

Agricultural research and nutrition: what we know and don't know

Lindsay H. Allen

USDA, ARS

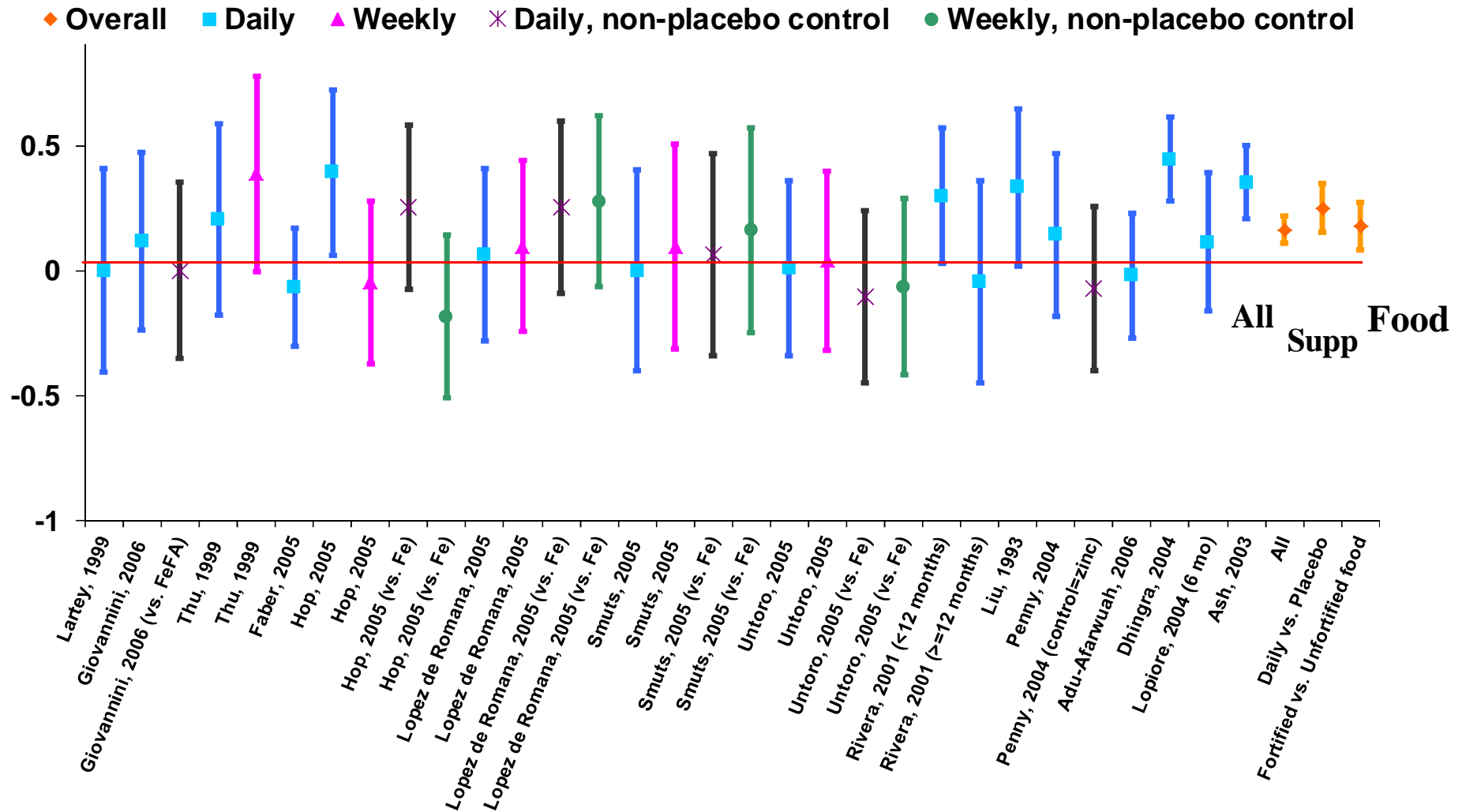
Western Human Nutrition Research Center

Davis, CA

Masset: nutrition outcomes

- Change in intake –
 - in 13/19 was ↑ intake of targeted food,
 - but few measures of total daily nutrient intake.
 - diet diversity is poor measure – need quantity.
- Anthropometry
 - very little effect of most foods; need 5000 to detect 10% ↓ in stunting or underweight (i.e. not sensitive outcome). True for supplements.
- Nutritional status
 - only effect on serum retinol (4/9 studies).
 - no effect iron intake; Zn not measurable.
 - there are few MN-rich foods.

