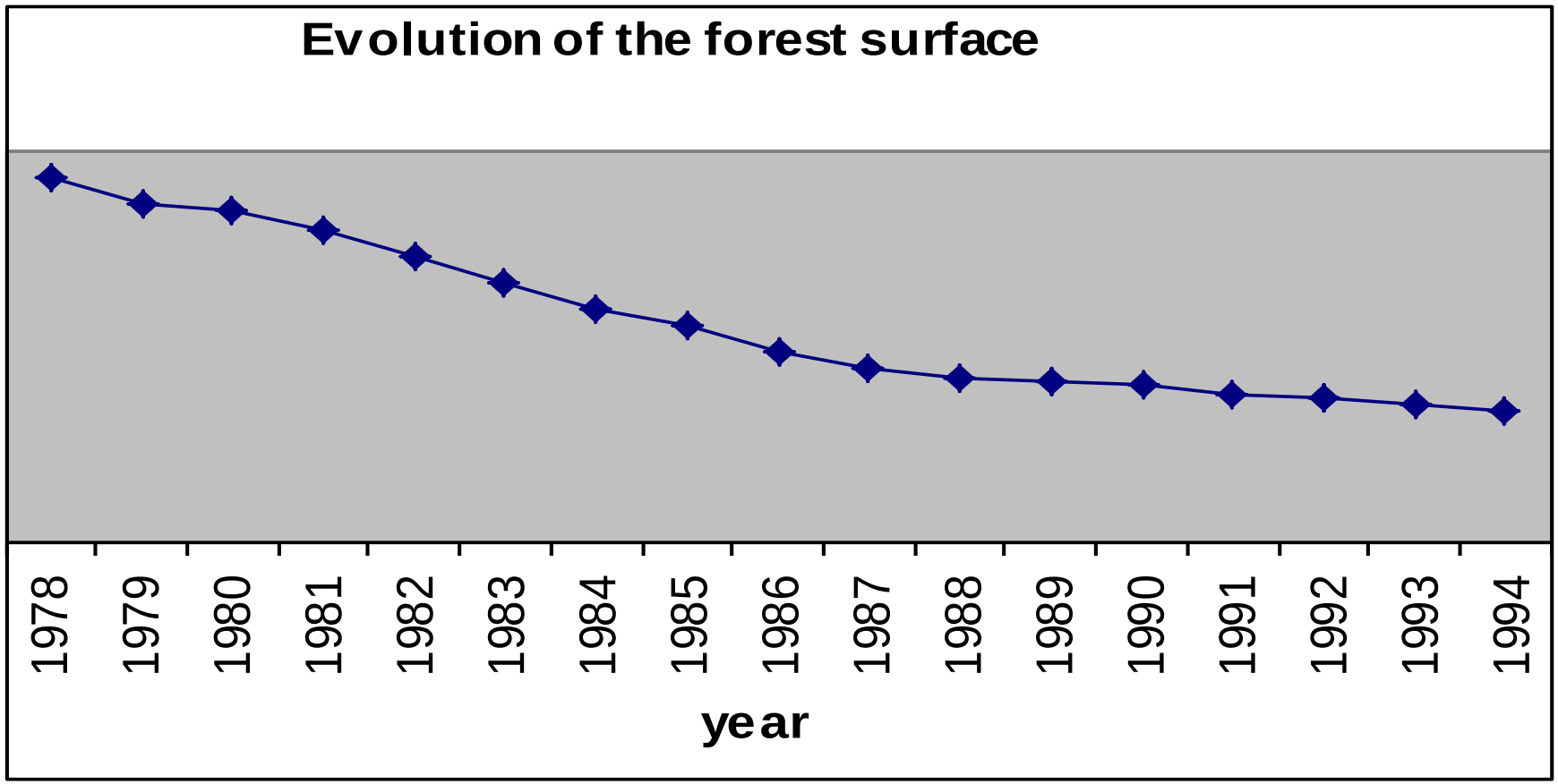
Context of the study(1) (Deforestation process)

