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## Irrigation-Nutrition Linkages

Presented by **Dawit Mekonnen** – **International Food Policy Research Institute (IFPRI)**  
National Information Platform for Nutrition – Ethiopian Public Health Institute, Addis Ababa  
7<sup>th</sup> December 2018

Photo: Desalegne Tadesse/IWMI



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## ... A SEQUEL FROM LAST MONTH'S NIPN SEMINAR

My big takeaways from Drs. Kalle Hirvonen's and Kaleab Baye's presentations:

- Big reduction in stunting rates in Ethiopia from 58% in 2000 to 38% in 2016
- Little improvements in average birth sizes (20% are born stunted), calling for focus on maternal health and nutrition
- In 2016, growth faltering occurs later in children – likely due to improvements in intensive breastfeeding practices
- However, child growth still collapses around the time when complementary foods are introduced (~6 months), possibly due to poor dietary diversity
- Complementary feeding practices are affected by
  - Caregivers' knowledge
  - Access to food: both physical and economic access to food
  - This is where productive agriculture (e.g. irrigation) can play a role to improve households' and women's dietary diversity, and to reduce stunting and wasting in children



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## OBJECTIVES

- Exploration of the potential of small-scale irrigation (SSI) to contribute to improved nutrition outcomes
- Identification of the pathways through which SSI affects nutrition with a focus on the production and income pathways



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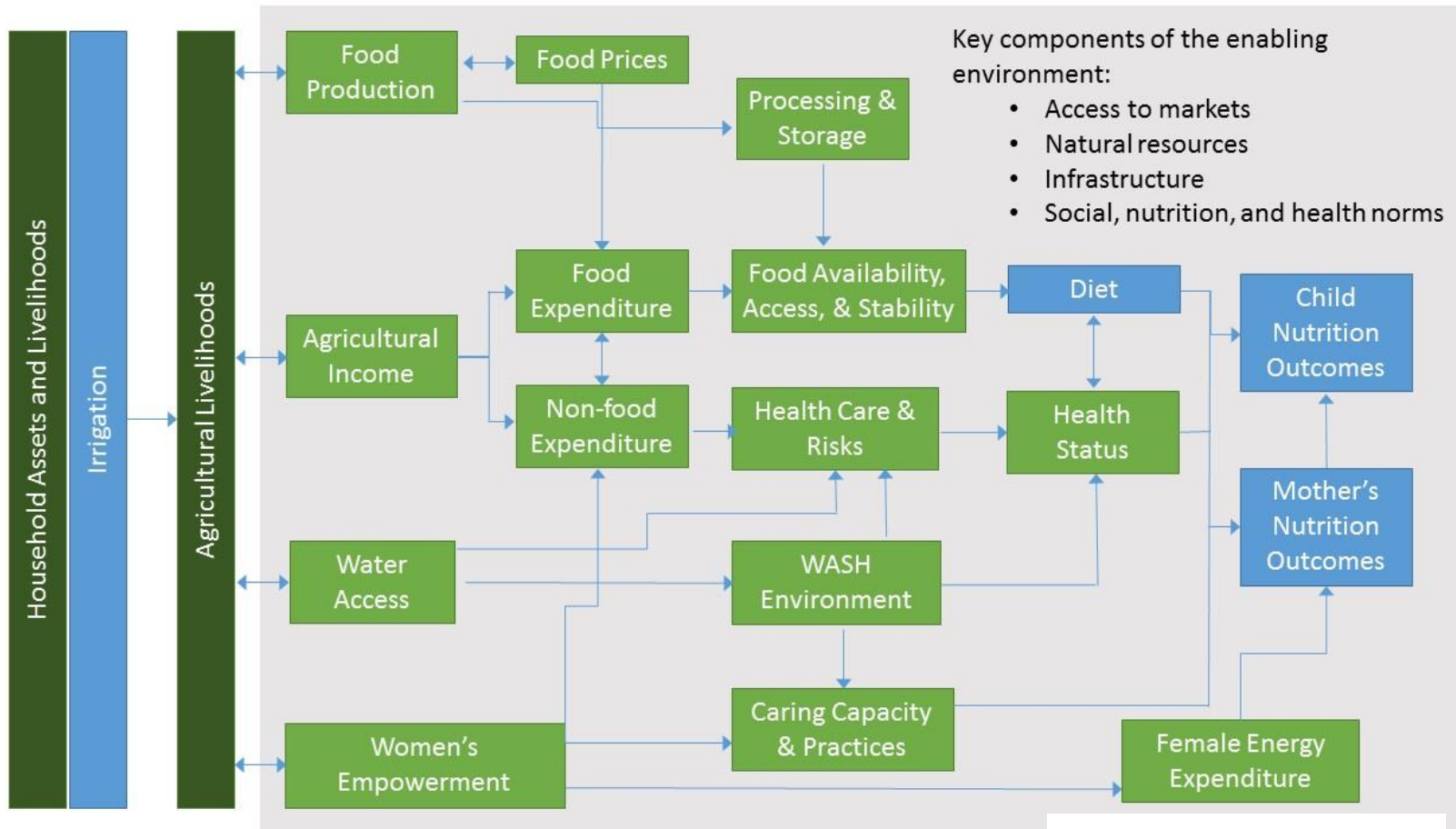