MMN: effect sizes for change in growth (by age)

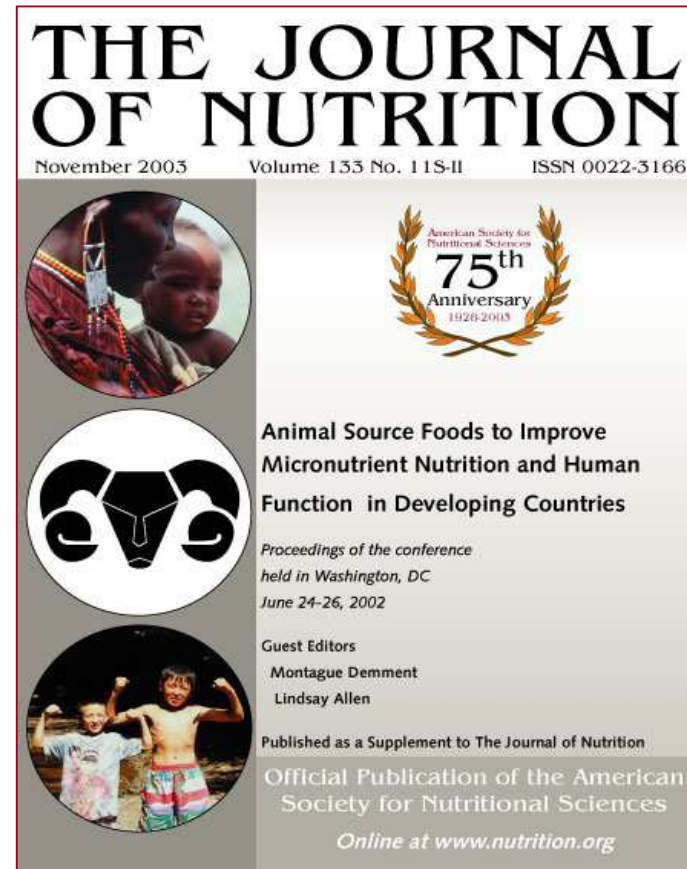


Olney, Pearson & Allen, 2009

Animal source foods do improve
child growth and development!

Milk vs. meat intervention trial in schoolers, Embu, Kenya (n=554, 2 years)

