



Innovative Methods and Metrics for  
Agriculture and Nutrition Actions

# Milk consumption, nutrition and health in southern Ethiopia

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# Introduction

- ✓ Animal Source Foods (ASFs) are rich in energy, proteins and essential micronutrients that contribute to:  
growth, health, cognitive functioning of children (Neumann et al. 2003)
- ✓ Milk is the major ASFs for pastoral system that substantially contributes to child nutrition
- ✓ Pastoralists have a limited access to diverse food sources and thus mainly dependent on milk intake(Villa et al. 2011).



# Introduction...

- ✓ Though milk is a universal food item of pastoralists, its consumption has declined over time and subjected to season variations (Megersa et al. 2014).
  - ✓ Reduce milk consumption in such dietary transition have shown negative effects on children's dietary outcomes (Fratkin et al. 2004; Ekpo et al. 2008).
1. This study explores the contribution of milk consumptions to nutritional outcome of study children
  2. **Assess the suitability of the conventional dietary intake measurements for pastoral contexts.**



# Study Methods

- ✓ The study was conducted in Borana, southern Ethiopia from August 2015 to March 2016 (Fig1).
- ✓ The area is characterized by: **arid and semi-arid areas**  
**Pastoral/Agro-pastoral system**
- ✓ Cluster sampling method was used to select six pastoral associations (clusters)
- ✓ A total of 538 children (6 to 59 months) were sampled from 406 households.

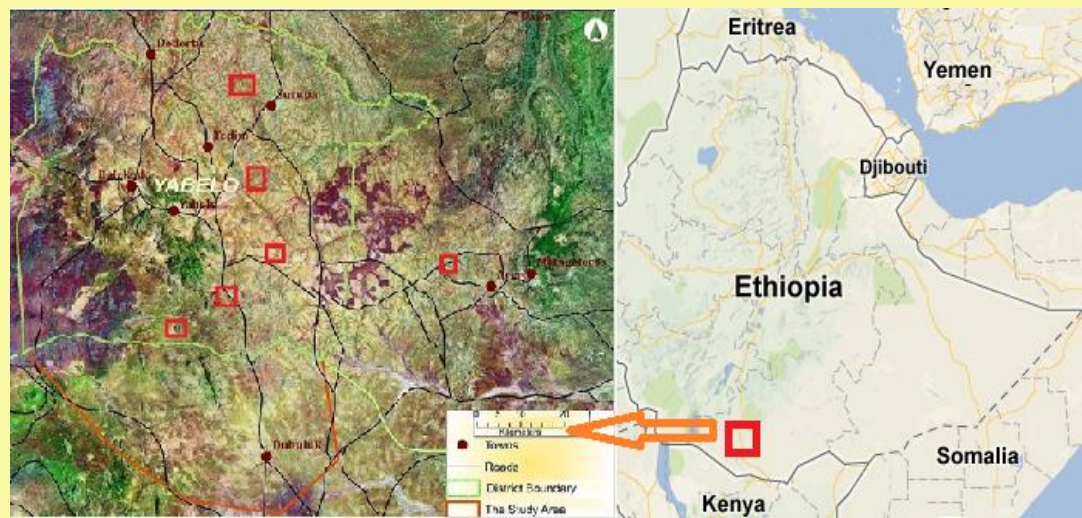


Figure 1. Map of the study sites in Borana, southern Ethiopia



# Methods...

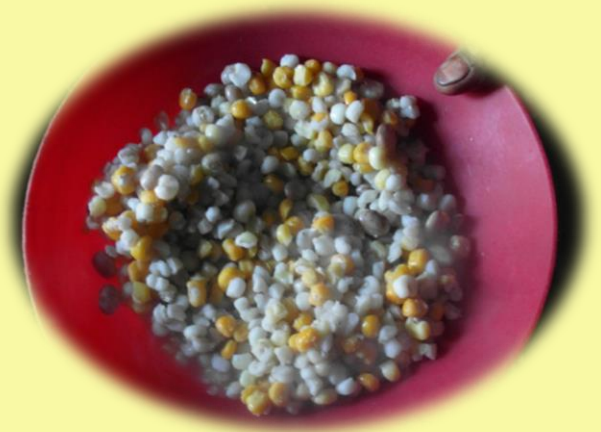
- (1) Questionnaire survey (socioeconomic variables, perceptions),
  - (2) Dietary intake (diversity, frequency, amount), and
  - (3) Anthropometric measurements (weight, height).
- ✓ Dietary diversity data were collected according to the seven food groups of the WHO guidelines (WHO 2008).
  - ✓ Repeated data on dietary intake (60 HH from Sep 2015 to March 2016), and market prices of milk, beans and maize were collected from July 2015 to March 2016.