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## RESEARCH CONCEPTUAL FRAMEWORK



Passarelli et al. 2018



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## IRRIGATION-NUTRITION LINKAGES: PRODUCTION PATHWAY

- Higher yields from irrigation (with improved varieties & complementary inputs) (e.g. Burney et al 2010)
- Growing in the lean season (e.g. Aseyehen et al 2012)
- Greater crop diversity (Namara et al. 2005, India), or no difference (Namara et al. 2011, Ghana), or more monocropping (Hossain et al. 2005, Bangladesh)
- More vegetables and fruits (de Fraiture and Giordano 2014)
- Increased production of animal source foods through irrigated fodder (Frenken 2005; Murphy and Allen 2003)



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## IRRIGATION-NUTRITION LINKAGES: INCOME PATHWAY

- Higher gross revenue per ha for SSI as with irrigated crops mainly being cash crops (Burney et al 2013; Nkonya et al 2011)
- Food expenditures higher among irrigating households in South Africa (Sinyolo et al. 2014)
- Employment generation due to increased productivity and expanded production calendar
- Agricultural income per hectare during the dry season is two times more for irrigators compared to non-irrigators (Mekonnen et al., under preparation)



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## IRRIGATION-NUTRITION LINKAGES: WATER SUPPLY PATHWAY

- Irrigation water may be used for other purposes such as drinking, washing, bathing or other productive purposes (e.g. livestock watering, aquaculture) (Meinzen-Dick and Bakker 1999)
- Greater water for domestic purposes as a result of irrigation resulted in lower diarrhea and stunting in Pakistan (Van der Hoel et al. 2002)



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## IRRIGATION-NUTRITION LINKAGES: HEALTH RISKS PATHWAY

- Increased risk of vector-borne diseases (i.e. malaria, dengue)
- Negative health outcomes from increased pollution (especially nitrates and pesticides)
- Greater health spending (e.g. malaria treatment and prevention)



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## IRRIGATION-NUTRITION LINKAGES: WOMEN'S EMPOWERMENT PATHWAY

Irrigation projects targeted towards women may have stronger impact on nutrition and health outcomes