30% stunting, famines, low ASF, 30-90% prevalence various deficiencies

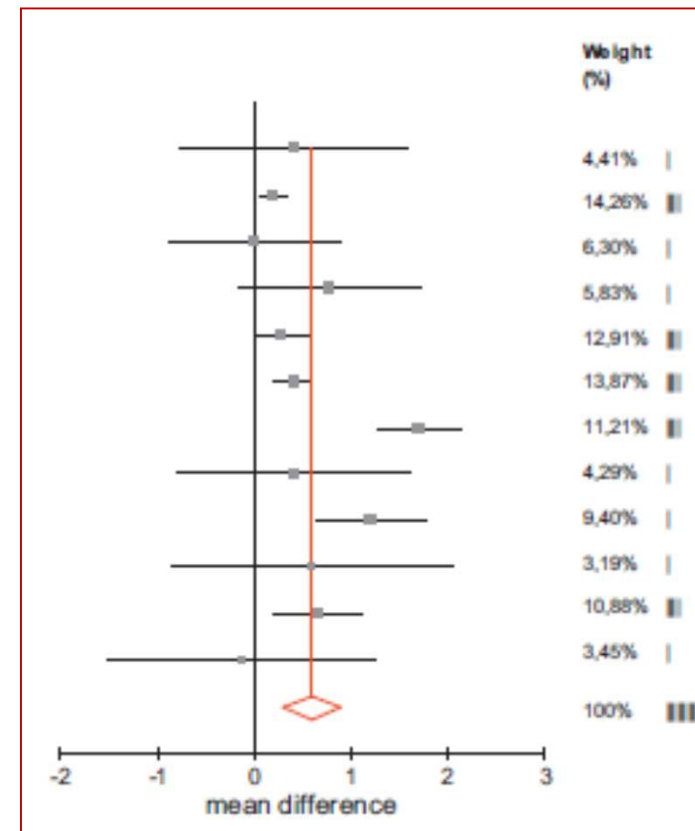


Outcomes in ASF intervention groups vs. controls

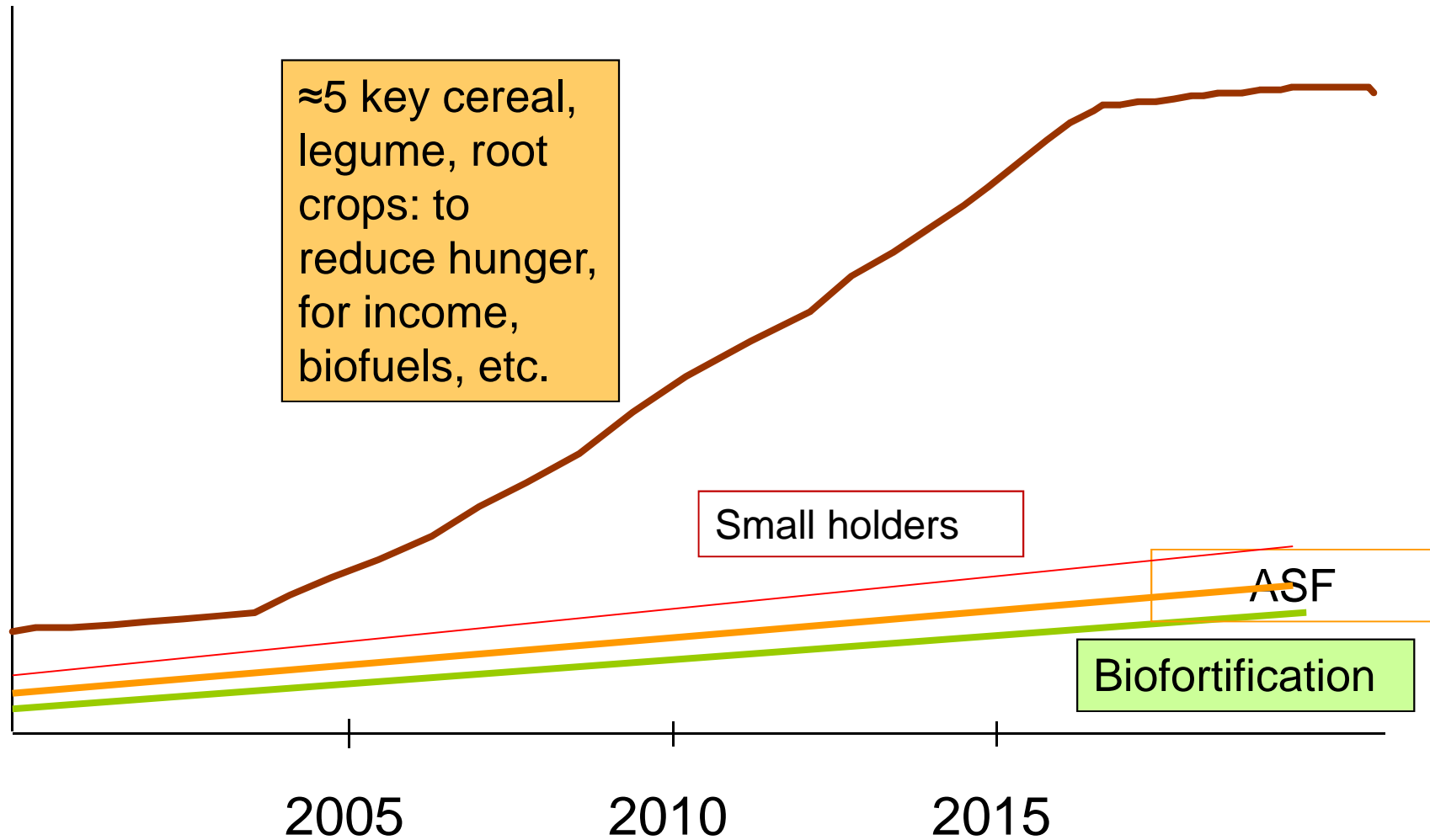
- **Meat supplementation (60-80 g/d) improved:**
 - cognitive performance (Raven's, math)
 - school test scores
 - physical activity
 - initiative and leadership behaviors
 - arm muscle mass (due to higher activity?)
- **Milk supplementation (1 cup/d) improved:**
 - linear growth of stunted children
- **Milk or meat supplementation improved:**
 - vitamin B-12 status

