# Application of the Integrated Decision Support System to improve livestock systems in Ethiopia:

## Research and capacity development

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### Objectives

1) Demonstrate the Integrated Decision Support System, IDSS, as a solid methodology for assessing livestock research.
2) Assess forages and livestock feed crops in terms of production, environment, and socio-economic impacts.
3) Evaluate farmer strategies for using feed.

# Demonstrating the Integrated Decision Support System to Analyze Livestock Systems

Jean-Claude Bizimana, Abeyou W. Worqlul, Yihun T. Dile, R. Srinivasan, Nicole Lefore, and Neville Clarke

## Introduction

The study aims to assess impacts of irrigated livestock fodder systems on production, environmental sustainability, household income and nutrition. The case study is located at the Lemo site of the Southern Nations Nationalities People Region of Ethiopia.

## Methods

The Integrated Decision Support System (IDSS) includes the Soil and Water Assessment Tool (SWAT), Agricultural Policy Environment eXtender (APEX) and Farm Income Simulator (FARMSIM) (Figure 1). The IDSS assessed the effect of feeding the fodder produced to native and dairy crossbred cows on overall household income and nutrition. A baseline which represents minimum irrigation and feeding to native cows was compared with optimal irrigation with rope and washer and solar pumps along with supplemental feeding to native and crossbred cows.

Sufficient water resources are available to produce fodder using small-scale irrigation at field and watershed scales in the Lemo watershed.

Both baseline and alternative scenarios met the minimum daily nutrition requirements for calories, proteins, iron, and vitamin A, but were insufficient for calcium and fat.

Increased consumption of milk, eggs and butter through purchase (income pathway) and production (consumption pathway) reduced the deficiencies in calcium and fat.

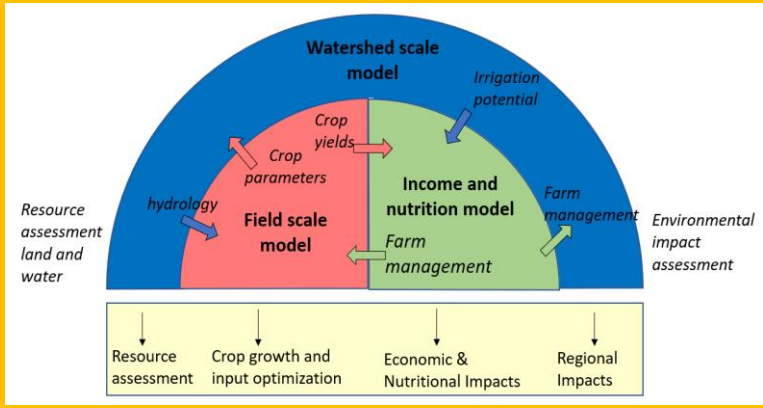



Figure 1: The Integrated Decision Support System framework.

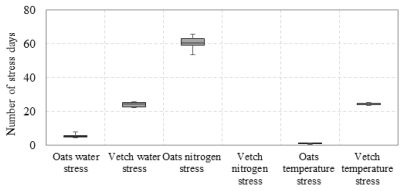



Figure 2. Major constraints for oats production was soil fertility, temperature stress was also found to limit vetch production in the watershed.

## Conclusions & recommendations

- Besides providing high biomass, improved protein, and energy content for livestock, fodder crops such as vetch provide other environmental services, e.g. improving soil fertility.
- Adopting improved livestock technologies (e.g. feed and breeds) can contribute to improved economic and nutritional wellbeing in Ethiopia.

## Research gaps or future opportunities

- IDSS can be demonstrated in different regions to explore opportunities and limitations of implementing diverse livestock systems in different agro-ecologies.

# Assessing Land and Water Resources Potential to Produce Irrigated Fodder in Ethiopia

*Yihun T. Dile, Abeyou W. Worqlul, Jean-Claude Bizimana, R. Srinivasan, Nicole Lefore, and Neville Clarke*

## Introduction

The study aims to estimate available land and water resources to produce fodder across Ethiopia.