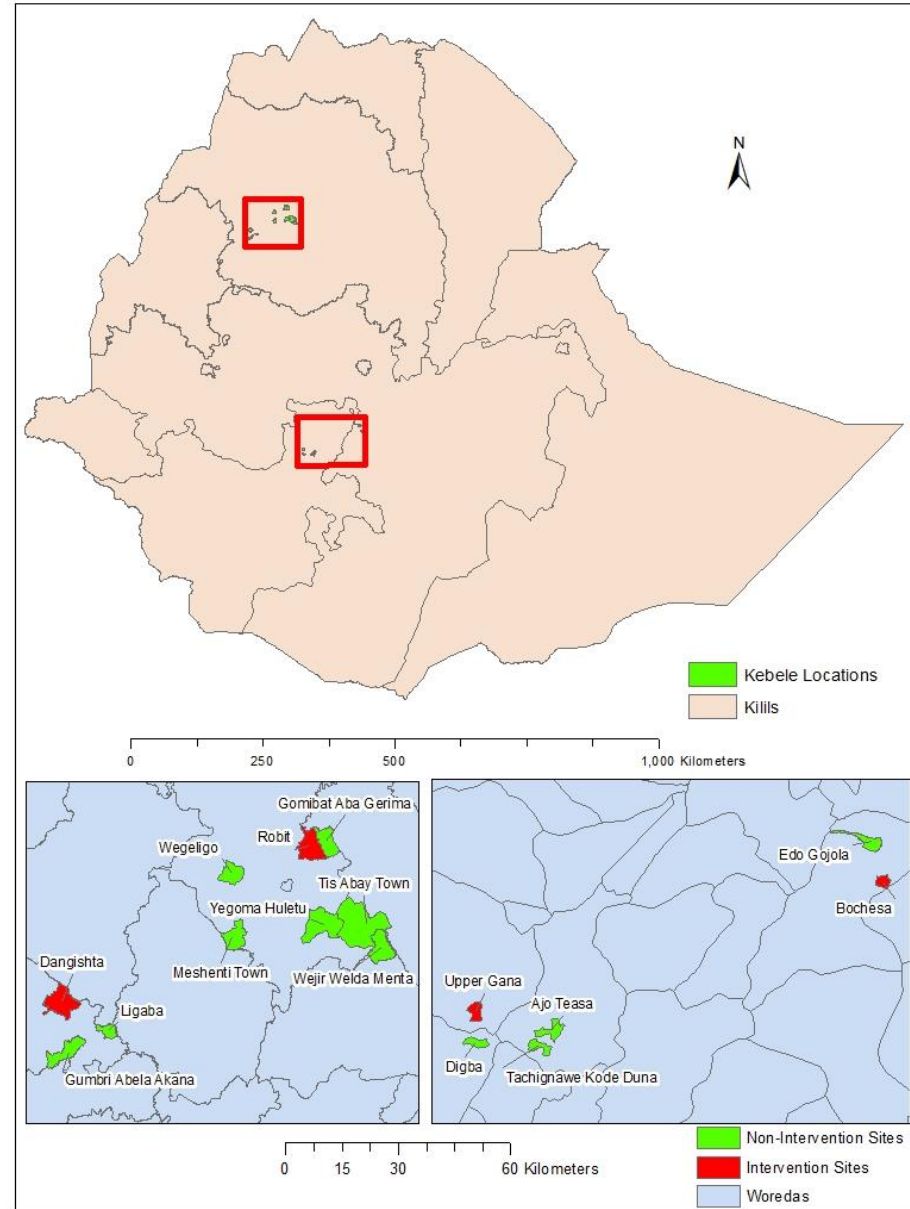
- Women may allocate resources gained from sale of irrigated crops towards food and health expenditures
- Women may use irrigation to grow more nutritious foods for home consumption
- Contribution to women's empowerment (e.g. increase in assets owned by women, income controlled by women)
- With potential negative effect due to time burden (depending on type of technology)
- Pumps reduce the person-days required to irrigate a hectare of land by 56% and 137% for men and women, (Mekonnen et al., under preparation).



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- Results are based on analysis of data collected in Ethiopia under the USAID funded Innovation Lab for Small Scale Irrigation (ILSSI) Project.
- Similar work under ILSSI in Ghana and Tanzania
- Baseline: 15 villages, Nov. 14th – Dec. 26th 2014 (covering 1 year): 439 households
- Endline: 15 villages, Feb. 20th – April 12, 2017 (covering the preceding year): 539 households