# Methods...

## Data analysis:

- ✓ Mainly descriptive methods
- ✓ Dietary intake indicators (dietary diversity, meal frequency, milk frequency) were converted to terciles
- ✓ The indicators were then analysed for their effects on anthropometric measurements using GLM
- ✓ While logit model was used to test the effects of dietary intake on health outcomes.

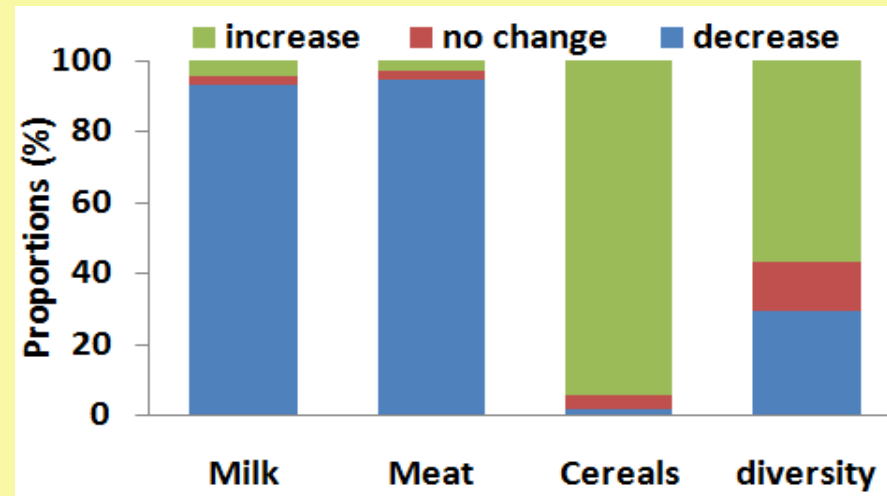


# Results...

## Trends in dietary intake

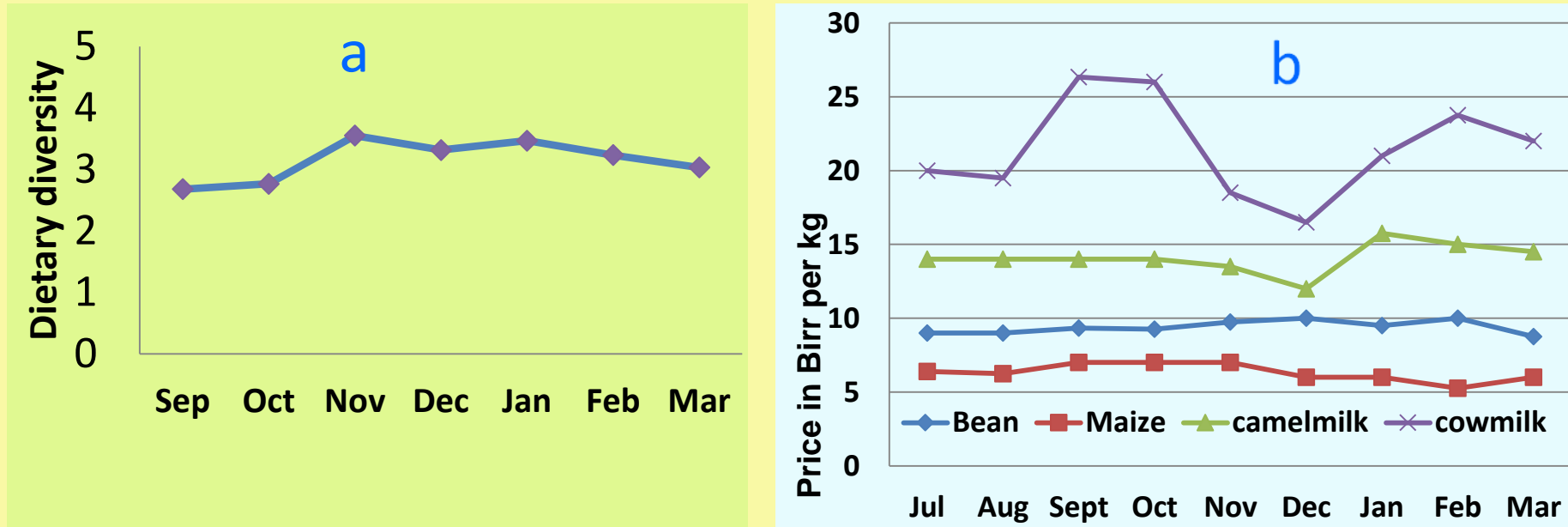
Mothers have perceived decreasing trends of animal source food consumption and viceversa for cereals, had negative effects on child growth and health outcomes

