Presentation from

2016 World Water Week in Stockholm

www.worldwaterweek.org

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Zentrum für Entwicklungsforschung
Center for Development Research
Universität Bonn

Agriculture, Water Quality, Nutrition and Health: Evidence from Rural Ethiopia

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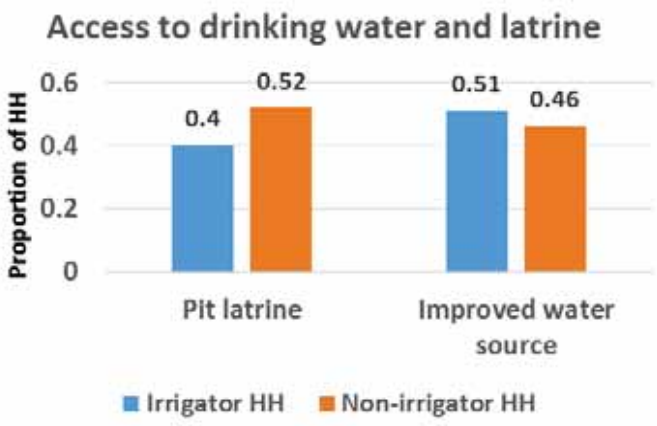
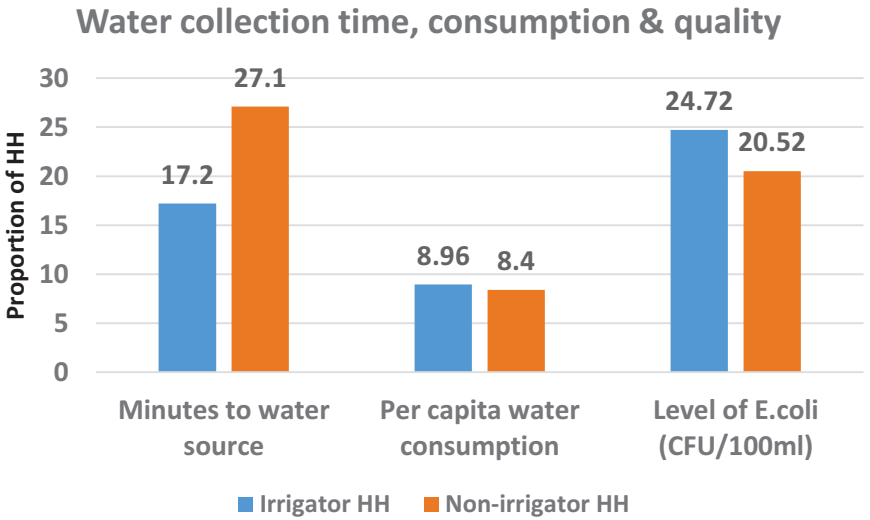
Muhammed A. Usman
Center for Development Research (ZEF), University of Bonn, Germany