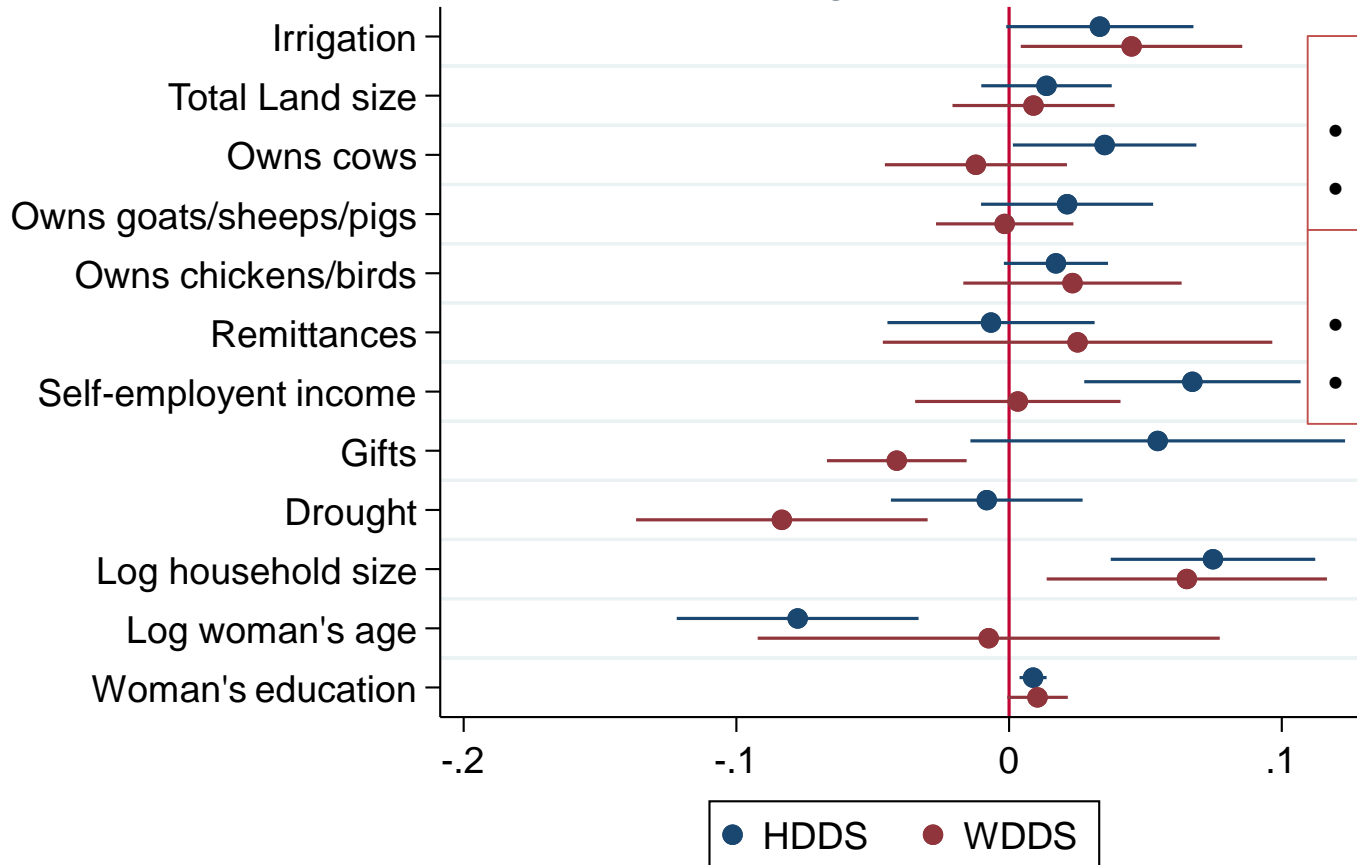


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# IMPACT OF IRRIGATION ON HDDS AND WDDS

HDDS and WDDS - 24 hour recalls  
Poisson Regression - Ethiopia



Mean HDDS:

