

***Communication,  
Western Attitude,  
Intercultural Competency  
(Where are the hotspots?)***

***Florence V. Dunkel***

***Department of Plant Science and Plant Pathology  
Montana State University-Bozeman***



Dull Knife

# ***Northern Cheyenne People***



**one of 564 federally acknowledged tribes in  
contiguous 48 US states and Alaska**

**25-50%  
tribes with  
history of  
edible  
insects**



# Sanambele, Mali



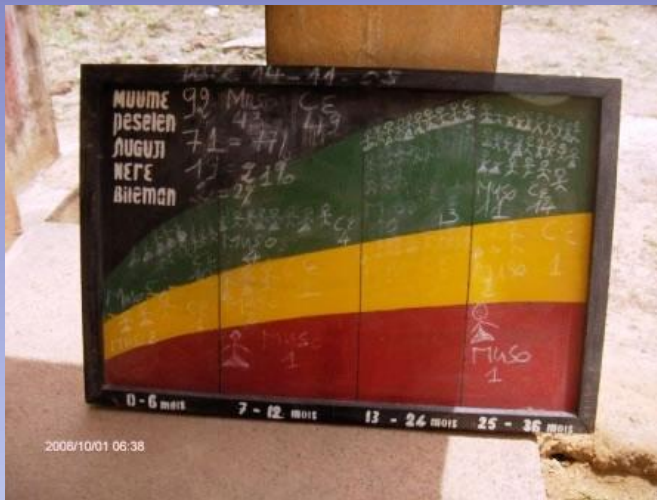
Map Source: Jamie Robertson, in Luong, Dunkel, Coulibaly, Beckage. *Journal of Medical Entomology*. In review.