Meta-analysis of dairy products and physical stature (de Beer et al., 2012)

- ❑ 12 studies, $n \cong 3500$.
- ❑ 7 countries/regions (including wealthier).
- ❑ Mix RCTs (recent) + observational.
- ❑ **+750 mL milk \rightarrow 0.4 cm \uparrow height.**

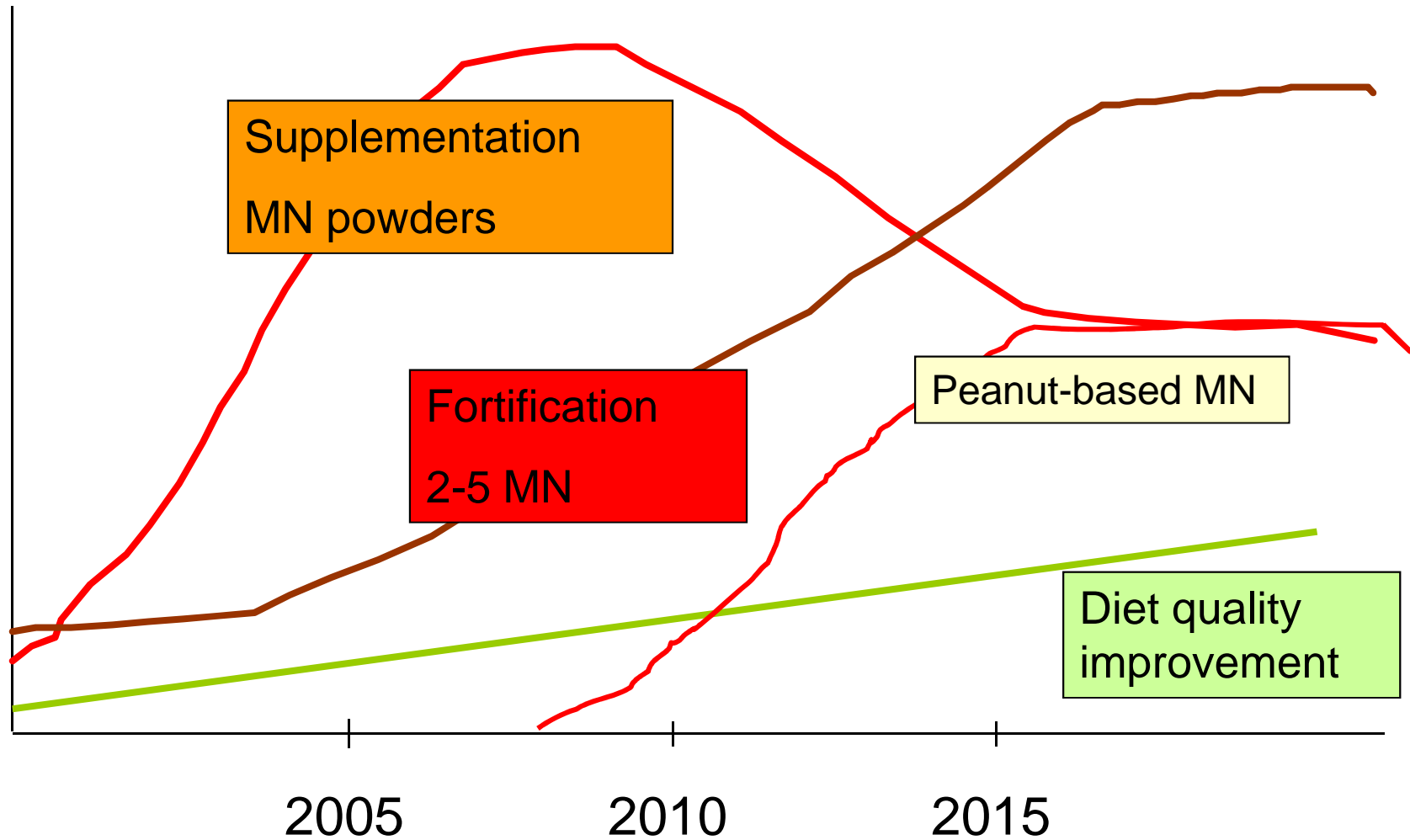


The agricultural community's approach to improving nutrition



The nutrition community's approach?