- Irrigators: 5.9
- Non-irrigators : 5.6

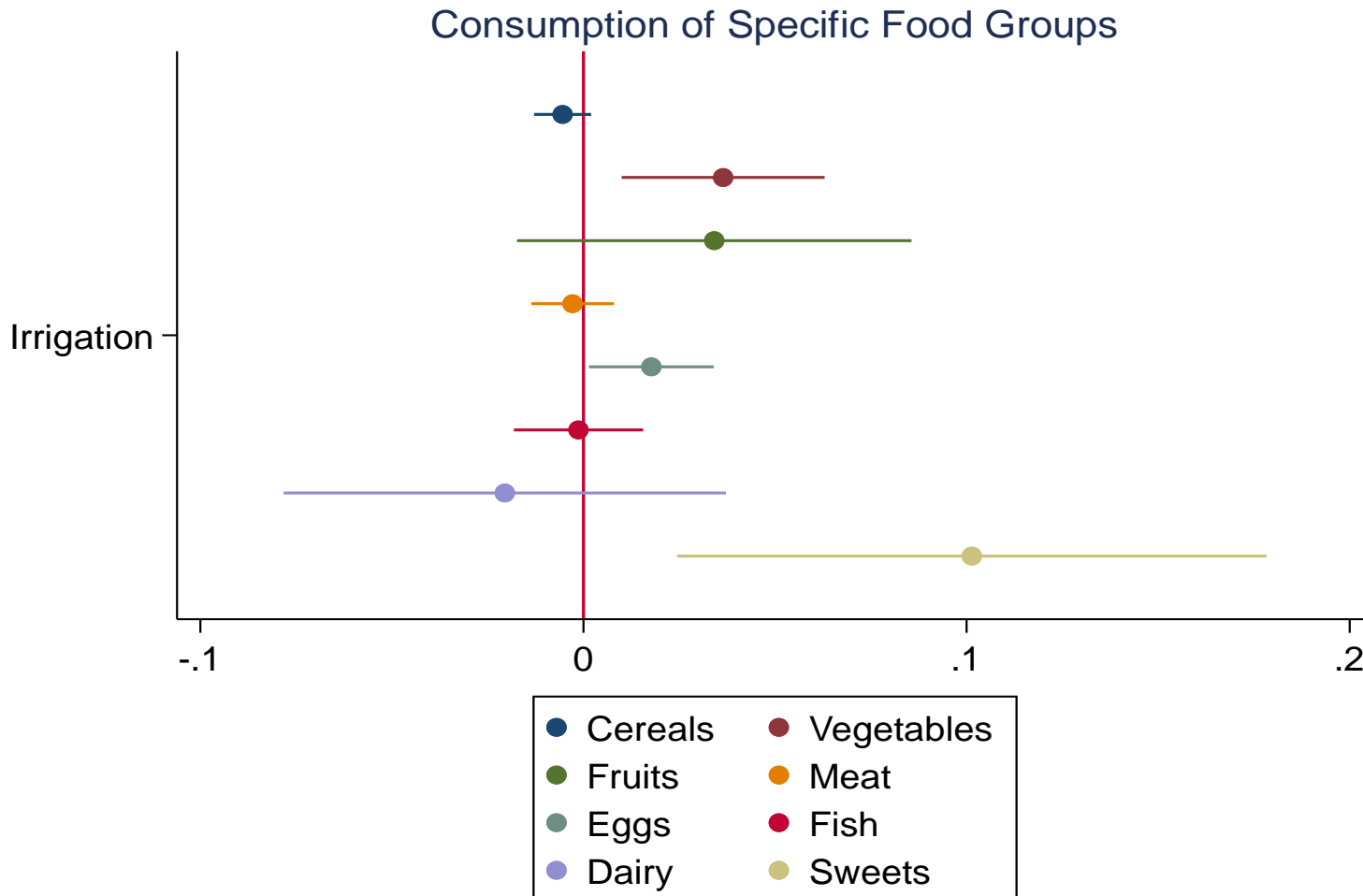
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Mean WDDS:

