



How can agriculture contribute to better nutrition? Developing the evidence based in Ethiopia and Tanzania

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Nutrition sub-sample

General Objective: Micronutrient and nutritional status among mothers and children aged 6-24 months in two agro-ecological zones of rural Ethiopia: longitudinal study

Outputs: Peer-reviewed papers published and in preparation

1. Seasonal variation in nutritional status and anaemia among lactating mothers (published in **Nutrition**)
DOI: <http://dx.doi.org/10.1016/j.nut.2015.03.007>
2. Stunting and anaemia among children 6-23 months of age (under review in **Public Health Nutrition**)
3. Zinc, iron and iodine deficiencies among lactating mothers (in progress)
4. Concurrent micronutrient deficiencies in lactating mothers and their infants (in progress)
5. Dietary diversity and young child feeding practices (in progress)
6. Co-existing micronutrient deficiencies among anaemic children





Introduction



- ❑ Undernutrition and stunting in children are very common in developing countries.
- ❑ Micronutrient deficiencies are a major nutritional problem, particularly in children and pregnant women.
- ❑ Two billion people (over 30% of world population) are anaemic, many due to iron deficiency.
- ❑ In 2011, 116,000 deaths in children under 5 years were attributable to zinc deficiency.
- ❑ About 1.88 billion (28%) of the world's population are considered to have insufficient iodine intake, of whom more than 321 million are Africans.





Materials and Methods



The study was conducted in Babile (eastern Ethiopia) and Endreta and Hintalo Wajirat (Tigray) following relevant ethical clearance and informed consent

Data collection:

Round one (post-harvest season): January to February 2014

Round two (pre-harvest season): July to August 2014

Study design:

A community based longitudinal study was conducted in four randomly selected kebeles

Sub sample:

216 child-mother pairs, equally divided between lowland and midland agro-ecological zones



Materials and Methods continued.....

Questionnaire

- 24 hour dietary diversity (mothers and children)
- Morbidity status of mothers and children
- Breast feeding and child feeding practices
- Maternal and child health services utilization
- Physical examination of the mothers for goitre

Anthropometric

- Weight, Length/Height, MUAC

Micronutrient measurements

- Haemoglobin
- Iron (ferritin)
- Zinc
- Urinary Iodine
- Household salt test for iodization





RESULTS



- ❖ Of the 216 mother/child pairs who enrolled in the post-harvest season, 206 (95%) were re-assessed in the pre-harvest season.
- ❖ In both agro-ecological zones the consumption of animal source foods (a source of heme iron) was very low.
- ❖ Low intake of vitamin C rich foods (increase bioavailability of non-heme iron).
- ❖ Very high intakes of phytate-rich cereal based foodstuffs and tea/coffee (inhibit iron absorption).



Prevalence of micronutrient deficiency in mothers and children in rural Ethiopia

Biomarkers	Infants (%)	Mothers (%)	X ²	P-value
Iron deficiency	44.4	19.8	22.66	0.000
Anaemia	52.5	19.1	39.16	0.000
Iron deficiency anaemia	29.6	10.5	18.50	0.000
Zinc deficiency	67.3	72.2	0.94	0.33
Grade 2 (Visible)		2.5		
Grade 1 (Palpable)		32.7		
Total goitre rate (TGR) (visible + palpable)		35.2		
Inadequate household salt iodine (<15ppm)		63.4		
Urinary iodine deficiency (<100 µg/l)		42.6		



Prevalence of micronutrient deficiencies and nutritional status of mothers by agro-ecological zone in Ethiopia

<i>Variables</i>	Lowland (%)	Midland (%)
Anaemia (post-harvest)	34.2	8.5
Anaemia (pre-harvest)	46.3	34.4
Iron deficiency	51.9	26.5
Low BMI <18.5 (kg/m ²) (post-harvest)	39.6	43.8
BMI <18.5 (kg/m ²) (pre-harvest)	52.8	56.7
Zinc deficiency	96.2	45.9
Urinary iodine deficient	45.2	39.8
Total goitre rate	36.5	33.7



Results continued



Prevalence of micronutrient deficiency and nutritional status of infants by agro-ecological zone in Ethiopia

<i>Variables</i>	Lowland (%)	Midland (%)
Anaemia	59.5	47.6
Stunting (post-harvest)	39.8	43.2
Stunting (pre-harvest)	44.9	47.6
Iron deficiency	46.3	42.5
Wasting/acute malnutrition	12.6	10.5
Zinc deficiency	73.2	61.2



Results continued

Iron, zinc and haemoglobin deficiencies in combination among lactating mothers and their infants in Ethiopia

<i>Variables</i>	Children (%)	Mothers (%)	χ^2	P-value
Deficient in all 3	23.5	19.9	17.03	<0.001
Deficient in 2	29.0	16.7	13.45	<0.001
Deficient in 1	35.8	48.1	2.1	0.15
Non-deficient	11.7	25.3	1.00	1.00