- Cote d'Ivoire had the highest rate of deforestation in Sub saharan Africa (5.2%)(N'guettia, 1999)
- From 16 million hectares in 1960, the forest area is less than 3 million hectares today representing less than the recommended rate of forest cover of 20% (Direction of environment, 2000)

United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

Context of the study(2)



…Context of the study(3)
(Impacts of deforestation process)

Deforestation has direct impacts on climate, land stability and land productivity

As consequences:

- Land saturation since from 3.5% in 1960, we passed to 11% in 1975, 23% in 1989 (National Environnemental plan, 1996) and 23.5 % in 1997 (World Resources, 2000-2001)

- Peasants' infiltrations in protected forests with a rate of 26% (Sodefor, 1998) and more than 30% today (Aifort, 2008) *(NB: more than 25% of the cocoa and coffee produced in CI come from theses protected forests (aifort, 2008))*

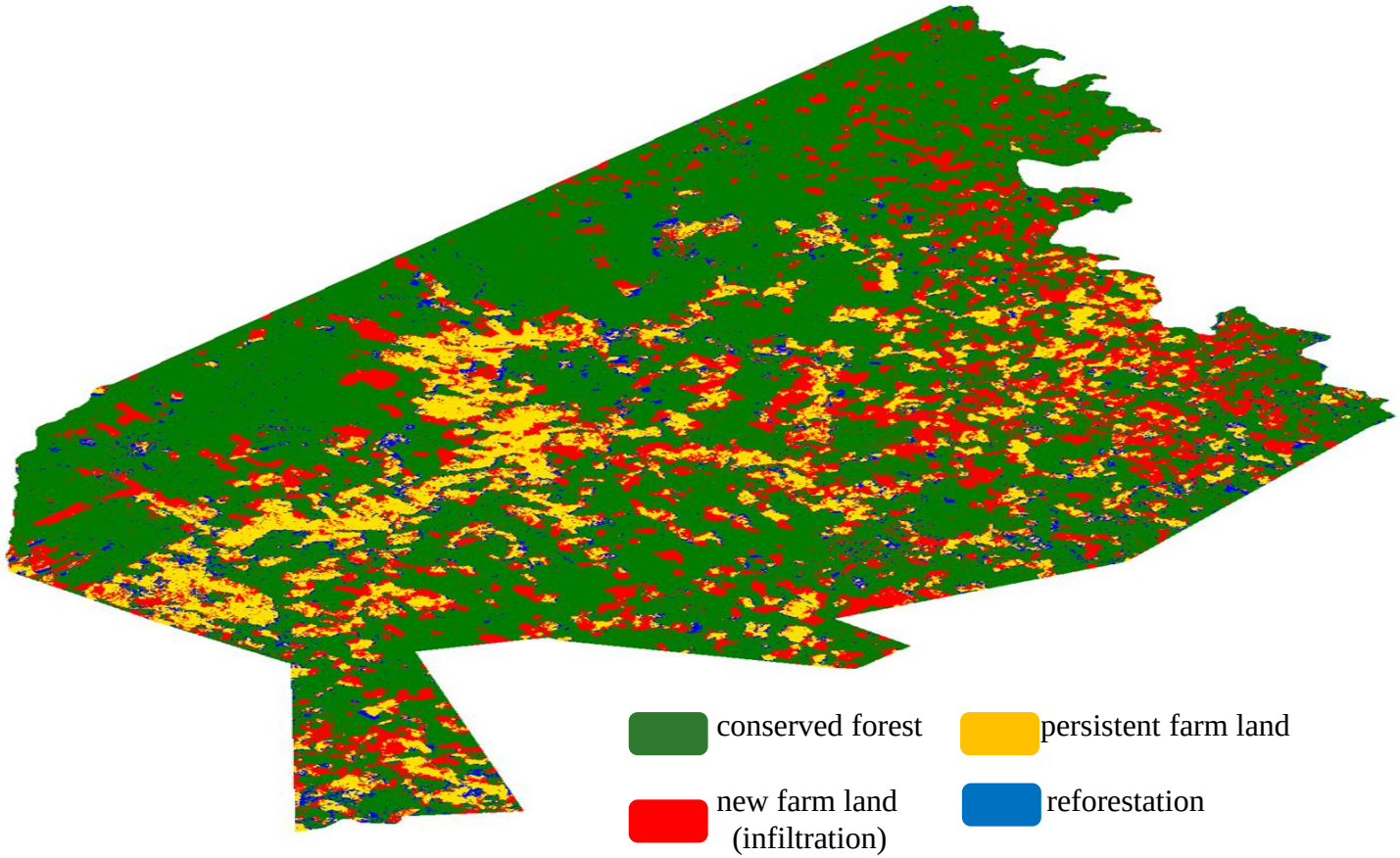
United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

