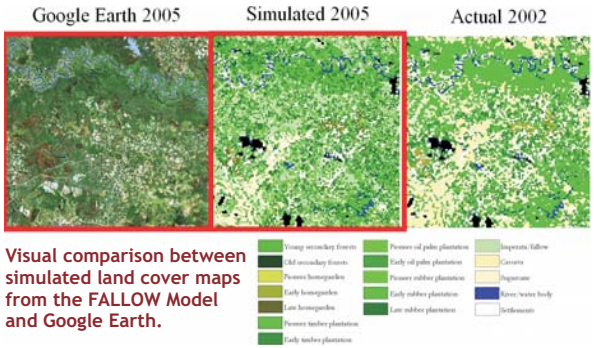
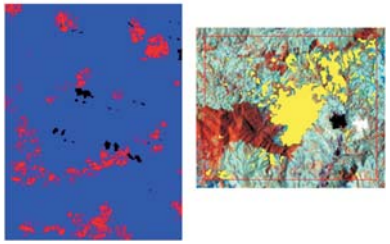
How good is it?

- Spatial goodness of fit of simulated land use: 41 to 70 %.
- Relative area difference of simulated land use: 10 to 19 %.
- Uncertainty of simulated carbon stocks: -1 to 4 Mg.ha^{-1}.



Visual comparison between simulated land cover maps from the FALLOW Model and Google Earth.



Visual comparison between simulated fire map from the FALLOW Model and burnt scar map from SPOT.

How to get the model?

We provide you with free sources of the model, which are freely downloadable from: http://worldagroforestrycentre.org/sea/product/AFModels/FALLOW or upon request to fallow@cgiar.org. We also provide you with educational versions of the model, developed using STELLA and NetLogo.
To apply the model, we support you with training, lecturing, research supervisions and consultancies. For more detail information, please contact: fallow@cgiar.org.

References

(http://www.worldagroforestrycentre.org/sea/Publications/index.asp)

Suyamto, D.A., Van Noordwijk, M., Lusiana, B.. 2006. Way Tenong and Sidrap: Tree Planting and Poverty Alleviation, Indonesia. In: Murdiyarso, D. and Skutsch (Eds.): Community Forest Management as a Carbon Mitigation Option: Case Studies. Center for International Forestry Research (CIFOR), Bogor, Indonesia. ISBN: 979-24-4660-5. pp: 74-84.

Suyamto, D.A. and Van Noordwijk, M. 2005. Scenario studies of land use in Nunukan, East Kalimantan (Indonesia): drivers, local livelihoods and globally relevant carbon stocks. In: Lusiana, B., Van Noordwijk, M and Rahayu, S (Eds.): Carbon Stocks Monitoring in Nunukan, East Kalimantan: A Spatial And Modelling Approach. Report from Carbon Monitoring Team of the Forest Resources Management for Carbon Sequestration (FORMACS) Project. World Agroforestry Centre.

Suyamto, D.A., Van Noordwijk, M., Lusiana, B., Ekadinata, A. and Khasanah, N. 2005. Prospects of adoption of tree-based systems in a rural landscape and its likely impacts on carbon stocks and farmers' welfare: the FALLOW Model Application in Muara Sungkai, Lampung, Sumatra, in a "Clean Development Mechanism' context. ICRAF Working Paper Wp06034.

Suyamto, D., van Noordwijk, M. Hadi D.P. and Lusiana, B., 2003. FALLOW model: assessment tool for landscape level impact of farmer land use choice. In: Post, D.A. (Ed.): Proceedings of International Congress on Modelling and Simulation of Modelling and Simulation Society of Australia and New Zealand Inc. on Integrative Modelling of Biophysical, Social and Economic Systems for Resource Management Solutions (MODSIM 2003), Jupiter Hotel and Casino, Townsville, Australia, 14-17 July 2003.

Van Noordwijk, M., 2002. Scaling trade-offs between crop productivity, carbon stocks and biodiversity in shifting cultivation landscape mosaics: the FALLOW model. Ecol. Model. 149, 113-126.

Van Noordwijk, M., Suyamto, D.A., Lusiana, B., Ekadinata, A. and Hairiah, K. 2008. Facilitating agroforestation of landscapes for sustainable benefits: tradeoffs between carbon stocks and local development benefits in Indonesia according to the FALLOW model. Agriculture Ecosystems and Environment. 126:98-112

This flyer is produced by
the TUL-SEA Project
funded by the Federal Ministry for Economic
Cooperation and Development, Germany

Contacts:
TUL-SEA Project
WORLD AGROFORESTRY CENTRE
Southeast Asia Regional Office
Jl CIFOR, Situ Gede, Sindang Barang, Bogor 16115
PO Box 161 Bogor 16001, Indonesia
Tel: +62 251 8625415
Fax: +62 251 8625416
E-mail: icraf-indonesia@cgiar.org
http://www.worldagroforestrycentre.org/sea/