Fig2. Perceived trends of dietary intake by children in Borana



✓ But emperical data showed milk consumption is still higher than cereal based foods (i.e. frequency of 4.3 vs. 2.6 for milk & cereals),

# Results....



**Fig 3. Fluctuation of dietary intake among 60 children (a), market prices of milk and food crops in Birr per kg of food items (b)**

- Fig 3. suggests that dietary intake vary overtime and be affected by fluctuation of household level food availability and market prices.



# Results...

- ✓ Milk constitutes a significant share of the diet requirements of pastoral children
- ✓ Large proportion of the milk (71%) consumed comes from cattle and camel contributed 28%

Table 1: Overall nutrient contents of milk consumed by children (750 g)

Age groups	Energy kcal	Protein g	Vit A µg	Vit B1 mg	Vit B2 mg	Vit B6 mg	Vit C mg	Calcium mg	Iron mg	Zinc mg
6-23m	484.52	24	344.12	0.25	1.23	0.39	7.02	864.53	0.62	2.91
%	56%	100%	86%	50%	25%	78%	23%	100%	10%	72%
24-59m	483.85	24.3	292.53	0.2	1.21	0.35	6.74	879.09	0.51	2.9
%	40%	100%	73%	33%	20%	58%	22%	100%	7%	58%

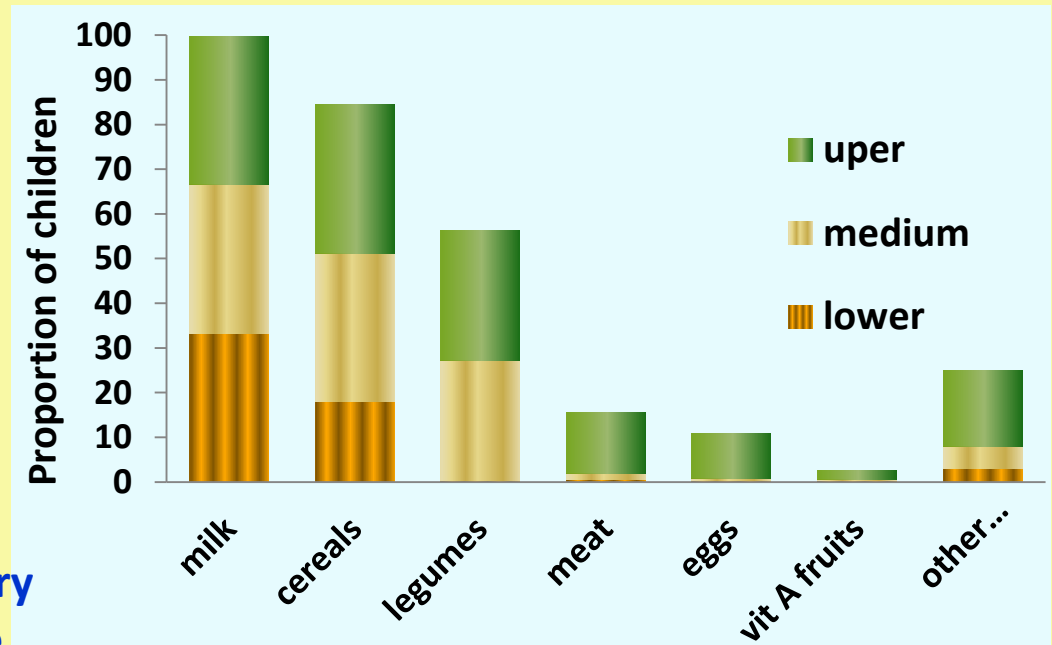
\*Percercetages were calculated according to WHO daily recommendation

**Milk intake contributed to higher percent of recommended diet for protein, calcium and Vit A**

# Results...

- ❖ Dietary diversity is very low (2.66) and highly variable (CV: 33%) with milk and cereal consumption predominating the dietary intake (fig 2) as also reported by Villa et al. (2011).

