

## **Agent-Based Modeling of HIV/AIDS and Land-Use Dynamics in South-Eastern Uganda (26)**

*Maction Komwa, Dawn Parker, and Kathryn H. Jabonsen*

George Mason University  
4400 University Dr.  
Fairfax, VA 22030

*Pepijn Schreinemachers and Thomas Berger*

University of Hohenheim (490e)  
Fruwirthstr 12, 70599  
Stuttgart, Germany

There is considerable interest in the effects of mortality and morbidity from HIV/AIDS on agricultural production in sub-Saharan Africa where HIV infection levels are high. Despite these investigations and the increasing availability and use of therapy drugs, infection with HIV remains an immense shock to the well being of the household of which the infected person is a part. However, net effects of HIV on agricultural production in these contexts remain uncertain.

This paper presents an agent-based simulation model that estimates the impact of HIV/AIDS on land use and livelihoods in rural communities of south-eastern Uganda. The work is grounded in an extensive review of relevant literature on the relationship between HIV/AIDS, household labor availability, cropping decisions, household livelihoods, and land tenure. Based on this background, contextual information was gathered using semi-structured interviews with groups and local experts at both district and local levels, conducted in Mayuge district, Uganda in summer 2006. These field studies have provided narrative evidence showing declines in income on agricultural production in most of the households affected by AIDS, widows being displaced from land and clan territory, declines in productivity as additional household labor is devoted to caring for person with AIDS (PWAs), decreases in labor productivity and supply of the PWA, and increases in the numbers of orphans in the level of drop outs from schools. These findings indicate increased vulnerability for households with PWAs.

Our model is built on previous modeling and fieldwork by our colleagues at the University of Hohenheim, Germany on the relevance of the crop yield gap concept to food security. Following the 2006 fieldwork, we modified their model to identify changes in available resources and decision making for both HIV-affected and non-affected households. Three factors were modified: household labor availability including both loss from PWA and caretakers, household expenses due to costs of medical care, additional high-nutrient foods, and funeral expenses, and land transactions rules. Using the modified model, we conduct scenario analysis to explore the potential effect on household welfare of policy interventions such as provision of subsidies for medicine and food for households with PWAs, strategies to protect the inheritance and land tenure for widows and orphans, and agricultural subsidies. Because our modeling framework incorporates interactions between households, effects of community-level constraints on land and labor availability can be explored, in contrast to household level approaches.

Adequate nutrition is essential to maintain the effectiveness of anti-retroviral drugs, which may allow PWAs to maintain productive lives. The model is being extended to endogenize linkages between household nutrition, health status, and labor productivity for PWAs. A new household survey, now in draft form, will be conducted in summer 2007. Our presentation will report preliminary results from this survey, as well as results from the existing HIV/MAS model. We anticipate that this framework will provide a foundation for realistic recommendations on current land use trends and dynamics of Mayuge district.

Our abstract relates to the following topic areas:

- B. Assessment tools for sustainable development.
- C. Socioeconomic, demographic, and other factors of land use change (incl. housing affordability).
- H. Land use and human health (vector-borne diseases, obesity, etc.).
- I. Equity and property rights issues.

and the following approach or method:

- 2. Multi-disciplinary/integrated

Key words: HIV/AIDS, Agent-based model, land-use, Nutrition, sub-Saharan Africa, Uganda