Evaluating Irrigation Investments in Malawi: Economy-Wide Impacts under Uncertainty

Franziska Schuenemann[1], James Thurlow[2],Stefan Meyer[2], Richard Robertson[2], Joao Rodrigues[2]

1. University of Hohenheim, Stuttgart, Germany
2. International Food Policy Research Institute, Washington DC, USA

1. Introduction and Problem Setting

- Very little irrigation use in Africa despite a large potential in terms of existing water resources
- Irrigation crucial to increase crop yields and mitigate effects from climate change
- However: irrigation profitability is often low due to high labor requirements and relatively small yield increases (Inocencio et al., 2007)
- Benefits from irrigation through different impact channels:
  - Direct impacts at the micro or farm household level
  - Indirect multiplier effects on the rest of the economy
  - Minimization of risks from weather variability
- Analyses of irrigation impacts in Africa so far were mainly limited to assessing direct benefits

→ Combined assessment of irrigation benefits from all impact channels is still missing, but crucial to measure the actual returns to irrigation investment

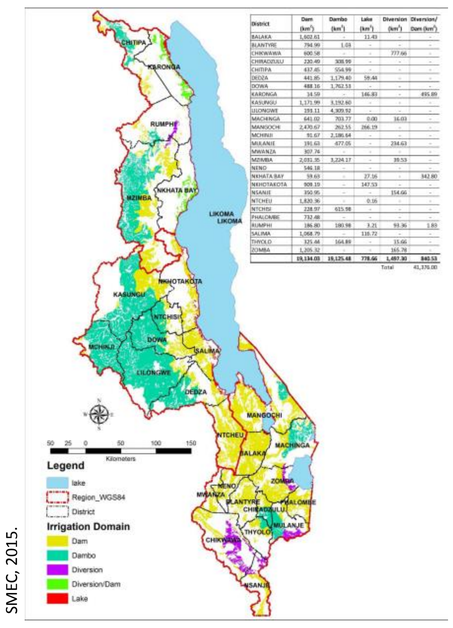
2. Background: Irrigation in Malawi

Country background

- Economy dominated by subsistence agriculture (staple food maize)
- Large smallholder tobacco export sector
- 50% of the population live below national poverty line and experience high food insecurity
- Extreme land constraints
- Large water resources but high weather variability
- Only 4% of cropland under irrigation (48,000 ha large scale estates and 56,000 ha smallholders)

Policy Background (Irrigation Master Plan):

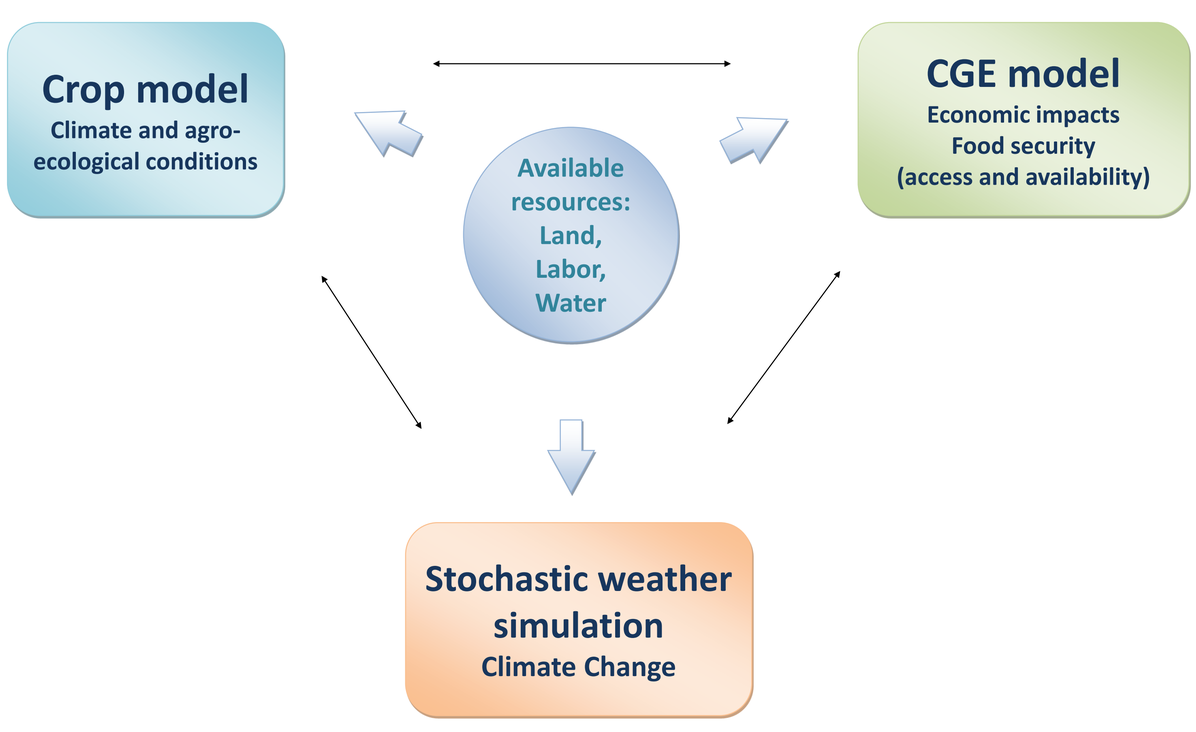
- Increase land under irrigation from 4% to 10%
- Irrigation potential considers competing water uses and environmental viability in terms of water availability
- Irrigate both food and export crops to increase food security and economic growth
- Produced by both smallholders and large scale estates
- Low cost smallholder irrigation technologies: gravity irrigation and treadle pumps for water conveyance and watering can for application (high labor demands)
- Water from dam storage or dambos (waterlogged depressions containing seepage)
- Majority of costs borne by development partners