"Complementary" micronutrient interventions

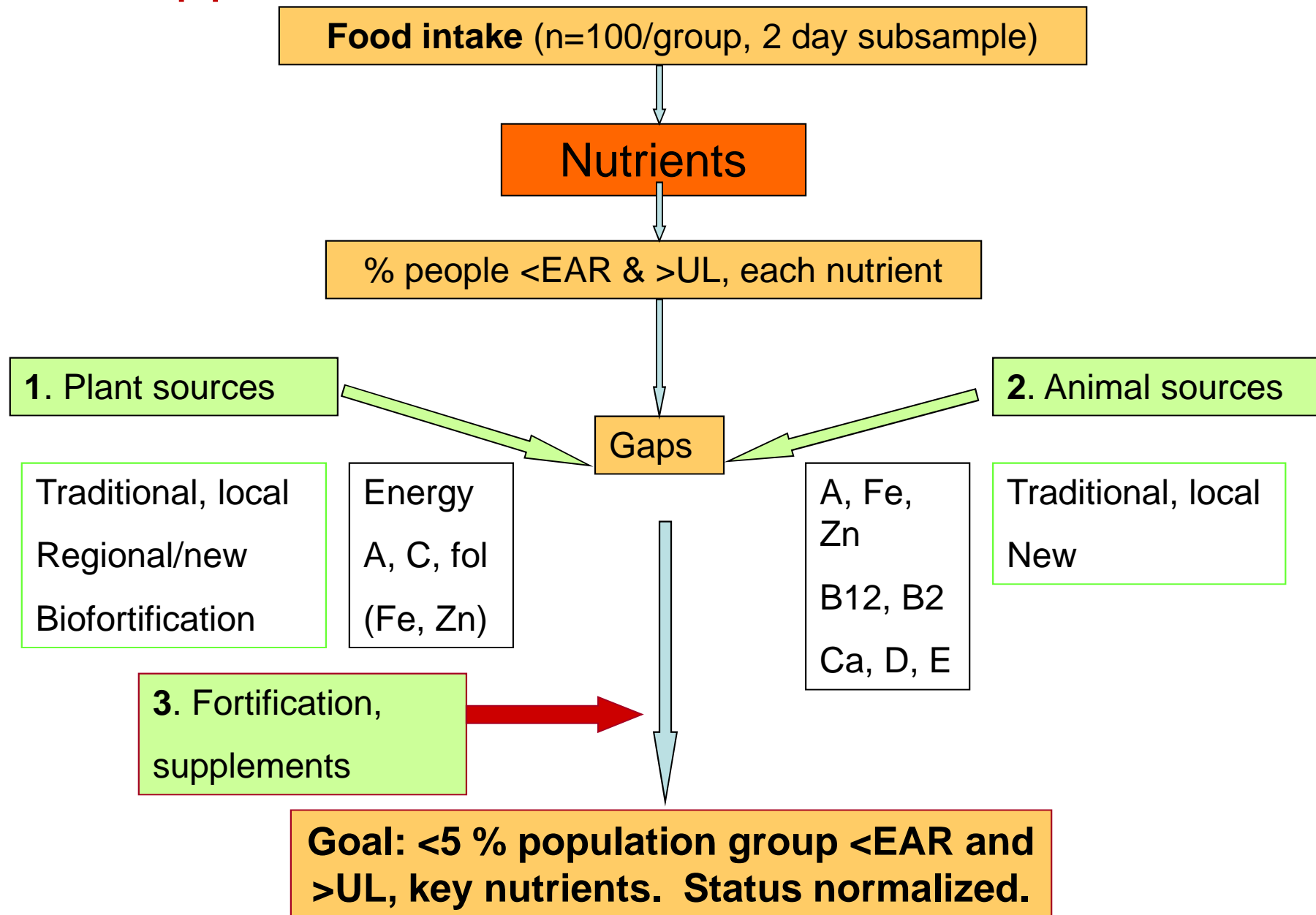


Current micronutrient policies and strategies

Preg-nancy	Lact-ation	0-6 mo	6 mo-5 y	Women, children
Fe + folic acid		Breast milk	Vit. A capsules, Fe. “Nutrient dense HH foods” MMN (powders, lipid-based, fortified complementary food)*	Fe if anemic Staples fortified with Fe, A, Zn, folic acid, B12 Biofortification with A, Fe, Zn*

* Not official WHO policy

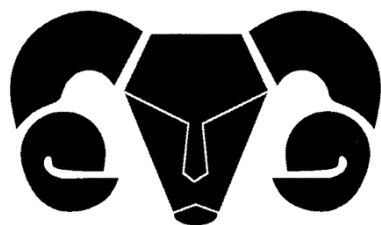
Coordinate agriculture, fortification and supplementation to meet nutrient needs