Context of the study(3)

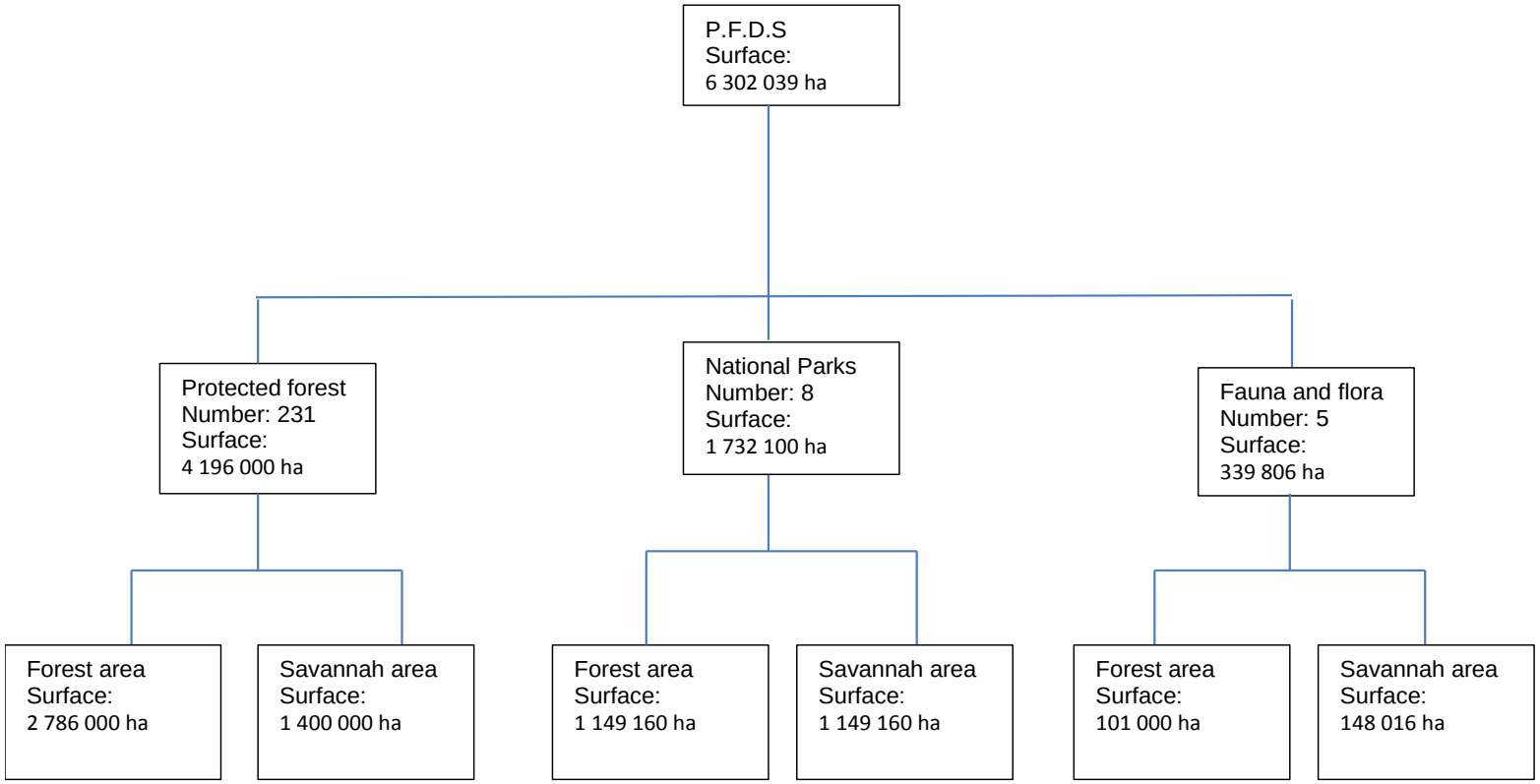
(Farming system)