SMEC, 2015.

3. Methodology

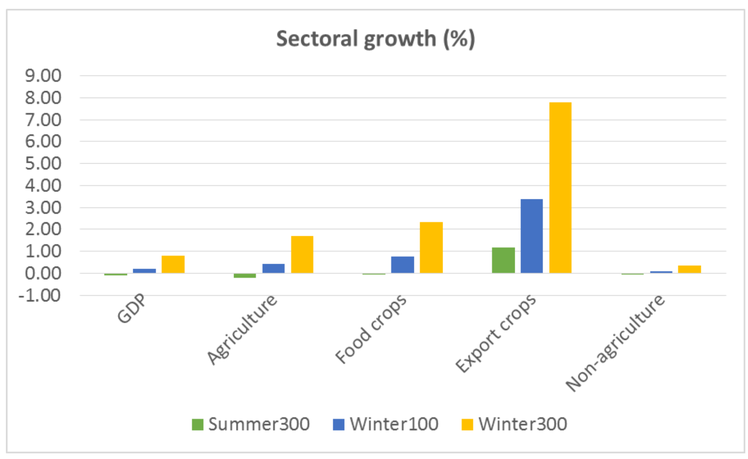
Integrated modelling framework



Scenarios:

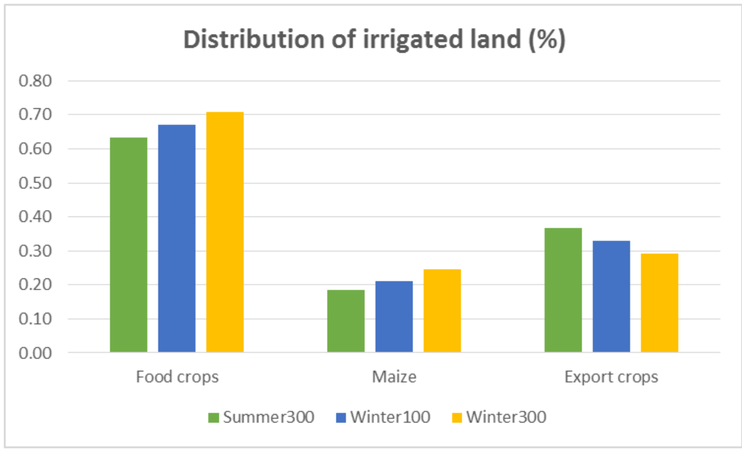
- Increase in agricultural land under irrigation area by 300 thousand ha in the summer season
- Additional increase by 100 thousand ha irrigated land in winter season
- Additional increase by 300 thousand ha irrigated land in winter season
- Comparison of rainfed and irrigated production in summer under uncertainty with variable weather

