



Evidence based assessment of scalability of agricultural technologies: The case of improved food legumes and small ruminant market sheds

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The presentation

- The two case studies
 - Welfare impact of food legume technologies in Bale highlands
 - Economic impact of market facilities in central highlands of Ethiopia
- Scaling and scalability of the technologies studied



Impact of improved food legume technologies

Motivation

Bale highlands are known for their mono-cropping production system: wheat and barley dominated.

Mono-cropping:

- Growing one crop year after year on the same plot of land
- Non-diverse rotations – Only a single crop is grown at a time within a field.
- Associated with two problems:
 - Soil degradation
 - Increased vulnerability to risk
- Implies lower efficiency [broadly defined] compared to poly-cropping systems.





The key questions

■ Our questions

- Do technical efficiency [the ratio between actual and potential output of a production unit] and crop productivity [crop output per unit of the most limiting input] vary between improved faba bean and field pea growers and non-growers?
- What are the welfare impacts of level and intensity of adoption of improved food legumes varieties in Bale Highlands?

■ Our objective

- **To empirically show whether the adoption of improved food legume varieties increases the technical efficiency of crop production and welfare [income/ae, consumption expenditure/ae, calorie intake/ae] of households.**



Methodology

■ Sampling

■ Multi-stage (mixed) sampling

- 3 of the 4 major legume producing districts in Bale highlands were selected.
 - Agarfa, Goba and Sinana based on relative importance of food legumes in terms of land allocation for crops.
- 4 peasant associations in each district were selected randomly.
- 200 farm households were randomly selected from the 4 PAs/District.
- Total sample size 600 farm HHs.

■ Models

- From PSM to DR-TEM



Results and implications

- Very low adoption of improved legume varieties – particularly faba bean and field pea.
- Positive relationship with people level welfare impacts:
 - Positive effect of adoption of improved food legume varieties on household income.
 - Positive and significant impact of **intensity** of adoption on income, consumption expenditure and daily calorie intake.
- However, the relationship with intermediate outcomes is not so impressive:
 - No relationship with efficiency no matter how the latter was measured.
 - No relationship with productivity per unit of limiting factor no matter what conversion [energy or price] was used.
- Victims of spurious correlation??

	Agarfa Col %	Goba Col %	Sinana Col %	Total Col %
Improved variety				
Non-Adopter	72.9	79.3	59.6	70.5
Adopter	27.1	20.7	40.4	29.5
Chemical fertilizer (for FP and FB)				
Non-Adopter	77.9	80.8	91.1	83.3
Adopter	22.1	19.2	8.9	16.7
Chemicals (herbi, pesti, and fungi) for FB and FP				
Non-Adopter	84.9	99.5	94.6	93
Adopter	15.1	0.5	5.4	7
N	199	198	203	600
	Agarfa Col %	Goba Col %	Sinana Col %	Total Col %
Adopt all components				
Non-Adopter	98	100	99.5	99.2
Adopter	2	0	0.5	0.8
Improved variety and fertilizer				
Non-Adopter	90.5	92.9	94.1	92.5
Adopter	9.5	7.1	5.9	7.5
Improved variety and chemicals				
Non-Adopter	97	99.5	96.6	97.7
Adopter	3	0.5	3.4	2.3
N	199	198	203	600



Economic impact of market facilities in central highlands of Ethiopia

- **Motivation**
 - National survey revealed some key market constraints
 - **Lack of livestock market information**
 - **Poor market infrastructure**
 - High transportation cost
 - poorly constructed marketing yards,
 - lack of facilities (vet, water, feeding, loading, etc)
 - **Lack of vertical linkage** of goat producers to the other market actors
 - **Weak horizontal linkage** among goat producers
 - Seasonality of (inconsistent) supply and demand
 - **Lack of market regulations** encouraging unlicensed traders and brokers
 - **Double taxation** when crossing regional borders
 - **Flow of animals to informal cross border trade** limiting number of animals coming to the formal market
 - Frequent clan conflict on feed and water – **increasing marketing risk**
 - **Lack of working capital for traders**



Economic impact of market facilities ..

