



Tropentag, October 9-11, 2007, Witzenhausen

“Utilisation of diversity in land use systems:  
Sustainable and organic approaches to meet human needs”

## **Integrated Crop-Livestock Bioeconomic Modelling Approach for Assessing the Impact of Productivity Enhancement Technological Interventions on Economic Performance, Soil Erosion and Nutrient Flow at Micro Watershed Level**

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### **Abstract**

The erratic rainfall pattern and degraded natural resources coupled with poor policies cause poverty and hunger in the semi-arid tropics of India. The watershed development programme approach aims to improve land use and sustainability as well as improving the livelihood security of the households in the rainfed areas. To realise the potential of the micro watershed projects in enhancing the livelihood security of the poor in the rainfed areas, investment in India in the mid- 1990's by the Indian government and international organisations in collaboration with the NGOs and other development agencies, amounted to about USD 500 million per year. Even though there are several exceptional case studies of successful watershed development in India, the impact of the approach on improving the welfare of the poor and the natural resource condition in the SAT areas is not fully known. This study applied a holistic and integrated approach, like bio-economic modelling, by incorporating both economic and biophysical aspects to simultaneously assess and evaluate the impact of productivity enhancement technologies (like improved high yielding varieties, cereal-legume intercropping and *in situ* soil and water conservation technologies) on the welfare of the poor and the natural resource conditions of Adarsha watershed in Kothapally village, Andhra Pradesh, India. The model predicted that the adoption of high yielding varieties of dryland crops leads to an increasing area under sorghum/pigeonpea and maize/pigeonpea cereal-legume intercropping systems and reduced the area under cotton resulting in higher income for farmers. The increase in yield of dryland crops has a positive effect on incentives to conserve land resulting in less soil erosion and nutrient mining in the watershed. Moreover, the increase in fodder availability enhanced the income of the farmers through increased livestock rearing.

**Keywords:** Bioeconomic model, erratic rainfall, productivity enhancement technology, watershed development programme