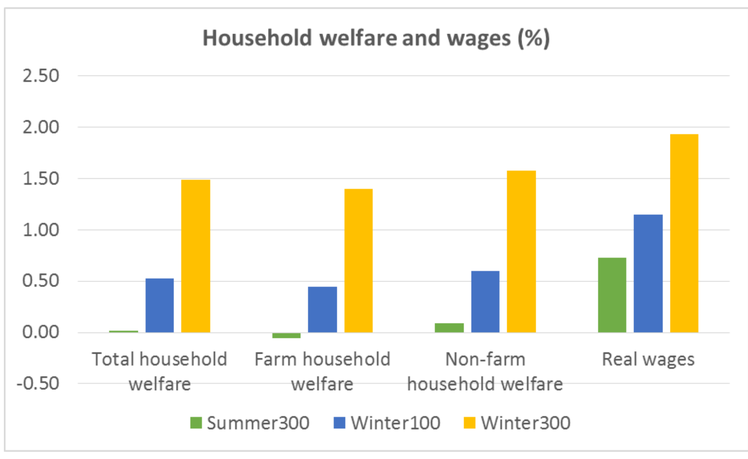
4. Results



- Summer scenario: negative growth in agriculture as labor intensive irrigation crowds out rainfed production with low labor needs
- Winter scenarios: Irrigation leads to growth in the agricultural sector, but slow growth in the non-agricultural economy (except for trading services) as workers migrate to agriculture

- Food crops benefit more than export crops from irrigation expansion, leading to lower food prices



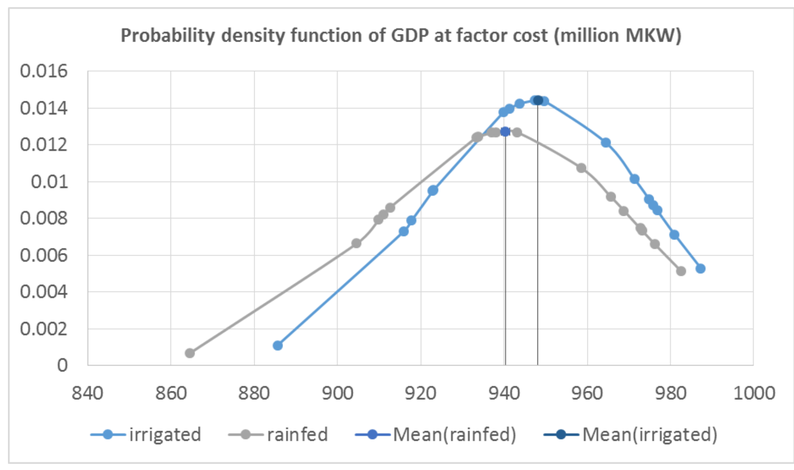


- Summer scenario: negative growth in agriculture leads to lower farm household welfare
- Winter scenarios: increases in welfare for both rural and urban households due to increases in wages and lower food prices

GDP under variable weather conditions

- Irrigation decreases risks due to climate change with lower standard deviation and higher mean

	rainfed	irrigated
Mean	940.3	948.2
Standard deviation	31.3	27.7



Source: Results from the Malawi CGE and crop models.
Notes: Percentage values are deviations from the final year baseline value (%) after simulation. Welfare is measured using real consumption expenditure.

6. Conclusion

- Irrigation expansion can bring considerable returns both in terms of economic growth and food security
- Structural change due to labor intensive irrigation: Negative impacts on the non-agricultural economy
- High labor needs of irrigation put pressure on already labor constrained farm households
- Irrigation can decrease the adverse effects of climate variability
- Tradeoffs for the environment reduced as water availability explicitly considered

7. References

Inocencio, A.; Kikuchi, M.; Tonosaki, M.; Maruyama, A.; Merrey, D.; Sally, H.; de Jong, I. 2007. Costs and performance of irrigation projects: A comparison of sub-Saharan Africa and other developing regions. Colombo, Sri Lanka: International Water Management Institute. 81 pp. (IWMI Research Report 109)

SMEC, 2015. National Irrigation Master Plan and Investment Framework for the Republic of Malawi, Ministry of Agriculture, Irrigation and Water Development, Department of Irrigation.

8. Contact

Franziska Schuenemann
Institute of Agricultural Sciences in the Tropics
Chair of Rural Development Theory and Policy (490a)
University of Hohenheim, Wollgrasweg 43, D-70593 Stuttgart, Germany
E-Mail: franziska.schuenemann@uni-hohenheim.de