Credits:
Authors: Desi Ariyadhi Suyamto and Rachmat Mulia
Design & Layout: Vidya Fitrian and Diah Wulandari

Forest, Agroforest, Low-value Landscape or Wasteland (FALLOW) Model:

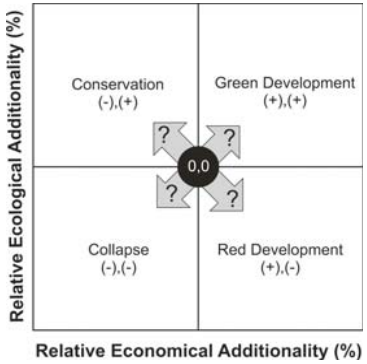
A simple tool to help you illuminating future options on development strategies to transform your rural agroforested landscapes into places worth living in and worth fighting for

Trees in Multi-Use Landscape in Southeast Asia (TUL-SEA)
A negotiation support toolbox for Integrated Natural Resource Management

What is FALLOW?

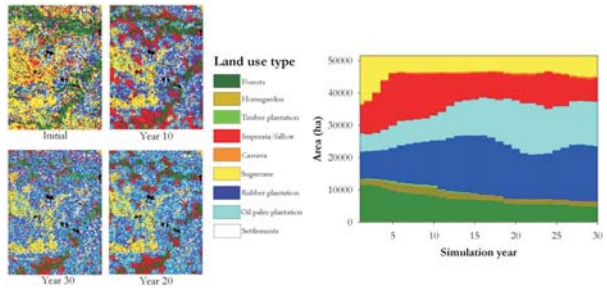
The main issues in prospecting development strategies for rural agroforeste landscapes in developing countries are related to:

- non-linear baseline trajectories;
- trade-offs between economical utilities and environmental services; and
- additionality or change compared to baseline scenario.

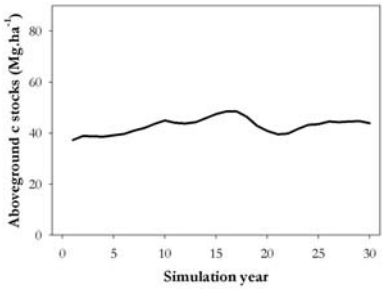


The FALLOW Model has been developed as a tool to prospect the likely baseline trajectory and the likely shifts of some scenarios on development strategies from the baseline. The strategies may imply to:

- losses in both economical and ecological values (collapse);
- gains in economical value but loss in ecological value (red development);
- gain in ecological value but loss in economical value (conservation); or
- gains in both economical and ecological values (green development).



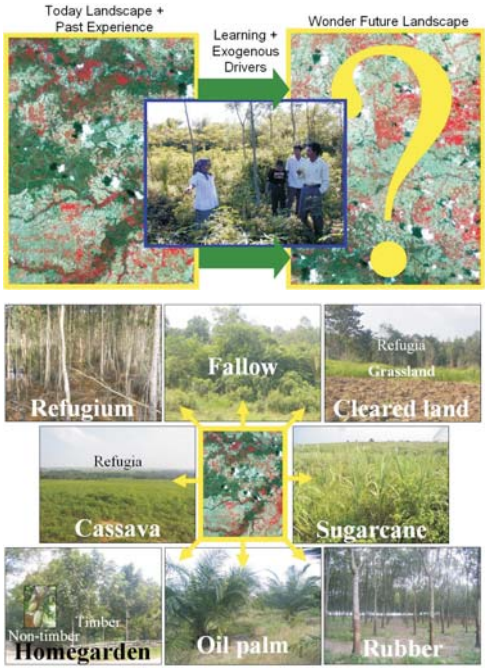
Non-linear baseline land use trajectory as resulted by the FALLOW Model.



Non-linear baseline carbon trajectory as resulted by the FALLOW Model.

How does it work?

The FALLOW Model simulates land use/cover change dynamics due to local responses on external drivers with various feedback loops, and assesses the consequences of the resulting land use mosaics on economical utilities (welfare and food security) and environmental services (carbon stocks, watershed functions and biodiversity).



Future fate is today choice!

Local responses portrayed by the model comprise:

- how farmers adjust their expectation about economical utility of each available option on land-based and non-land-based investments through learning;
- how farmers allocate their capitals (labors, money and land) to each available option of investments;
- how farmers perceive about attractiveness of a plot to expand particular land use system, with regards to some spatial factors determining potential benefits (soil fertility, suitability and attainable yield) and potential costs (transportation, maintenance and land clearing);
- succession, growth, fire and land conversion; and
- diminishing and increasing marginal returns on soil fertility and land use productivity.

The main external drivers incorporated in the model include:

- market mechanisms and relevant regulation interventions, articulated through commodity prices, costs and labor productivity;
- development programs, articulated through provision of extension, subsidies, infrastructures (settlements, road, market, processing factories), and technologies to increase yield productivity; and
- conservation programs, articulated through delineation of forest reserves as prohibited zones for farmers to make living.

How the model has been applied?