Access to water & san, and health status by irrigation

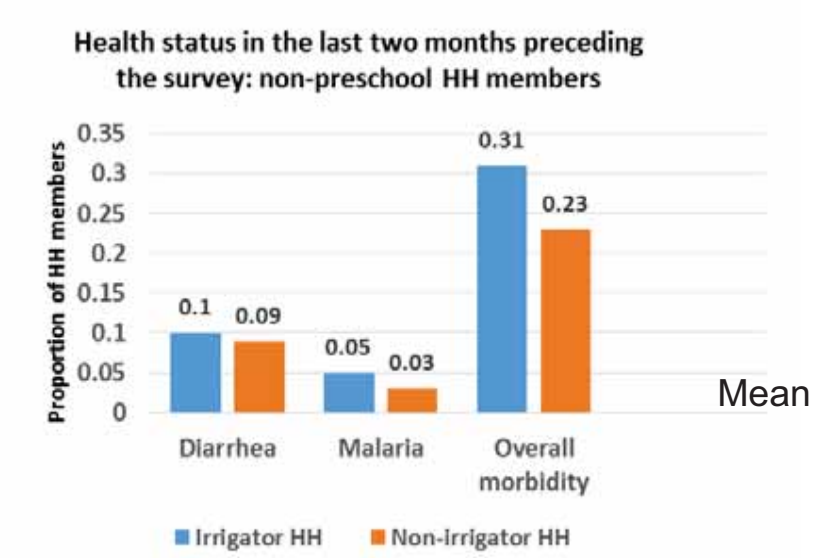
Sample size N=454



Mean difference: latrine sig. at 1%

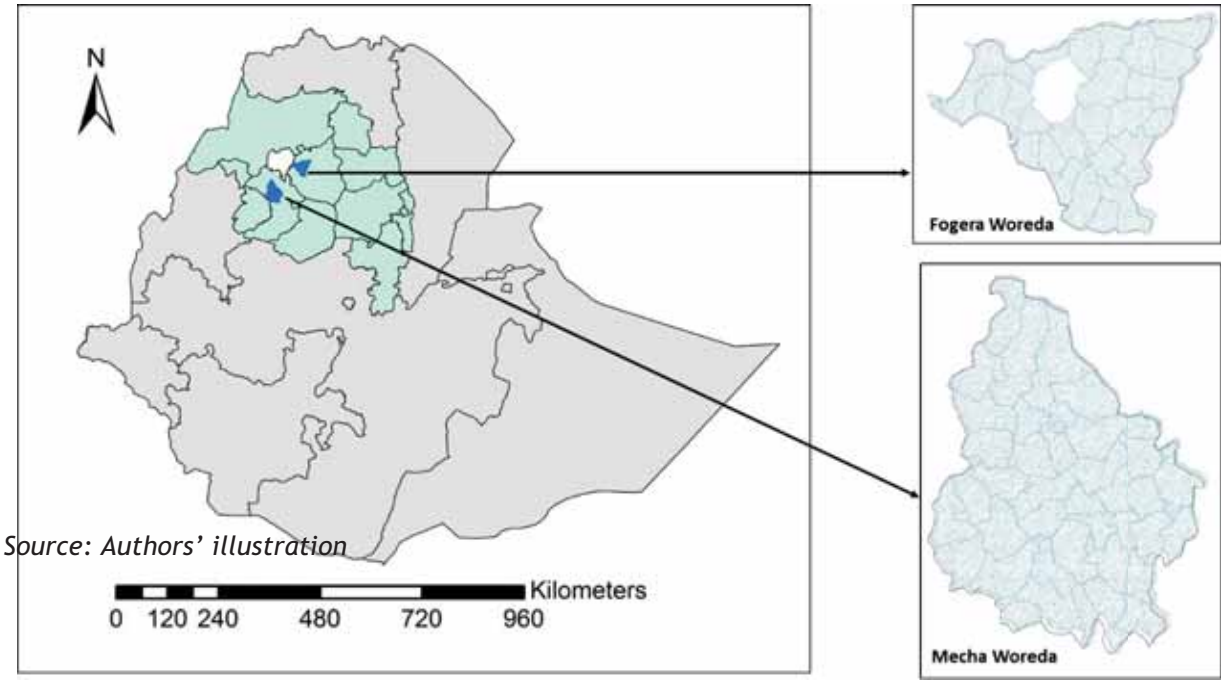


Mean differences: significant at 1%



Mean differences:malaria sig. at 5%
morbidity sig. at 1%

Study areas



Source: Authors' illustration

Fogera wereda:

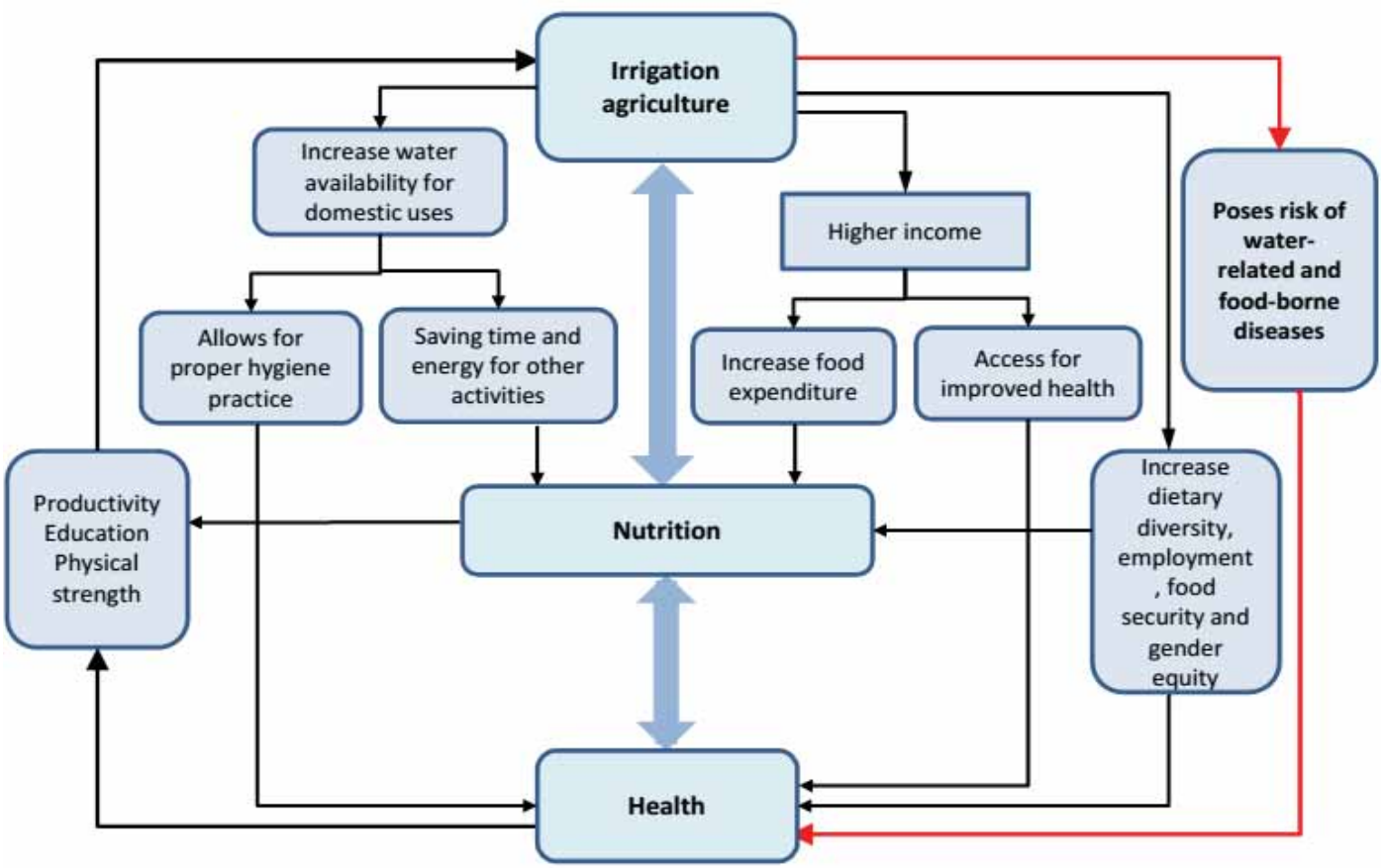
- Population: 264, 512
- Area: 1,111.43 sq. km
- Av. temp.: 22 – 27.2 ^{0}C
- Rainfall: 1100 – 1500mm
- Altitude: 1774 – 2415m
- Drinking water: ?