- Irrigators: 3.5
- Non-irrigators: 3.4



## IMPACT OF IRRIGATION ON CONSUMPTION OF SPECIFIC FOOD GROUPS

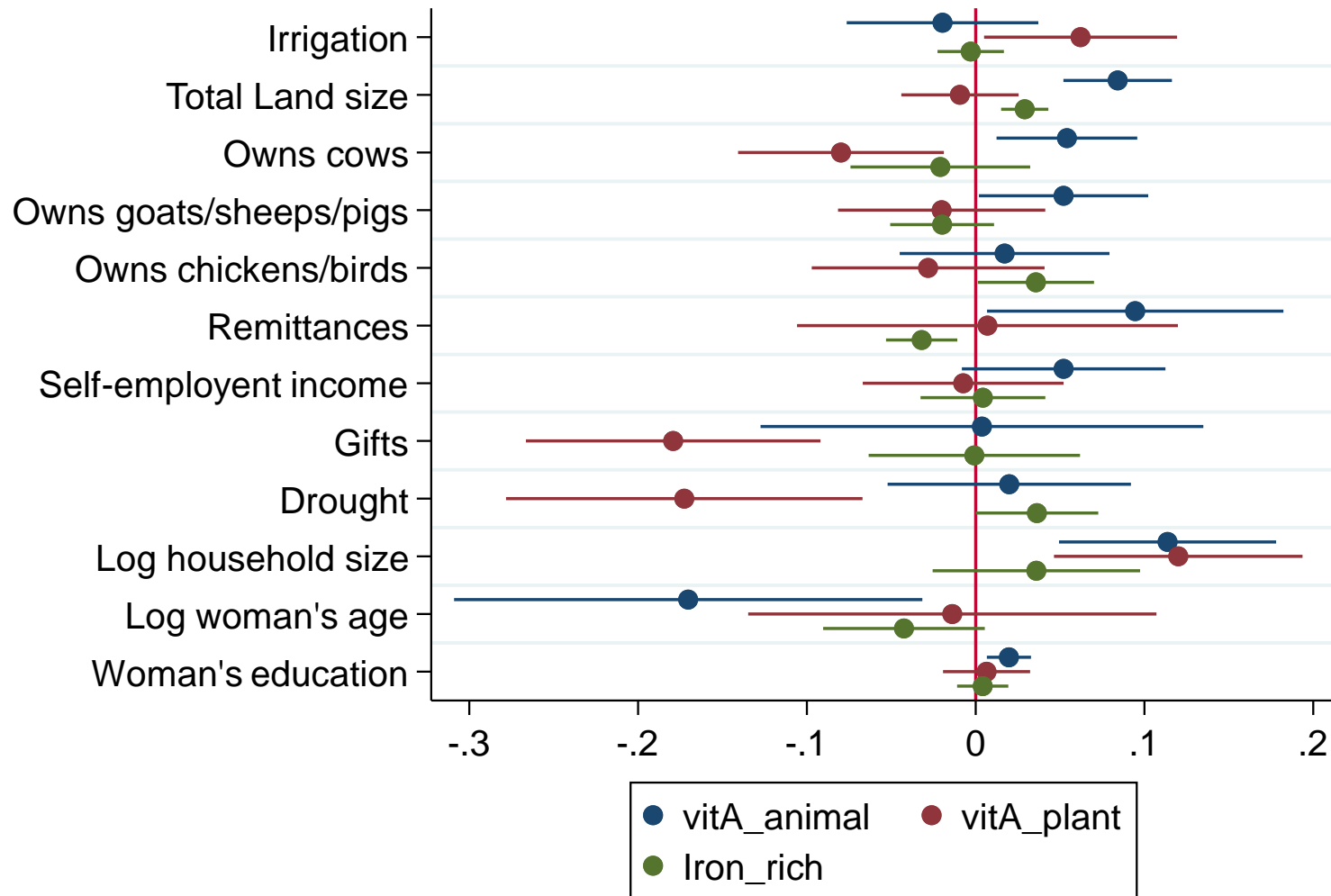