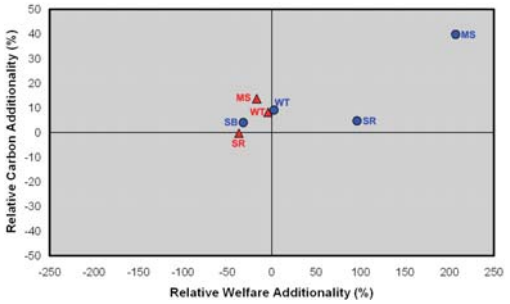
1. Which Development Strategy Will You Use: True Development or Pseudo Development?

There are two beliefs of strategies currently practiced by development agencies for the development of tree-based land-use systems in developing countries: project-based approach and programmatic approach. Both approaches involve regulations and interventions in order to speed up the adoption on tree-based land use systems by farmers.

Project-based approach is bounded by temporal and spatial boundaries, done through the provision of incentives and top-down rules, without any substantial efforts to remove the real constraints. Thus, this approach can potentially reverse the development process to its normal trajectory.

While programmatic approach is done through substantial removal of real constraints that restrict farmers to among others: accessible markets, legal tenure arrangements, availability of reliable technical information and local investment.

The FALLOW Model was applied for 4 landscapes in Indonesia Muara Sungkai (MS) and Way Tenong (WT) in Lampung, Sumatra; Sidenreng Rappang (SR) in South Sulawesi; and Sebuku (SB) in East Kalimantan,to test the internal consistency of the hypothesis that farmer-led development of tree-based land-use systems in response to programmatic approach (blue circles) can convert degraded forest lands at low

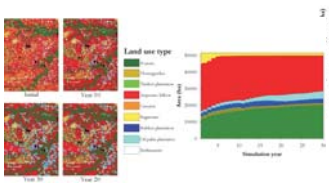


public cost and form an attractive alternative to project-based approach (red triangle). Relative additionalities on carbon and welfare from the baselines were used to assess each development strategy.

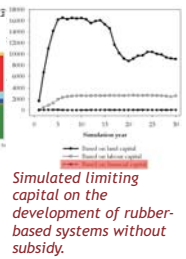
From the results, most of project-based approaches will likely gain carbon but lose welfare. While most of programmatic approaches will likely gain both carbon and welfare. Results are given by van Noordwijk *et al*. (2008).

2. S-curve story of subsidy for development.

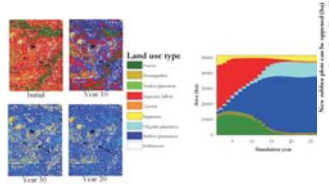
Impact of subsidy to boost the development of rubber-based systems in initially grassland area of Muara Sungkai, Lampung, Sumatra, was prospected using the FALLOW Model. Without subsidy, it is impossible that the landscape would be transformed into rubber agroforests. But, using the model we also found that subsidy should obey to the law of S-curve. Results are given by Suyamto *et al*. (2005).



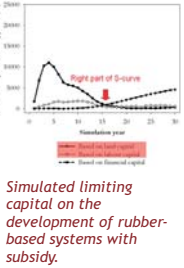
Simulated land use/cover change dynamics without subsidy for the development of rubber-based systems.



Simulated limiting capital on the development of rubber-based systems without subsidy.



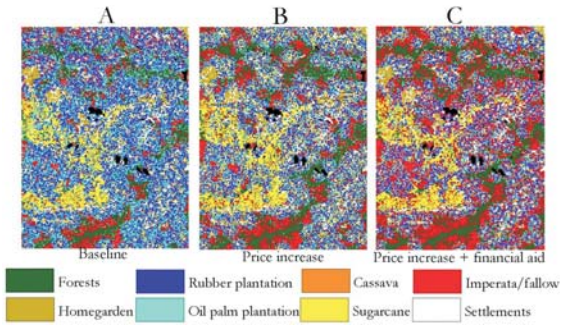
Simulated land use/cover change dynamics with subsidy for the development of rubber-based systems.



Simulated limiting capital on the development of rubber-based systems with subsidy.

3. Sugarcane potentially creates contagious corridor for fire spread.

Boosting the development of sugarcane plantation would likely endanger the landscape from fire risks. Results are given by Suyamto *et al*. (2005).



A: final landscape patterns for baseline trajectory after 3 decades; B: final landscape patterns when price of sugarcane increased; C: final landscape patterns when price of sugarcane increased and subsidy was given to boost sugarcane development.

How to use it?

- The FALLOW Model is a raster-based spatially explicit model with spatial resolution of 1 ha, temporal resolution of 1 year and socio-economical resolution of 1 community, applicable for rural agroforested landscapes.
- The model uses PCRaster (http://pcraster.geo.uu.nl) as the main platform.
- Your computer should have operating system of Microsoft Windows XP Professional, version 2002 or later, which processor having at least 3.2 GHz of speed and 496 MB of RAM, and which hard disks having at least 15 GB of free space