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"Utilisation of diversity in land use systems:
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Decision Making Models for Cattle Ranchers with Respect to Land Use Change and Silvopastoral Systems Adoption in Costa Rica

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Abstract

The research developed several decision making models with the objective to contribute to one of the objectives of the socioeconomic component of the GEF project "Determine the effect of environmental service payments (ESP) over the decisions making process in the farm and determine the factors that influence adoption of sustainable land use systems".

The final model is a non-linear optimisation model which identifies the optimal land use change allocations using profit maximisation for land use at the farm level. This model used real assumptions of credit access, family labour, initial capital availability and pasture areas. An assumed strength of the model is that the farmers maximise their benefits. Even though the farmers do not maximise their decisions the same way, the model shows trends in land use change similar to real tendencies. This model is dynamic and deterministic and made by MatLab^{TM} software. It provides a practical way to achieve the objective of evaluating the impact of external and internal factors as well as the environmental service payments on land use and adoption of silvopastoral systems. The model shows that with base simulation conditions for medium farms, there is a positive effect of ESP incentives on more environmental friendly land use change (SPS). The greatest land use changes are due to natural or improved pastures. The effect of ESP in the base simulation was conditional for the absence of credit access and low capital. If the farm has access to credit and more initial capital, the land use will occurs even without ESP. This shows the interest of ESP to remove the capital barriers. Environmental service payments did not effect small farms as the current ESP amount is insufficient. On the large farms, there are land use changes without the necessity of ESP. That is to say the current amount of ESP is not necessary. An increase in the current amount of ESP could overcome the financial barriers for tree introduction. A 3 times increase in the 2-year ESP scheme will cause more changes and the largest changes will be towards pastures with high tree densities.

Keywords: Decision models, environmental service payments, land use change, optimisation model

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