## NUTRIENT-DENSE FOODS: HOUSEHOLD DIET

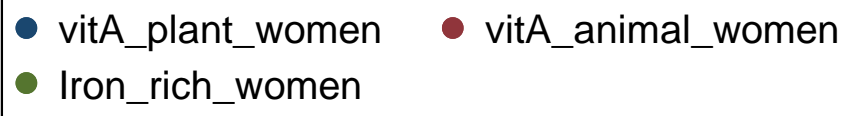
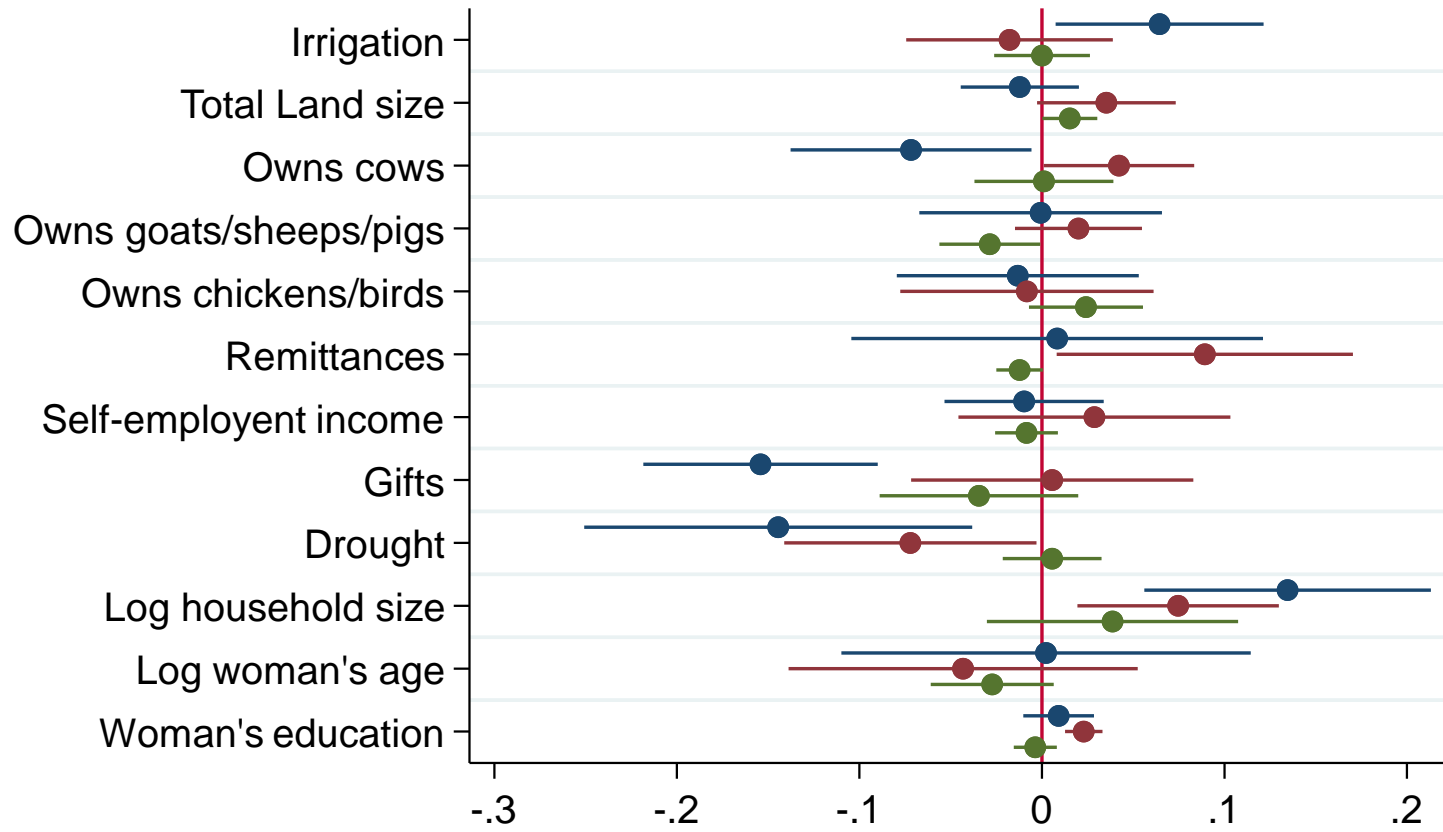
### VitA and Iron-Rich Foods