Planning agriculture for nutritional needs

1. The ENAM project in Ghana

Enhancing child **N**utrition through **A**nimal source food **M**anagement



USAID

WID

Univ. Ghana

Iowa State

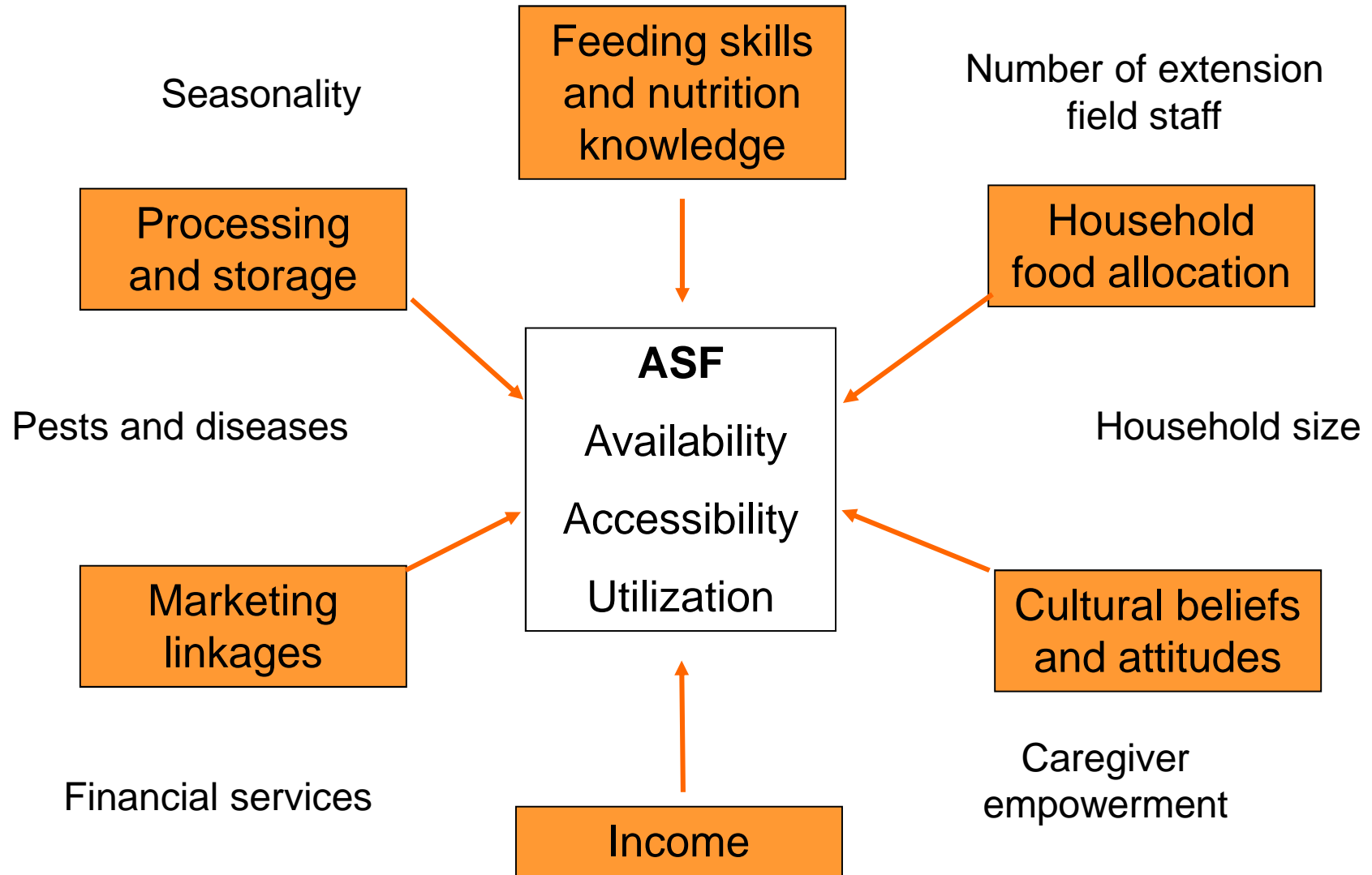
McGill



2 Intervention
+
2 Control
communities
per zone



Phase 1: developed problem model for key constraints on ASF (interviews, focus groups, workshops).



ENAM phase 2: Interventions to improve food security and use of ASF for children



**Microcredit loans & savings
\$50**
(fish smoking and sales,
poultry and eggs, sale of
yams and cooked foods)

**Nutrition
education**



**Weekly
meetings**

**Entrepreneurship
education**



Results

In intervention vs control or non-participant households:

- 50% reduction in food insecurity previous month.
- 0.12 Z increase in height, 0.26 Z increase in weight.
- Higher intake of protein (30%), calcium (50%), zinc (30%), iron (20%).

Example 2

Homestead production in Bangladesh “Diversifying into healthy diets”

Iannotti et al. 2010



- Helen Keller International
- Small-scale home gardens with MN-rich plants → small livestock, nutrition education.
- Scale-up implementation by >70 local NGOs, government.
 - Tripled veg. production, increased income
 - ↑ consumption of MN-rich foods
 - ↑ food security for 5 million, very sustainable

Additions: what we do don't know

- What strategies best to improve DQ of poor?
- How and why diets are changing with and across HH, countries? How to influence this.
- How effective longer-term ag. interventions are for improving nutrient status and growth vs. CD risk.
- Unintended effects on diet (food sold & purchased; earlier breastfeeding), BMI, water quality, food security and safety.
- How best to integrate MN interventions.