…Protected forest of TAMIN

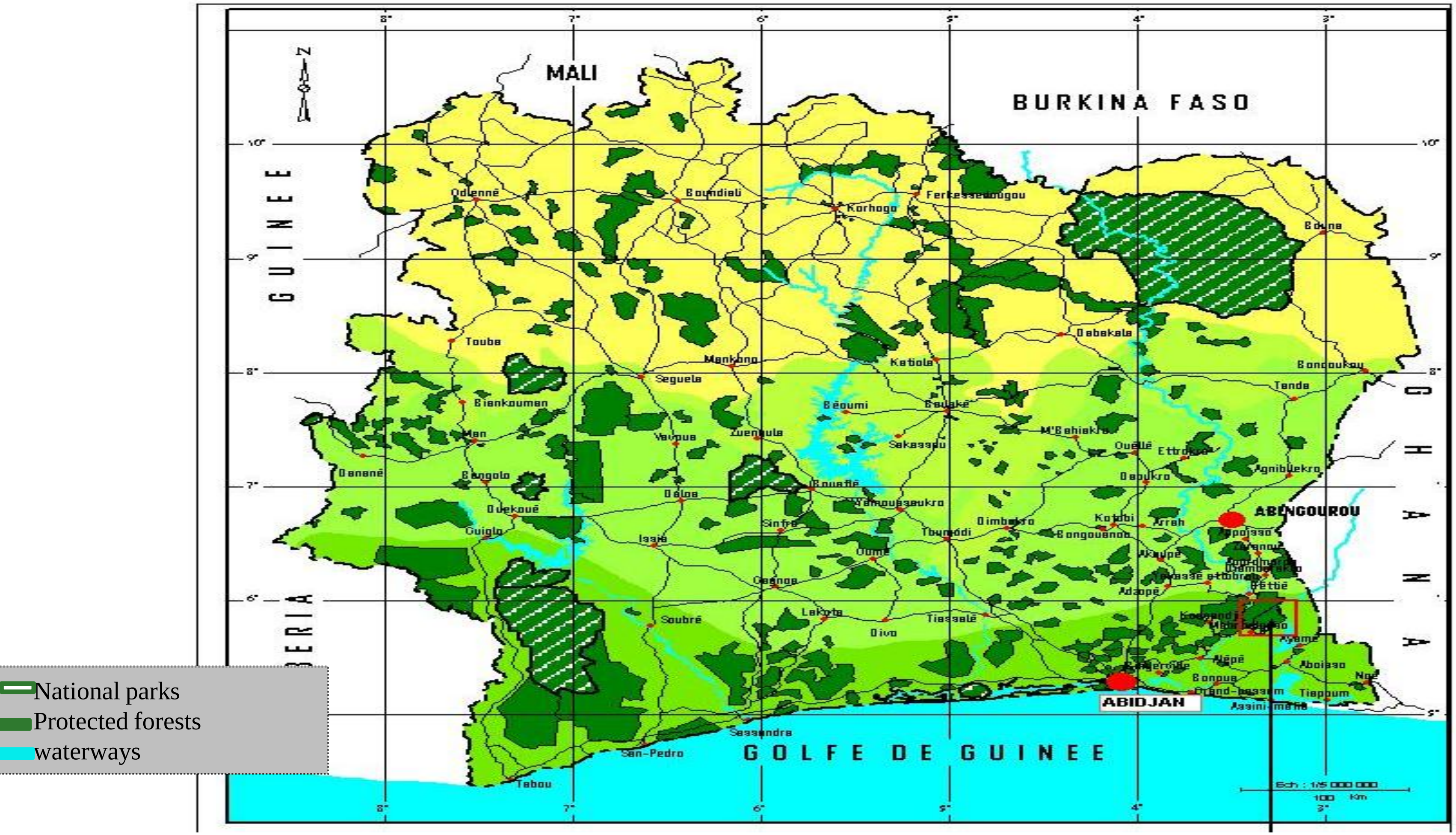


…Permanent Forest Domain of State (PFDS)

Permanent Forest Domain structure (P.F.D.S)



Study Area


MALI
BURKINA FASO
GUINEE
GHANA
GOLFE DE GUINEE
ABIDJAN
ABENGOUROU
Odienné
Boundiali
Korhogo
Ferkessedougou
Bouna
Touba
Seguela
Katiola
Bondoukou
Man
Bouaké
Danané
Daloa
Yamoussoukro
Guiglo
Issia
Soubré
Divo
Tiassalé
Sassandra
San-Pedro
Tabou
National parks
Protected forests
waterways

…Context of the study (4)

(How did they(authorities) address this challenge?)

- **Joint Management Policy (JMP)**[in line with the forest management plan 1988-2015, SODEFOR implemented JMP in 1992]

- International pressure with the Sustainable management concept(forest resource scarcity)
- Decentralized policy adoption around the world (multiples interests divergences of actors)
- Poverty reduction strategies implementation (rural populations impoverishment)
- Lack of material, human and financial resources(failure of top-down approach)

…(How does JMP work?)

- The main tool of the Joint-Management Policy (for the rehabilitation of protected forests by associating the local populations to the forest management) is called **"Peasant-Forests Commission (PFC)"** which is a forum of discussion and decision-making
- This commission has two components(local and national)
- At local level, it brings together riparian peasants and local authorities (prefect, officials,…)
- At national level, it is composed with ministries, institutions, private sector and peasants (which are under-represented 1/6)
- But, the infiltrations continue……..

…(potential Gaps in JMP)

- Economic aspects have not been taken into account since only the institutional aspects are addressed through PFC