Results continued



Seasonal variation in nutritional status among mothers and their children 6-23 months in rural Ethiopia

<i>Variables</i>		Post-harvest	Pre-harvest	
Maternal	Anaemia	21.8	40.9	
	Low BMI (<18.5 kg/m ²)	41.7	54.7	
	MUAC (<22 cm)	43.1	55.2	
	WDDS	6.0	13.4	
Children	Stunting	39.8	47.7	
	Wasting	11.6	8.5	
	Underweight	26.9	30.8	
	IDDS	22.2	24.2	



Conclusions and Recommendations



- ❖ Undernutrition and micronutrient deficiencies affect both lactating mothers and their children. Interventions focusing on both these groups should be considered.
- ❖ The prevalence of undernutrition was clearly higher during the lean season (pre-harvest). Thus, interventions targeting season should be considered.
- ❖ Undernutrition was more severe in lowland zone. Intervention should take account of agro-ecological zone.
- ❖ Dietary diversity, including consumption of iron-rich foods and fruits and vegetables, was very low in these rural communities. Appropriate interventions should address these issues in both mothers and their children.





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- Kebele health extension workers





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Relationship between Agricultural Production Systems and Nutritional Status of Women and Children in Rural Ethiopia

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Introduction

- ❑ This presentation draws on research conducted by all three AgriDiet PhD students in Ethiopia
- ❑ Integrated analysis based on households surveyed in the nutrition sub-sample.
- ❑ Aims to integrate selected socio-economic and nutritional data gathered in the pre-harvest season from two different agro-ecological zones of rural Ethiopia.

Anaemia, WDDS and HFIAS are significantly affected by agro-ecological zone

Table 1: Indicators of maternal nutritional status by agro-ecological zone.

Variables	Overall	Zone		t-value (p-value)
		E Hararghe	SE Tigray	
Anaemia (%)	40.9	48.4	32.9	-3.06 (0.003)**
BMI <18.5kg/m ² (%)	53.7	50.6	57.0	1.72 (0.89)
MUAC <22 cm (%)	55.4	55.1	55.8	0.997 (0.321)
WDDS (less than 5 food groups, %)	85.6	72.3	100.0	2.17 (0.032)*
HFIAS Score (HH)	6.5	8.6	4.4	8. (0.000)***



IDDS is significantly affected by agro-ecological zone



Table 2: Indicators of child nutritional status by agro-ecological zone.

Variables	Overall (%)	Zone		t (p-value)
		E. Hararghe (%)	SE Tigray (%)	
Anaemia (Hbg <11g/dl)	55.6	57.4	53.5	-0.28 (0.78)
Stunting (HAZ<-2 Z score)	47.7	48.3	47.1	0.48 (0.63)
MUAC for age z score (<-2)	34.3	31.5	35.8	1.19 (0.24)
Infant DDS (<4 food groups)	74.0	52.1	97.7	3.7 (0.000)*





Mothers' DDS, age and non- food expenditure significantly influence prevalence of child stunting in pre-harvest season

Variables	Coefficients	S.E.	Sig.
Zone	-0.357	0.455	0.433
Education of mother	0.510	0.425	0.231
Cooperative membership	0.446	0.418	0.286
WDDS	1.281	0.553	0.021
Age of mother	-0.056	0.034	0.099
Cereal production	0.000	0.001	0.920
Non-food expenditure	0.00001	0.000	0.049
TLU	0.227	0.271	0.402
Income (ETB)	0.000	0.000	0.268
Land cultivated (ha)	0.495	1.142	0.665
Participation in food supplementation	0.064	0.339	0.850

Agricultural zone and cultivated land size significantly influence maternal haemoglobin level

Variables	Coeff.	Standard error	t	P values
<i>Zone</i>	<i>1.102</i>	<i>0.024</i>	<i>2.08</i>	<i>0.039</i>
Mother education	0.001	0.009	0.011	0.890
<i>Cultivated land size</i>	<i>0.013</i>	<i>0.006</i>	<i>2.13</i>	<i>0.034</i>
Non-farm income	-0.00002	0.000	-1.1	0.270
Farm income	0.0001	0.00	0.59	0.550
Age of mother	0.001	0.001	-1.59	0.130



Conclusions



- ❑ Anaemia, WDDS and HFIAS were significantly affected by agro-ecological zone
- ❑ Maternal anaemia was most prevalent in lowland agro-ecological zone
- ❑ Overall stunting of children in the study areas was 47.7% in the pre-harvest season
- ❑ Stunting in children increased as age of mother and WDDS decreased and non-food expenditure increased
- ❑ 74% of children and 85% of mothers in the study area had poor DDS



Thank you

