ILSSI Project
Research Results and Outcomes

Presented by Dawit Mekonnen – International Food Policy Research Institute (IFPRI)
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Photo: Desalegne Tadesse/IWMI
RESEARCH CONCEPTUAL FRAMEWORK

Key components of the enabling environment:
- Access to markets
- Natural resources
- Infrastructure
- Social, nutrition, and health norms

Adapted by the authors from Herforth and Harris, 2014
RESEARCH AIMS

1. What are the constraints and benefits of adopting irrigation technologies? (→ Econometric Analyses)

2. How can nutritional outcomes be strengthened through adoption of irrigation technologies? (→ Household Survey Analysis, Engagement with nutrition and health departments, Outreach on irrigation-nutrition linkages)

3. How can women’s empowerment be strengthened through adoption of irrigation technologies? (→ Focus Group Discussions and Household Survey Analyses, Training on Gender-Irrigation Linkages, Outreach)
METHODOLOGY

ILSSI collected detailed household survey data in Ethiopia ILSSI intervention villages and nearby control farmers: 2 rounds of survey data (2014, 2017)

- In collaboration with Association of Ethiopian Microfinance Institution
- Topics of the survey include:
  - Crop & livestock inputs, production and practices
  - Household and women’s dietary diversity
  - Child health, diet, feeding and anthropometry
  - Household shocks, assets, credit
  - Women’s Empowerment in Agriculture Index (WEAI)
- The household surveys are accompanied by community surveys, FGDs, anthropometric measures, and intra-household surveys
SITES IN ETHIOPIA

**Baseline:** 15 villages, November 14th - December 26th 2014 (covering 1 year): 439 households

**Endline:** 15 villages, February 20th – April 12, 2017 (covering the preceding one year)

- 439 households from round I
- Additional 100 households under SIPS funding - quantitative nutrition module for 368 households.
KEY RESEARCH FINDINGS

1. Irrigation profile of ILSSI sample

2. Irrigation-nutrition linkages

3. Gender considerations for irrigation
IRRIGATION PROFILE: RAINY SEASON

- Chat: 125
- Coffee: 26
- Onions: 23
- Sugarcane: 15

Crops grown on less than 15 irrigated plots not shown.
IRRIGATION PROFILE: DRY SEASON

Crop planted on plot

- Chat: 146
- Coffee: 35
- Cabbage: 23
- Sugarcane: 22
- Tomato: 19
- Mango: 18
- Onions: 17

Number of irrigated plots during dry season

Crops grown on less than 15 irrigated plots not shown
SOURCES OF WATER FOR IRRIGATION

- River: 0.41
- Ground-water: 0.03
- Lake: 0.02
- Dam/pond: 0.54
- Other: 0.01
METHODS OF OBTAINING WATER FOR IRRIGATION

- Gravity: 0.11
- Diesel pump: 0.05
- Hand/foot pump: 0.37
- Hand Bucket/hose: 0.02
- Other (includes electric pump): 0.02
TYPES OF IRRIGATION METHOD

- Surface/Flooding: 0.36
- Bucket/hose/watering can: 0.13
- Furrow: 0.50
- Other: 0.02

Other includes drip, level basin, and bay/border strip.
## SELECTED SAMPLE CHARACTERISTICS

<table>
<thead>
<tr>
<th>Dry/Belg season</th>
<th>Non-irrigators (1)</th>
<th>Irrigators (2)</th>
<th>P-value (1)-(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female household head</td>
<td>0.087</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Age of the head (years)</td>
<td>46.7</td>
<td>43.6</td>
<td>***</td>
</tr>
<tr>
<td>Educational attainment of the head (years)</td>
<td>4.88</td>
<td>2.64</td>
<td>***</td>
</tr>
<tr>
<td>Plot size (ha)</td>
<td>0.19</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Main plot decision maker - female only</td>
<td>0.041</td>
<td>0.077</td>
<td>*</td>
</tr>
<tr>
<td>Main plot decision maker - male only</td>
<td>0.34</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Plot soil fertility - lem</td>
<td>0.49</td>
<td>0.76</td>
<td>***</td>
</tr>
<tr>
<td>Plot soil fertility - lem-tuef</td>
<td>0.42</td>
<td>0.22</td>
<td>***</td>
</tr>
<tr>
<td>Homestead-plot travel time (minutes)</td>
<td>5.36</td>
<td>8.00</td>
<td>***</td>
</tr>
<tr>
<td>Family child agricultural labor (person-days/ha)</td>
<td>42.3</td>
<td>164.7</td>
<td>***</td>
</tr>
<tr>
<td>Family male agricultural labor (person-days/ha)</td>
<td>199.9</td>
<td>590.5</td>
<td>***</td>
</tr>
<tr>
<td>Family female agricultural labor (person-days/ha)</td>
<td>122.0</td>
<td>372.5</td>
<td>***</td>
</tr>
<tr>
<td>Total cultivated area (ha)</td>
<td>0.51</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Tropical Livestock Units: TOTAL</td>
<td>3.54</td>
<td>4.46</td>
<td>***</td>
</tr>
<tr>
<td>Informed about irrigation options &amp; methods</td>
<td>0.74</td>
<td>0.94</td>
<td>***</td>
</tr>
<tr>
<td>Household belongs to an Iqub savings group</td>
<td>0.096</td>
<td>0.38</td>
<td>***</td>
</tr>
<tr>
<td>Household belongs to a credit or microfinance group</td>
<td>0.35</td>
<td>0.44</td>
<td>**</td>
</tr>
<tr>
<td>Total value of harvest (thousands of Birr/ha)</td>
<td>45.8</td>
<td>90.5</td>
<td>***</td>
</tr>
<tr>
<td>Value of coffee harvest (thousands of Birr/ha)</td>
<td>4.94</td>
<td>5.61</td>
<td></td>
</tr>
<tr>
<td>Value of chat harvest (thousands of Birr/ha)</td>
<td>9.33</td>
<td>37.1</td>
<td>***</td>
</tr>
<tr>
<td>Value of hopes/gesho harvest (thousands of Birr/ha)</td>
<td>0.50</td>
<td>4.90</td>
<td>***</td>
</tr>
</tbody>
</table>
CONTRAINTS TO IRRIGATION ADOPTION

