

**Economic analysis of crop-livestock integration:  
The case of the Ethiopian highlands**

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## Abstract

This study is concerned with the impact of crop-livestock integration on food production and farm incomes in highland farming systems in Ethiopia. Structural food deficits and rural poverty are important household and economy-wide problems. The study uses empirical data that were obtained from 900 rural households in 23 villages in the low potential cereal livestock agro-ecological zone of the Ethiopian highlands. Using stratified random sampling, data were collected through direct measurements, structured formal questionnaires, field observations, group interviews and from secondary sources. Statistical techniques (e.g., principal components) and whole-farm linear programming have been applied to complete the analysis.

There are significant differences between households measured by age-sex structure, resource (e.g., land and capital) endowments, resource exchange contracts, and land use practices. Markets for farm labour, agricultural land and animal traction are evolving and involve different inter-household resource exchange contracts. Important household goals include subsistence food production, ownership of livestock and income generation.

Several factors constrain improved farm production including inclement weather, diseases, pests, poor transport and market infrastructure. Strategies to achieve household goals include (i) planting different crops in non-contiguous fields, (ii) owning different livestock species, (iii) on-farm grain storage, and (iv) staggered piece-meal sales of farm produce. Sources of non-farm income include input (land, labour and traction) rentals, sale of firewood and cow dung cakes. The proportionate contribution of cereals and pulses to household cash income decreases as the number of livestock increases and more grain tends to be stored by households having more livestock. Farmers with livestock leave more land under fallow, have more land under soil conservation and practise less soil burning.

Timely availability of work oxen is crucial in the farming system. It permits households to diversify food production, increase farm income and use less family labour. At low levels of livestock and pasture productivity, the analysis shows that ownership of cattle and oxen is a more profitable integration strategy than sheep. At higher levels of livestock productivity, ownership of crossbred dairy cows is a more profitable integration strategy than local cattle or indigenous sheep. At higher levels of both livestock and pasture productivity, improved sheep is a more profitable innovation than local or crossbred cattle. This indicates that improvements in agricultural performance will require different technical and policy interventions to suit different resource endowments, constraints and needs of different types of households. Application of the sampling and analytical approach employed in this study is urged in further socio-economic research in the Ethiopian and other highland farming systems.

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## **Acronyms and Abbreviations**

|        |  |
|--------|--|
| AIDAB  | Australian International Development Assistance Bureau                 |
| AIDB   | Agricultural and Industrial Development Bank (Ethiopia)                |
| CTA    | Technical Centre for Agricultural and Rural Co-operation (Netherlands) |
| E.I.U. | Economist Intelligence Unit  |
| FAO    | Food and Agriculture Organisation of the United Nations                |
| GDP    | Gross Domestic Product   |
| GNP    | Gross National Product   |
| IAR    | Institute of Agricultural Research (Ethiopia)                          |
| ICRA   | International Centre for development oriented Research in Agriculture  |
| IFPRI  | International Food Policy Research Institute                           |
| ILCA   | International Livestock Centre for Africa                              |
| ILRI   | International Livestock Research Institute                             |
| IRRI   | International Rice Research Institute                                  |
| kg     | Kilogram   |
| km     | Kilometre  |
| mJ/yr  | MegaJoules per year  |
| MoA    | Ministry of Agriculture  |
| MOTAD  | Minimisation of Total Absolute Deviations                              |
| NARS   | National Agricultural Research System                                  |
| NGO    | Non-Governmental Organisation  |
| OFR    | On-Farm Research   |
| PA     | Peasant Association  |
| PCA    | Principal Components Analysis  |
| SCRIP  | Soil Conservation Research Project (Ethiopia)                          |
| TDN    | Total Digestible Nutrients   |
| TLU    | Tropical Livestock Unit  |



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'Recall the face of the poorest and the weakest person whom you may have seen, and ask yourself if the step you contemplate is going to be of any use to him. Will it restore in him a control over his own life and destiny?'

-Mahatma Gandhi-