Additions: what we do know

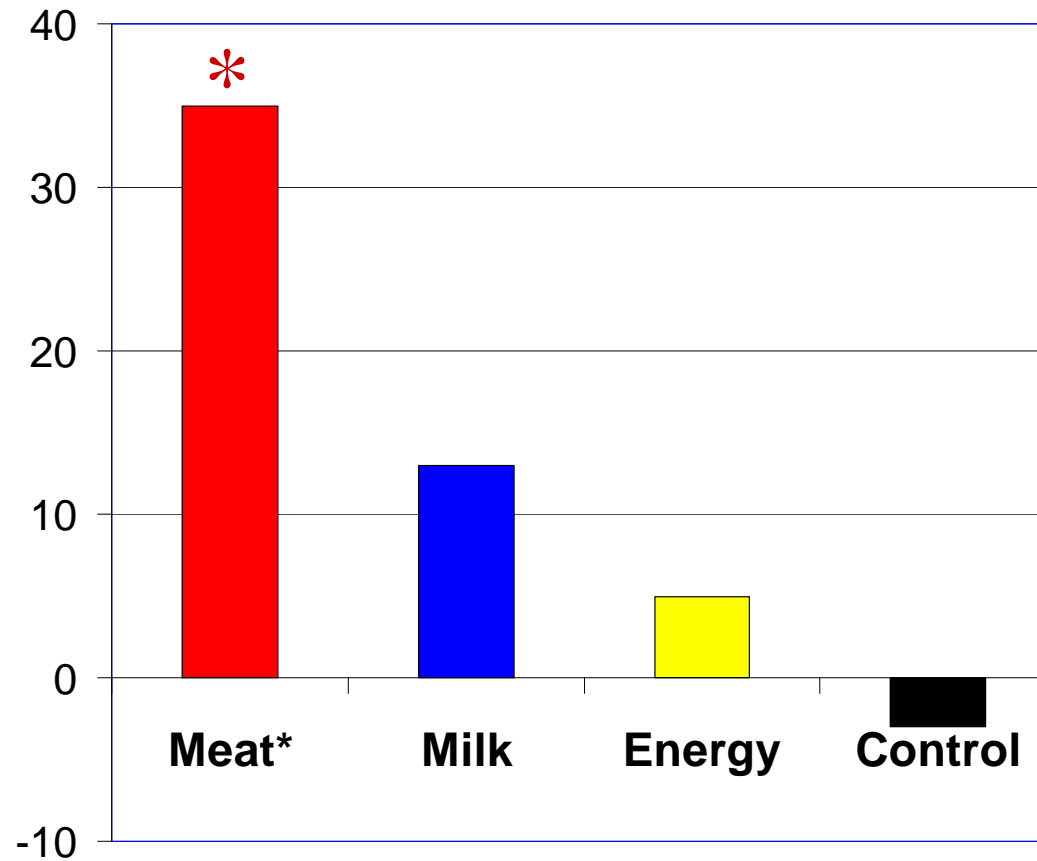
- Few interventions \uparrow growth directly; ASF, MILK.
- Growth is an insensitive outcome.
- Anemia also insensitive status outcome (use breast milk MN? Serum B12? Match to intervention.
- Ag. should impact whole household, not focus on only pregnancy, young children.
- Ag. interventions should be planned to meet nutrient gaps. If not, little effect will be seen.
- Impact on whole diet should be well measured, for several HH members.
- IMPORTANT: Education, behavior change, micro-credit, women, local practices.....

Thank you

Animal and plant foods provide different nutrients
(relative amount/100g)

	Cereal	Leg-umes	Veg	Fruit	MFP	Eggs	Dairy
Prot	+	++	+		+++	++	++
A			(++)	(++)	+	+++	++
Fe	(+)	+ (soy)			+++	+	
Zn	(+)	+			+++	+	+
B12					++	++	+++
Ribo	+		(+)	(+)		++	+++
Fol		+++	(++)	(++)		+	+++
D					+	+	

Change in end of term test scores



MEAT group improved most