Plot has flat slope
Plot faces soil erosion
Main plot decision maker - female only
Plot soil fertility - lem-tuef
Plot soil fertility - tuef
Female household head
Age of the head (years)
Educational attainment of the head (years)
Household size
Family female agricultural labor (person-days/ha)
Family male agricultural labor (person-days/ha)
Asked but did not receive loan
Household belongs to an Iqub savings group
Household belongs to a credit or microfinance group
Informed about irrigation options & methods
Met extension agent in the past year
Tropical Livestock Units: TOTAL
Total land size (less plot area) (ha)
Small-scale irrigation suitability score (0-100)
IRRIGATION – NUTRITION LINKAGES
HDDS and WDDS - 24 hour recalls
Poisson Regression - Ethiopia

Mean HDDS
• Irrigators (n=412): 5.9
• Non-irrigators (n=458): 5.6
NUTRIENT-DENSE FOODS

VitA and Iron-Rich Foods

- Irrigation
- Total Land size
- Owns cows
- Owns goats/sheeps/pigs
- Owns chickens/birds
- Remittances
- Self-employment income
- Gifts
- Drought
- Log household size
- Log woman's age
- Woman's education

\[ \text{vitA\_animal} \quad \text{vitA\_plant} \quad \text{Iron\_rich} \]
NUTRIENT-DENSE FOODS: WOMEN’S DIETS

VitA and Iron-Rich Foods

- Irrigation
- Total Land size
- Owns cows
- Owns goats/sheeps/pigs
- Owns chickens/birds
- Remittances
- Self-employent income
- Gifts
- Drought
- Log household size
- Log woman's age
- Woman's education

Legend:
- vitA_plant_women
- vitA_animal_women
- Iron_rich_women
Effects of SSI on under-five Wasting and Stunting

- Irrigation
- 0 to 24 months old
- Child's gender
- Total Land size
- Owns cows
- Owns goats/sheeps/pigs
- Owns chickens/birds
- Remittances
- Self-employent income
- Drought
- Log household size
- Log woman's age
- Woman's education

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WOMEN’S ROLE IN DECISION-MAKING

• There appears to be a movement towards more women’s involvement in decision-making especially on irrigated production decisions (less so on income decisions)

• Women decide on how to use income for daily expenses like food while men control decisions regarding larger expenditures

• Women report that they have more say over use of income from vegetables that they produce on plots near the home

• Women have much less access to information and training on irrigation (58% vs. 80%)—invitations to meetings and trainings are typically sent to the head of the household
KEY MESSAGES

• Agricultural income per hectare during the dry season is two times more for irrigators compared to non-irrigators.

• Irrigation is dominated by chat, coffee, and hops/gesho. 40% and 34% of the irrigated plots during the wet and dry seasons are covered with chat.

• Pumps reduce the person-days required to irrigate a hectare of land per year by 56% and 137% for men and women, respectively.
KEY MESSAGES

➢ Irrigators have higher household dietary diversity (economic access to foods) and higher women’s dietary diversity (reflecting a higher probability of micronutrient adequacy of the diet), compared to non-irrigators.

➢ Irrigation has positive effect on the consumption of vegetables, and sugar and honey.

➢ Irrigation has a positive effect on the consumption of Vit-A rich plant source foods (both at the household level and women’s diets).

➢ Children in irrigating households have a 0.3 SD higher weight for height score, indicating lower acute malnutrition (wasting).
RECOMMENDATIONS

• Irrigation is shown to have a strong effect on household’s economic access to food and on nutritional outcomes of women and children. As such, it needs to be promoted on its merit to improve nutrition, in addition to its potential for higher income and yield.

• However, the highly skewed crop portfolio of irrigation in Ethiopia towards ‘chat’ needs more attention from policy makers and researchers on its impact on nutritional outcomes and its high water requirement.
PUBLICATIONS UNDER PREPARATION

1. Small-Scale Irrigation Improves Household Dietary Diversity through Increased Income: Evidence from Ethiopia and Tanzania


4. Constraints and opportunities for adoption of small scale irrigation technologies. Evidence from East and West Africa