Fig3. Proportions of dietary diversity by tercils of food groups



Consumption of other ASFs such as meat (7.4%) and eggs (4.5%) were very low, though egg is relatively available



# Results ...

- ✓ Except for milk (90.5%), only some children attained minimum acceptable diet (5%), minimum dietary diversity (8%), minimum meal frequency (31.2%) of the WHO (Fig 4).
- ✓ This implies shortcoming of dietary diversity as measurement of dietary intake for pastoral areas.

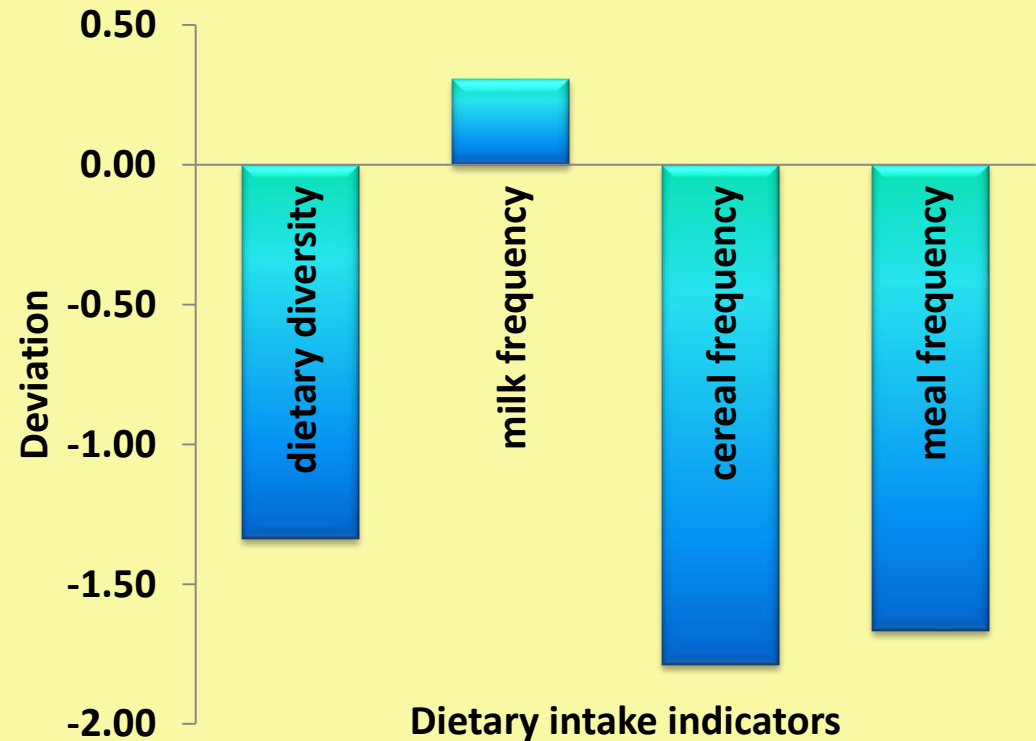


Fig5. Deviation of dietary indicators from minimum standards of WHO

# Results...

Table 2: Prevalence of malnutrition by sex group (n=538)

Indicators	Global	Moderate	Severe
<b>Acute malnutrition</b>	<-2 z-score	-3 to -2 z-score	<-3 z-score
<b>Boys</b>	<b>11.2</b>	<b>8.9</b>	<b>2.2</b>
<b>Girls</b>	<b>8.6</b>	<b>6.4</b>	<b>2.3</b>
<b>Total</b>	<b>9.9</b>	<b>7.7</b>	<b>2.2</b>
<b>Underweight</b>			
<b>Boys</b>	<b>30.9</b>	<b>23.4</b>	<b>7.4</b>
<b>Girls</b>	<b>25.8</b>	<b>18.4</b>	<b>7.5</b>
<b>Total</b>	<b>28.4</b>	<b>20.9</b>	<b>7.5</b>
<b>Stunting</b>			
<b>Boys</b>	<b>43.4</b>	<b>28.7</b>	<b>14.7</b>
<b>Girls</b>	<b>38.8</b>	<b>25.8</b>	<b>13.1</b>
<b>Total</b>	<b>41.1</b>	<b>27.2</b>	<b>13.9</b>