- According to the literature, the economic aspects matter (fernandez-puente, 1996; Nguinguiri, 1999; Gueneau *et al.*, 2004; ferraro *et al.*,2003; Nicholls, 2004)
- Moreover, there are some apprehensions about the lack of procedure for allocating benefits at the time when participatory forest programmes were first established (Saxena, 1988; Campbell, 1992).

Research Question

- What are the factors that explain the persistence of peasants' encroachments on protected forests?
- What are the economics incentives of the joint management policy?
- In other words, what are the economic factors that drive the optimal level of forest conservation in CI?

Objective of the study

Main objective

- Mitigate the peasants' encroachments on protected forests

Specific objectives

- Evaluate the joint-management policy
- Determine the economic incentives (factors) for a sustainable joint forest management policy

Method of Analysis

- Formalize a bioeconomic model of the joint-management strategy involving SODEFOR and local community in form of optimization programs
- Use optimal control techniques in continuous time to solve those optimization problems
- Compare the market based solutions to the social planner's solutions to derive some policy measures

…model formalization

- We formulate a bio-economic model with two agents (local community and SODEFOR) and two activities (agriculture and forest conservation) in the form of dynamic optimization in continuous time.
- SODEFOR has a fixed amount of forest (protected forest) for protection and reforestation.
- The local community lives adjacent to the protected forest and has user right over the remaining land for agricultural purpose.
- These two agents act in a defined area but the conflict arises when farmers infiltrate the protected forest to search for fertile land for agriculture.