- Kwashiorkor, protein, energy malnutrition causing mental/physical stunting



- Nationally, 40% of Malian children were Found with or at-risk for Kwashiorkor



# Kwashiorkor

## Sanambele, Mali

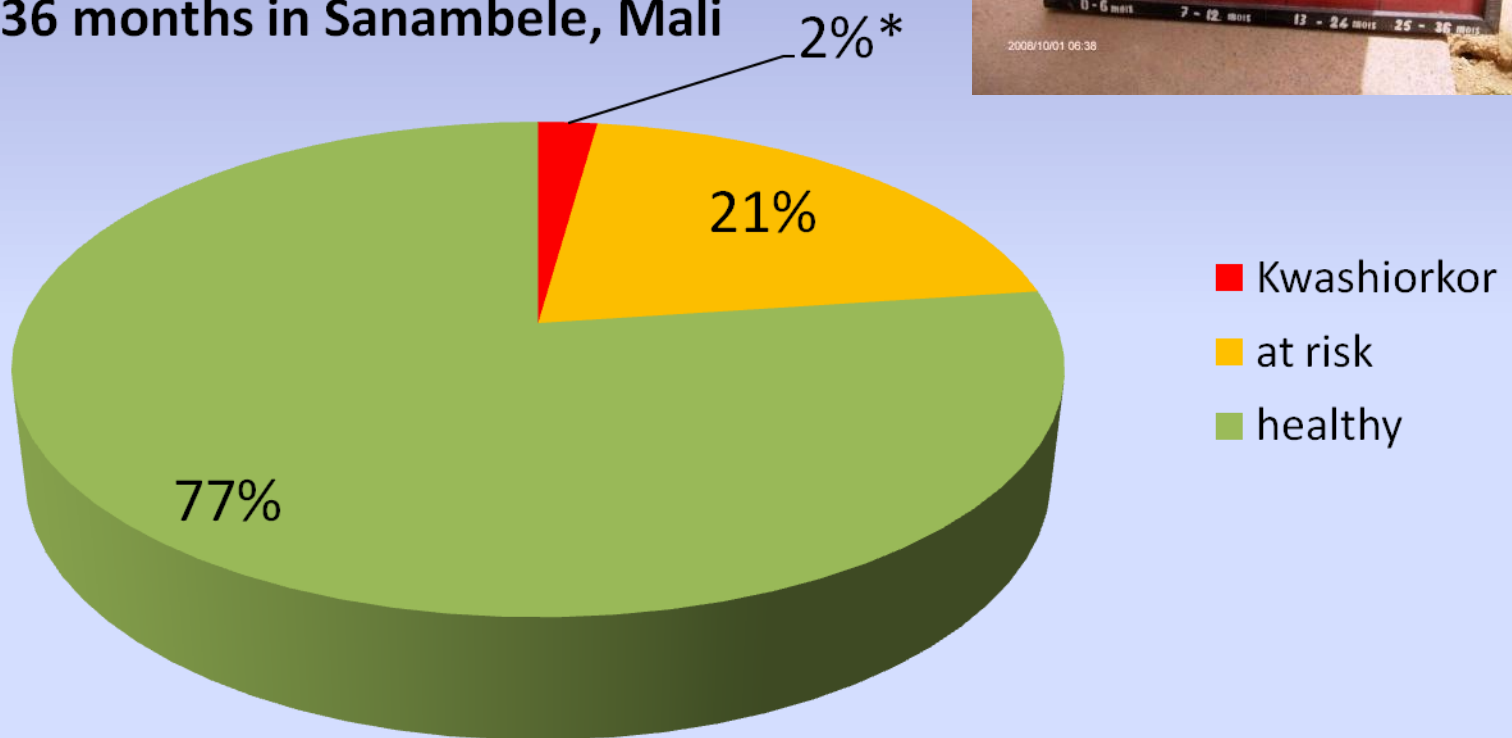


### “Hunger” History

- 2008 23% of young children, 0 to 36 month old with Kwashiorkor or in risk category (mean for Mali is 40%)  
(Source: Sanambele Health Center records)
- 2008 Village women/village midwife develop recovery diet for children at risk
- 2008-2011 Montana State AGSC (PSPP) 465R students and mentors learn about diet and kwashiorkor and try out models to teach about essential amino acids and crops

# Health Statistics

Health Statistics of children ages  
0-36 months in Sanambele, Mali



\*These cases recovered. No deaths due to Kwashiorkor in 2009



# What Kids eat in Sanambele



- Millet, sorghum, corn tou
- Fish, wild birds
- Cashew fruit
- cowpeas
- Bambara groundnuts
- Grasshoppers



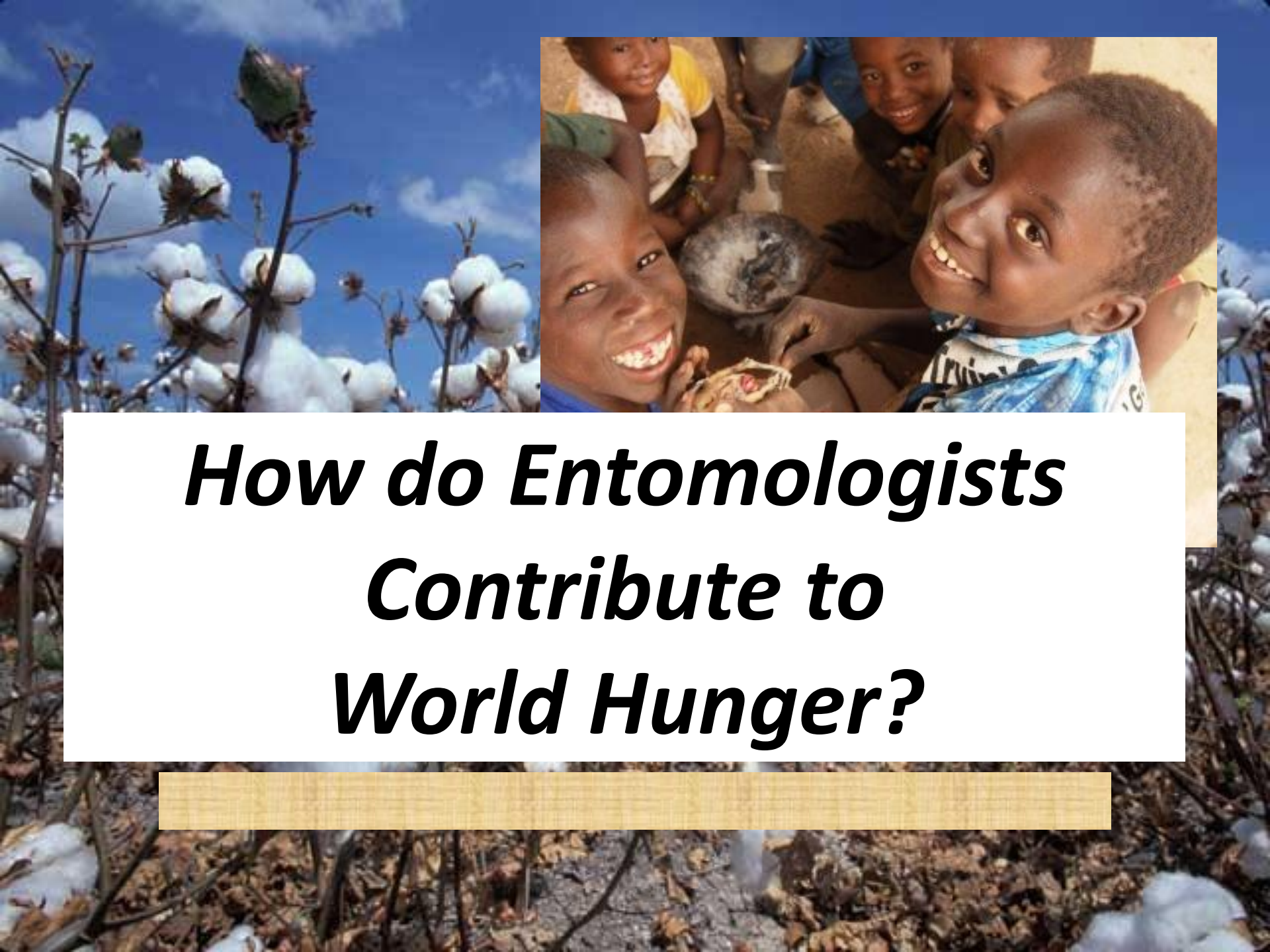
- Chicken entrails, knuckles
- Mangoes
- Oranges
- Peanuts
- Vegetable sauce