- The result is comparable to the national level figure of 44% stunting, 29% underweight among under-five children (EDHS 2011).
- Malnutrition was assumed to be lower in pastoral areas due to better access to animal source food



# Results...

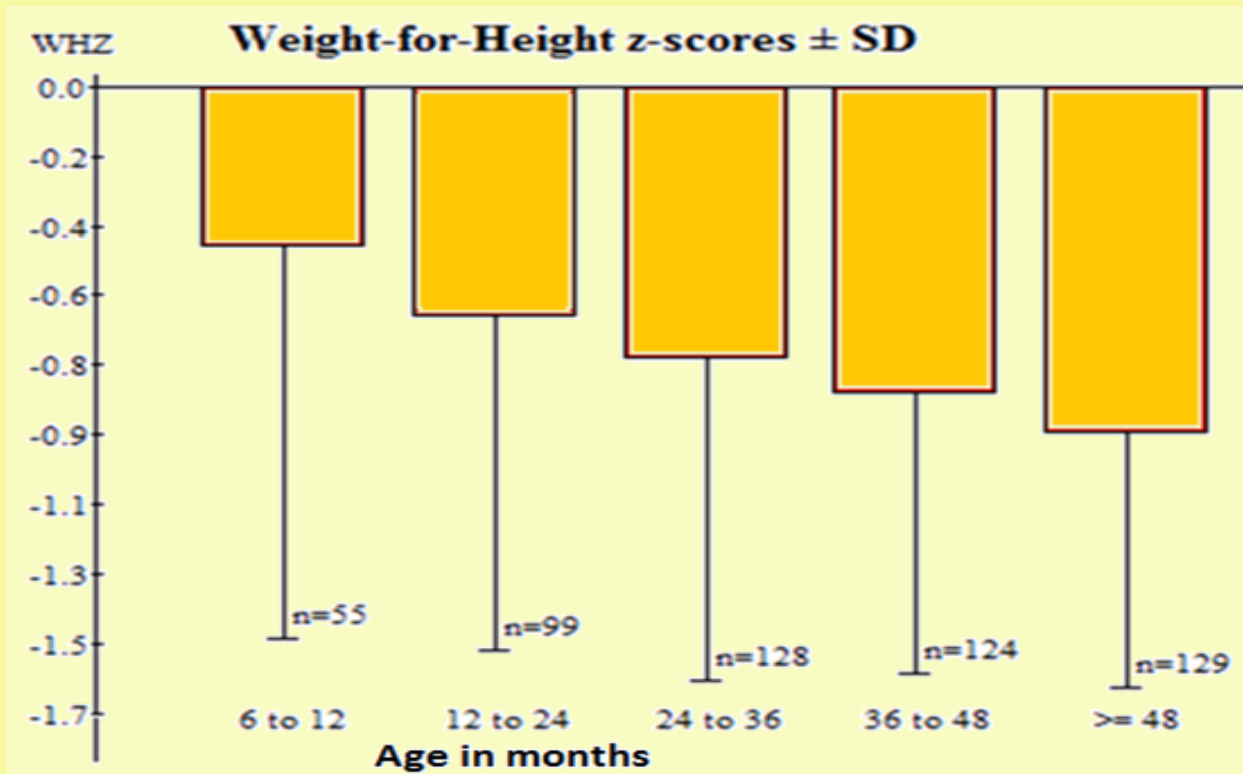


Fig6 distribution of weight for height Z-score by age groups

✓ Malnutrition showed an increasing trend with age

# Results...

Table 3. Effects of dietary indicators on nutrition outcome of children

Indicators age in months	waz		haz		whz	
	6 - 23	24 - 59	6 - 23	24 - 59	6 - 23	24 - 59
<b>DDS tertiles:</b> 1(ref)						
2	0.04	0.25*	-0.17	0.45*	0.15	-0.01
3	0.25	0.63*	-0.10	0.74*	0.43	0.29
<b>Meal tertiles:</b> 1(ref)						
2	0.10	-0.02	-0.44	0.22	0.49	-0.20
3	0.27	0.22	-0.54	0.63*	0.76	-0.12
<b>Milk tertile</b> 1(ref)						
2	0.37*	0.06	0.14	0.11	0.41*	-0.04
3	0.57*	0.57*	0.16	0.58*	0.66	0.36*
<b>Age in months**</b>	-0.03*	-0.02*	-0.02*	-0.02	-0.02*	-0.01

- Increased dietary intake had positive association with anthropometric measurements, particularly for those above two years

# Results...

Illness cases have been reported from 51% of the children, out which diarrhea and respiratory infections were 27.9% & 21%.

Table 4. Effects of dietary indicators on health outcome of children

Variables	Illness		Diarrhea		Pneumonia	
	6 - 23 m	24 - 59 m	6 - 23 m	24 - 59 m	6 - 23 m	24 - 59 m
<b>DDS tertiles: 1(ref)</b>						
2	0.53	0.27	0.35	0.03	-0.25	0.31
3	0.77	0.37	-0.73	0.50	-1.74	0.77
<b>Meal tertiles: 1(ref)</b>						
2	0.22	-1.12*	0.14	0.16	0.10	0.30
3	-0.35	-1.39*	0.56	-1.72	0.25	-0.25
<b>Milk tertile: 1(ref)</b>						
2	-0.10	0.22	0.29	0.01	-0.30	-0.04
3	0.21	0.11	1.13	-0.18	0.52	-0.70
<b>Age in months</b>	<b>-0.02</b>	<b>-0.01</b>	<b>0.01</b>	<b>-0.01</b>	<b>-0.01</b>	<b>0.00</b>