Mecha wereda:

- Population: 334, 789
- Area: 1, 481.64 sq. km
- Av. temp.: 24 – 27 ^{0}C
- Rainfall: 1200 – 1400mm
- Altitude: 1700 – 2300m
- Drinking water: 35%

Linking agriculture-health-nutrition

The conceptual framework



Source: Authors' illustration

Key drivers of stored household drinking water quality

Multivariate regression

Independent variables	Ordinary least squares (OLS)	Logistic regression
Irrigated-agriculture (dummy)	**0.439*** ** (0.137)	**1.288*** ** (0.096)
Livestock units	**0.166*** ** (0.040)	1.507 (0.407)
Observations	454	454
R-squared	0.45	0.35
Model F-Test	68.18	185.81
Model P-value	0.000	0.000

Robust standard errors adjusted for clustering in parentheses; Significance *** p<0.01, ** p<0.05, * p<0.1
The OLS model predicts the natural log of *E.coli.*
The logistic regression coefficients are odds ratio (OR).

Both models are controlled for: types of primary drinking water source, distance to water source, types of water collection container, education level, household size, household density, proportions of adult women, garbage disposal behaviors, handwashing with soap, presence of latrine and other community characteristics.

Child Health: Under-5 years-old children

VARIABLES	(1) Probit	(2) Instrumental Variable	(3) Bivariate Probit
Water quality (1= no *E.coli*)	**-0.160*** **	-0.140**	-0.133**
	(0.031)	(0.060)	(0.066)
Minutes to water source (round trip)	**0.002****	0.002*	0.002**
	(0.001)	(0.001)	(0.001)
Livestock units	**0.015****	0.017**	0.016**
	(0.007)	(0.008)	(0.008)
Irrigated-agriculture	**-0.026**	-0.016	-0.025
	(0.039)	(0.038)	(0.039)
Safe child stool disposal	**-0.235*** **	-0.222***	-0.233***
(Village level mean)	(0.083)	(0.072)	(0.083)
Additional control variables	**YES**	**YES**	**YES**
Observations	562	562	562
Model Chi2	230.29	275.44	1235.36
Model p-value	0.000	0.000	0.000
Probit rho chi2			0.19
Probit rho p-value			0.66

Robust standard errors adjusted for clustering in parentheses; Significance *** p<0.01, ** p<0.05, * p<0.1
Probit and BP in average marginal effects

Additional control variables: child age & sex, mother age & age squared, head age, highest education completed, number of adult women, household density, dependency ratio, exclusive breastfeeding, number of medical visits, handwashing with soap, latrine density and household asset/per capita expenditure, number of children under age 8 and distance to the nearest health center.

Child Nutrition

Multivariate regression

Variables	OLS	PROBIT	OLS	PROBIT
	Weight-forage-z scores	Underweight	Height-for-age z scores	Stunting
Storage water quality	-0.17* (0.08)	-0.06 (0.04)	-0.10 (0.11)	-0.03 (0.04)
Minutes to water source	-0.004 (0.003)	-0.002 (0.001)	**-0.011*****(0.003)	-0.002 (0.001)
Irrigator households	0.11 (0.99)	**0.10**** (0.04)	0.14 (0.13)	0.09* (0.05)
Observations	547	547	480	480
R-squared	0.24		0.25	
Model F-Test	10.33		15.15	
Model Chi2		128.26		139.44
Model P-value	0.000	0.000	0.000	0.000

Robust standard errors adjusted for clustering at the village level in parentheses;
Significance *** p<0.01, ** p<0.05, * p<0.1
Probit in average marginal effects.
The dependent variable for the OLS model is negative of the z-scores.

Both models are controlled for: child age & sex, mother age & age squared, education level, household size, number of medical visits, safe child stool disposal, latrine, dietary diversity, delivery with health professional, antenatal care visits, distance to health center.

Policy implications

- The agr-watsan nexus requires a mix of instruments to address existing problems of health and nutrition
- It needs a more integrated cross-sectoral approach from various actors in agriculture, watsan, health, nutrition (central & local gov't, NGOs, …)
- Creating an enabling environment to facilitate the multi-sectoral approach to maximize the synergies and minimize the trade-offs in the nexus among WASH-agriculture and nutrition.
  - **Caveat**: Multi-sectoral approach may even worsen the situation if the right institutional arrangement is not in place.

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Thank you

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