…(local community's program)

He maximizes the flux of net revenue deriving from forest preservation and agricultural activities by taking into account the dynamic of the resources

$$\underset{(q_{2t},\theta)}{Max}\ \pi^{cl} = \int_0^{\infty} [\alpha R(q_{1t}) + \beta R(x_{1t}) + R(q_{2t}) - C(\theta)]e^{-\delta t} dt \quad (1)$$

- Is a revenue from logging activities
- Is a revenue from by-products activity
- Is the revenue from agriculture
- Is a cost of anti-infiltration effort

$$s/c$$

$$\dot{x}_{1t} = g_1(x_{1t}) - q_{1t} - I(x_{1t},\theta) \quad (2)$$

- Is the infiltration function
- Is the natural growth rate of protected forest
- Rate of timber extraction (standing volume)

$$\dot{x}_{2t} = g_2(x_{2t}) - q_{2t} \quad (3)$$

- Surface under farming
- Is a natural growth rate of unprotected forest

…(SODEFOR's program)

He maximizes the present value of the income deriving from its main and secondary activities by taking into account the dynamic of the resource especially the infiltration function

$$\underset{(q_{1t})}{Max}\,\pi^{SOD} = \int_0^{\infty} [(1-\alpha)R(q_{1t}) + (1-\beta)R(x_{1t})]e^{-\delta t}dt$$

- A share of a remaining revenue from logging
- A share of remaining revenue from by-products exploitation

$$s/c$$

$$\dot{x}_{1t} = g_1(x_{1t}) - q_{1t} - I(x_{1t}, \theta)$$

…(Social planner's program)

he maximizes the present value of the forest and agricultural profits while taking into account the public good effect of forest

$$\underset{(q_{1t},q_{2t},\theta)}{Max}\ \pi^{Social} = \int_0^{\infty}[\alpha R(q_{1t}) + \beta R(x_{1t}) + R(q_{2t}) + B(x_{1t}) - C(\theta) + (1-\alpha)R(q_{1t}) + (1-\beta)R(x_{1t})]e^{-\delta t}dt \quad (5)$$

Public good effect of the forest (biodiversity, existence and option values)

s/c

$$\dot{x}_{1t} = g_1(x_{1t}) - q_{1t} - I(x_{1t},\theta) \quad (2)$$

$$\dot{x}_{2t} = g_2(x_{2t}) - q_{2t} \quad (3)$$

Expected results and outcomes

- Joint management policy is better than the state management in terms of forest conservation
- The economic factors (share of revenue deriving from forest activities) matter (profit sharing: most importantly **which** resource should be shared? and **how much**?)
- The international community has a role to play(in terms of support)
- Help SODEFOR improving its JMP

Outputs

- Working paper
- Two policy briefs
- Publishable paper

Work Plan

activities	Time (week)			
	By 2nd week of september	3rd and 4th week of september	1st week of October	1st and 2nd week of October
Results and interpretations				
Writing of working paper and policy briefs				
2nd seminar on findings				
Writing of paper for publication				


Kwaye ye nkwa, enti bo ho ban

United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

The end

THANK YOU FOR YOUR ATTENTION

www.inra.unu.edu

United Nations University
"advancing knowledge for human security and development"

United Nations University
UNU-INRA
Institute for Natural Resources in Africa

Announcing an International Conference (Celebrating 25 years of UNU-INRA)

International Conference on Sustainable Development of Natural Resources in Africa 2011

Creating a nexus between research and policy for sustainable management of natural resources in Africa

- 5 - 8 December 2011, Accra, Ghana