- There is little evidence regarding the effects of dietary indicators on health of children, But there is negative association of dietary intake and illness occurrences

# Results...

Table 5 Factors affecting minimum standards of dietary indicators (dummy)

Variables	DDS		Milk freq		Meal freq	
	6 - 23 m	24 - 59	6 - 23 m	24 - 59	6 - 23 m	24 - 59
Ethnics (Gabra)*	-0.966	<b>-1.052</b>	0.743	<b>-1.565</b>	<b>6.169</b>	<b>2.601</b>
age of mother (year)	-0.164	-0.020	0.057	0.010	-0.155	-0.024
Father literacy (yes)*	1.126	0.292	-0.965	0.281	3.134	<b>-1.980</b>
polygamous family (yes)*	-0.252	<b>-2.419</b>	-1.043	<b>-1.125</b>	1.281	0.524
family size	0.499	0.122	0.103	-0.002	0.173	-0.028
sex of child (female)*	-0.316	-0.059	-0.023	-0.035	2.215	-0.417
age of child (month)	0.106	-0.024	0.034	<b>-0.054</b>	0.221	<b>0.041</b>
livestock in TLU	0.323	<b>0.271</b>	0.070	<b>0.262</b>	-0.111	0.021
house in town (yes)*	1.255	0.199	0.348	0.208	-0.165	0.248
possess radio (yes)*	0.760	-0.012	-0.246	-0.095	-1.447	0.679
crop cultivation (yes)*	-0.378	-0.623	0.112	<b>1.019</b>	-0.856	-0.626
off-farm income*	-0.357	<b>1.359</b>	-0.116	0.475	-0.189	<b>1.887</b>
travel time to town (hr)	-0.232	0.750	0.160	0.432	2.223	<b>-1.082</b>

\* Dummy variables, coefficients with red fonts are significant



# Conclusion so far

- ✓ Malnutrition is widely prevalent and comparable to the national level figure
- ✓ There is evidence that dietary intake indicators had positive effects on nutrition outcome of children but not on health indicators.
- ✓ The study showed an optimum milk consumption frequency and low level of dietary diversity (8% met minimum requirements), which signifies pitfall of dietary diversity

## **Furthers analyses.**

- ✓ Modeling combination of milk and meal frequency with DDS that predicted the optimum recommended percent,

THANK YOU