## NUTRIENT-DENSE FOODS: WOMEN'S DIETS

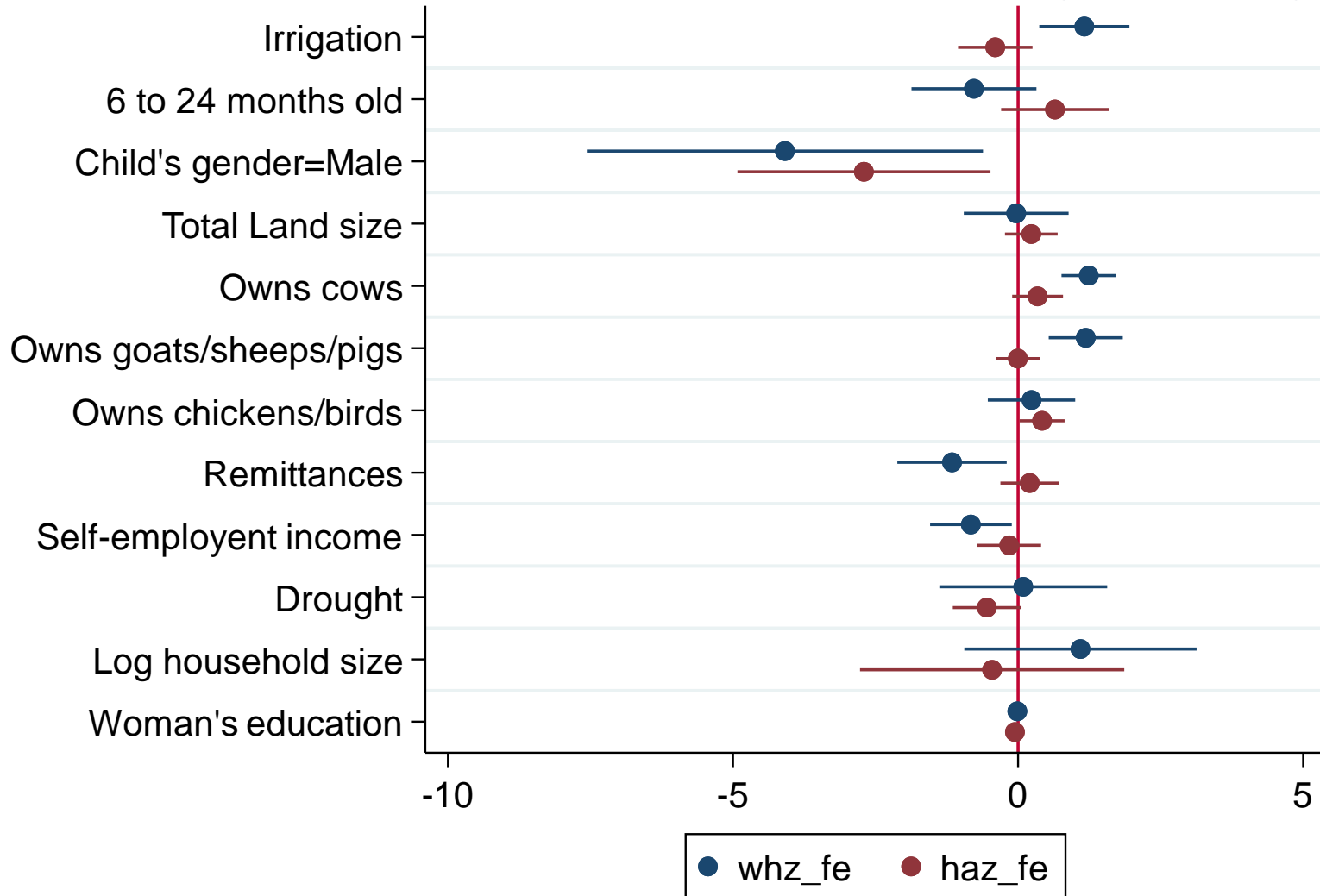
### VitA and Iron-Rich Foods





## IMPACT OF IRRIGATION ON CHILDREN'S NUTRITION

### Effects of SSI on under-five Wasting and Stunting





## 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 effects on the consumption of vegetables, eggs, 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 1.2 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. But potential adverse impacts (pollution and water shortages) need to be monitored.
- The highly skewed crop portfolio of irrigation in parts of Ethiopia toward 'chat' (up to a third of irrigated plots in the study area) needs more attention from policy makers and researchers on its impact on nutritional outcomes and its high water requirement.





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