## Methods

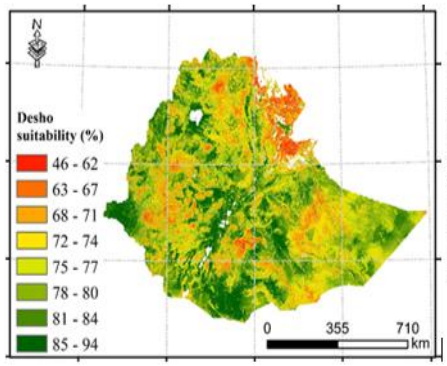
- GIS based multi-criteria evaluation was applied to identify the potential suitable land, which considers biophysical (e.g. rainfall, topography, land use, and soil) and socio-economic (e.g. access to market, population density) factors.
- Biophysical model - Soil and Water Assessment Tool (SWAT) - was applied to estimate available water resources potential and biomass produced. The model was calibrated and validated using observed streamflow from 10 meso-scale watersheds in the Upper Blue Nile basin.

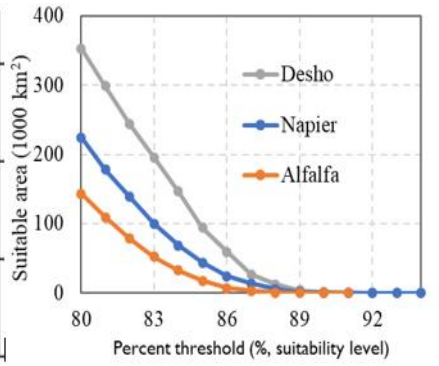
## Selected results

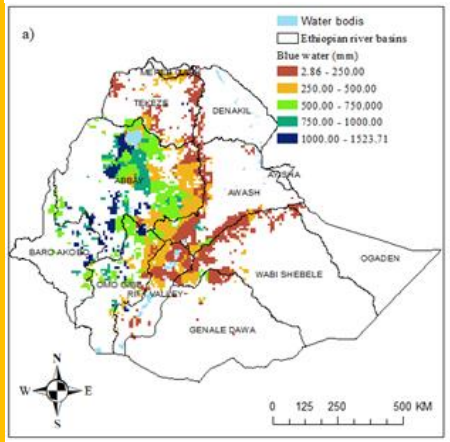
- More than 30% of the agricultural land has a blue and green water storage of more than 750 mm which is sufficient to produce fodder during the dry season.

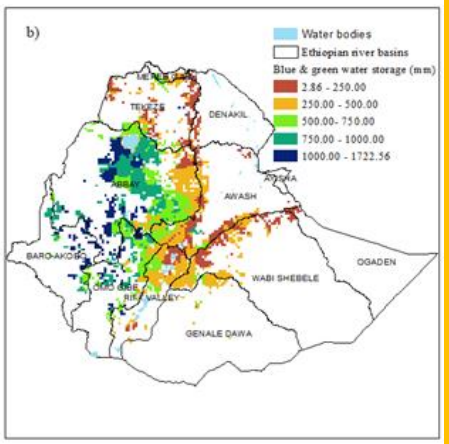
**Substantial amounts of suitable land are available for fodder production in Ethiopia.**

**The areas suitable for fodder productions are in areas where there are sufficient ground-water resources, which could be accessed using simple water-lifting technologies.**

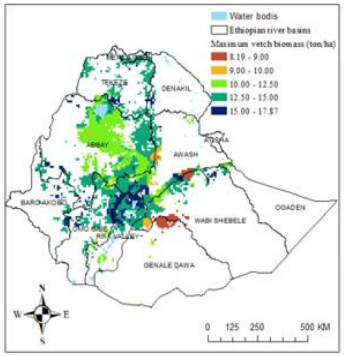



- Depending on the location in Ethiopia, during the most optimal climatic conditions 8-18 ton/ha (depending on location) vetch fodder dry matter biomass can be produced on rainfed fields during the dry period using irrigation.




## Recommendations

- IDSS tools are helpful to identify priority areas for livestock system intensification.
- Policy makers can use the tools and results from analysis to prioritize investment options and monitor the substantial land and water resources available to scale fodder production.

## Future opportunities

- Spatial analysis and biophysical modeling could be integrated to estimate economic outcomes and number of people benefited
- This methodology can be applied in other regions to compare livestock investment potential in the regions.