

Title: Application of a multi-market model to the assessment of advances in animal health and livestock feed technologies

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ABSTRACT

Livestock production plays an important function in the supply of calories and nutrition to households; and is a significant agricultural activity globally (Dror and Allen, 2011; Bruinsma, 2003). Further, it is estimated that up to 900 million poor in south Asia and sub-Saharan Africa are livestock keepers (Staal et al., 2009), making appropriate design of policy for livestock development an integral part of the overall development agenda in these regions. A much-cited study (Delgado, et al., 1999) estimated significant expansion in the demand for livestock products in developing countries, projecting up to a doubling (of 1990s levels) by 2050. Reports such as this may suggest that opportunities exist in emerging and other developing regions, to improve livestock incomes, including for poor producers. Other studies, however, point out that while some smallholder production systems have shown capacity to respond to growing food demands, the future roles of these systems is yet unclear, as are the pathways through which growth of this subsector of producers could be achieved (see e.g., Thornton, 2010).

In this paper, we examine two broad categories of advances in livestock technology for their potential to improve livestock productivity in developing countries, providing foresight analysis that tracks a range of welfare outcomes associated with induced technological change. Development of an improved multi-component vaccine for the control of east coast fever is assessed alongside investments in livestock feed improvements (fodder and dual purpose crops) for selected countries in eastern and central Africa. These candidate technologies were identified through a consultative process with scientists familiar with system-specific constraints to livestock production in the region.

Economic evaluation of the promising livestock technologies is conducted within the framework of a widely-used global agricultural sector model, the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT). Model parameters to represent current livestock production and potential productivity changes are developed from the published literature and from the extrapolation of experimental and field-based scientific results. The specification of GIS-based application domains for adoption of the vaccine technology has its foundations in ongoing work at the International Livestock Research Institute (Ochungo et al., 2012).

By adopting an integrated approach to the model parameterization and application, we are able to assess more globally, the socio-economic outcomes of otherwise localized applications of advances in livestock technologies that are in themselves the returns of internationally-funded livestock research. Recently concluded work disaggregating the supply side of the livestock sector in IMPACT, allows us to anticipate to some extent, the potential role that smallholder and extensive systems could play in a future livestock production expansion driven by advancements in livestock technologies.

This study, by quantifying (agricultural) income, nutrition and environmental implications of alternative uses of national and or international research funding, demonstrates the application of an integrated modeling environment to strategic research decision and planning. However, model and data limitations on the demand side of the model pose a challenge to the measurement of implications for certain distributions of populations (e.g., urban or rural consumers), of the technological changes tested. Our work thus underscores the need for improved model, data and

analysis capabilities to bridge the gap between advances in livestock technology on the one hand, and the design of appropriate pro-poor economic policy for (livestock) development on the other. Policy makers should be made aware that the support of livestock data and model development is integral to researchers' capabilities to contribute meaningful quantitative input to targeted livestock sector planning.

Keywords: Livestock; Foresight; Animal Health; Livestock Feed; Productivity; Economic Policy

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