- The key argument
 - Lack of market infrastructure significantly undermines the market margins farmers generate and elevates the prices they pay for agricultural products when involved as buyers.
 - This study aims at quantifying the added monetary advantage for livestock keepers due to accessing key market facilities in selected markets of the central highlands of Ethiopia.



Economic impact ...

■ Design

- 9 livestock markets were randomly selected and market facilities – sheds – were constructed.
- Other 9 markets which are close to the 9 intervention markets are being monitored for comparison purpose.
- Data are being collected on price determination patterns, transaction costs incurred, and prices received.
- The demand and supply patterns are also being monitored in both sets of markets.
- A year- long data generation procedure will be followed to capture price volatility in the markets.



Economic impact ...

- 9 intervention markets:
 - 3 groups – in terms of average volume of supply at a time
 - 10-300 small ruminants
 - 300-600 small ruminants
 - 600-1000 small ruminants
- Sheds (3 types) designed by a registered architect.
- MoU signed between ICARDA and key governmental institutions in each of the districts.





The Markets

Market	District	Size category
Mollale	Menz Mama	Large
Mehal Meda	Mehal Meda Town	Large
Zemero	Menz Keya Gabriel	Large
Zeret	Menz Keya Gabriel	Medium
Gey	Menz Gera	Medium
Girar Amba	Gishe	Medium
Shesho	Menz Mama	Small
Ashen	Menz Gera	Small
Kolo Margefia	Menz Mama	Small



The market sheds – The Girar Amba (medium market) story





The Girar Amba story





The Girar Amba story





The Girar Amba story





The Girar Amba story





What have we observed so far?

- Very few or no farmers used to bring their sheep and goats to these markets in the rainy season simply because of limited access [due to seasonal rivers] and no sheds in the markets to protect themselves and their animals from the rain.
- After the construction of the sheds, it was observed that farmers – in areas where rivers were not cutting the roads to markets -were able to bring in some animals to the markets in the rainy season.
- Traders are also staying longer in the markets possibly due to the sheds as the animals are no more exposed to heat and rain while in the markets.



Scaling: In judging scalability of agricultural technologies

- We consider the following aspects depending on the context
 - Technology attributes such as
 - Profitability, compatibility, trialability, observability, riskiness, capital requirements, complexity and availability.
 - Resource endowments such as
 - Land, labour, livestock and farm equipment.
 - Market access such as
 - Credit and input and output markets.
 - Risk and uncertainty such as
 - Idiosyncratic and covariate shocks
 - Topographic factors such as
 - slope, soil type and location
 - Intellectual capital accumulators such as
 - Education, experience and extension.
 - Policy and institutional factors such as
 - Taxes and subsidies, policies on/about factors of production, bureaucracy/corruption



To what extent can the technologies studied be scaled-up?

- Improved food legume technologies
 - They have attributes that need to be modified:
 - Compatibility with machine based cropping system
 - Divisibility of the technology is being a curse in this case. Farmers often try the different components separately. The technology is not meant to be divisible and this is undermining its uptake.
 - Scaling improved food legume technologies in Bale Highlands and similar farming systems might be critical [to abate the effects of mono-cropping] and yet the technologies need to be [re-]designed to fit into farmers' circumstances.



To what extent ...

- **The market sheds/facilities**
 - Can't be available at individual level and are built on plots of land owned by the government. Limited or no sense of ownership.
 - Farmers could be subjected to more irrational taxing due to the sheds.
 - The establishment costs are very high [financial + non-financial terms].
 - Scaling market facilities is possible and needs to be done. This however needs a long-term strategy at macro level on how to develop livestock/small ruminant markets – taking the social and economic functions of markets [including the market plots] in rural Ethiopia into consideration.



- Africa RISING/USAID
- PIM CRP
- Sinana Agricultural Agr. Research Center
- Debre Birhan Agr. Research Center
- Sample farmers
- Different Offices in Agarfa, Goba and Sinana Districts, Bale Zone, Oromia region.
- Different Offices in Gishe, Menz Gera, Menz Keya Gabriel, and Menz Mama Districts, and Mehal Meda Town in Amhara region.





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