2009







***How do Entomologists  
Contribute to  
World Hunger?***

# Review of Essential Amino Acids



**A story is too difficult, this time. We opted for a model.**



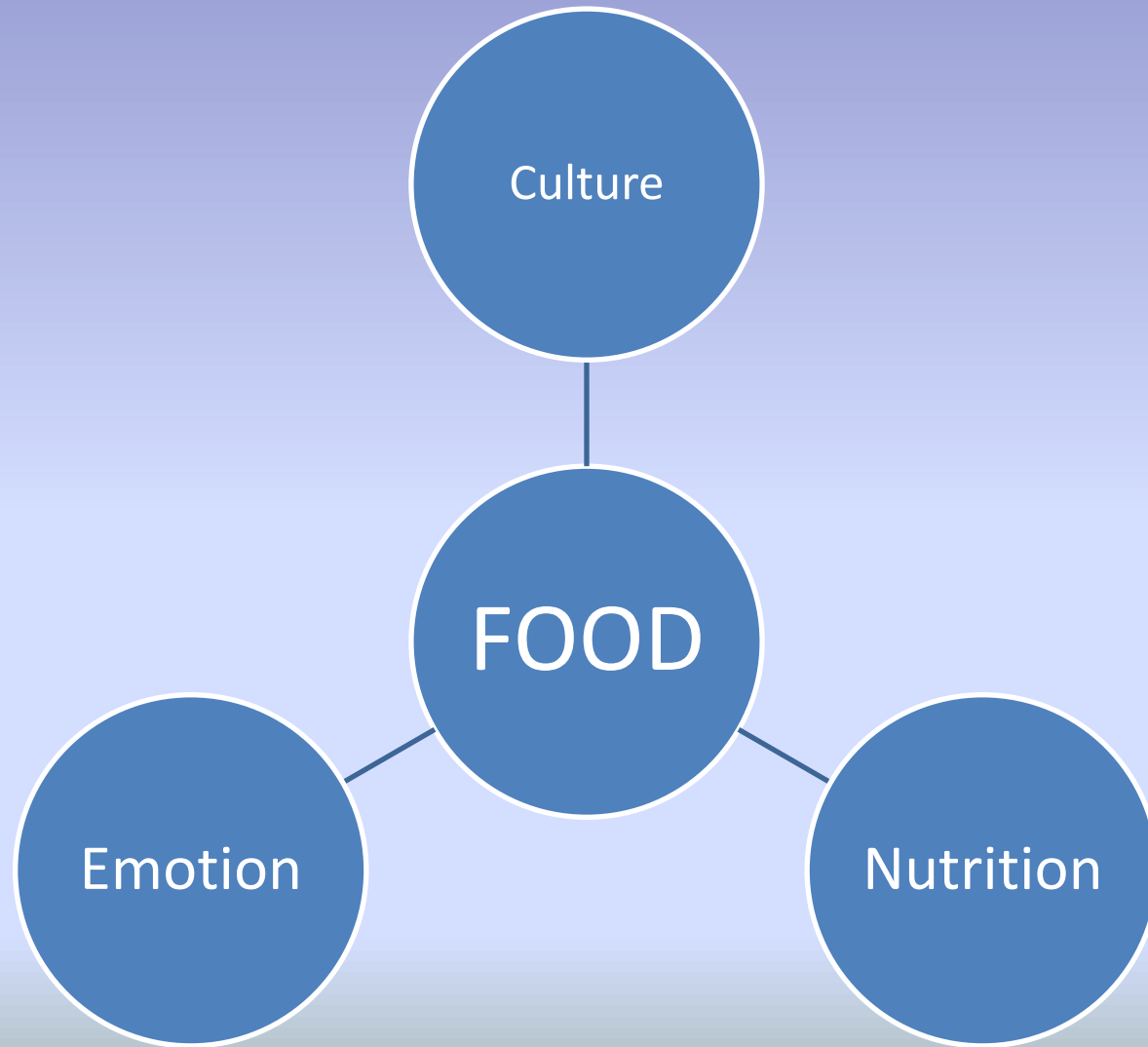
# What does it mean to be culturally competent?

Denial  
Defense  
Minimization  
Reversal  
Acceptance  
Adaptation  
Integration





# The Food Complex



# ***The Stories***



2008/11/21 09:58





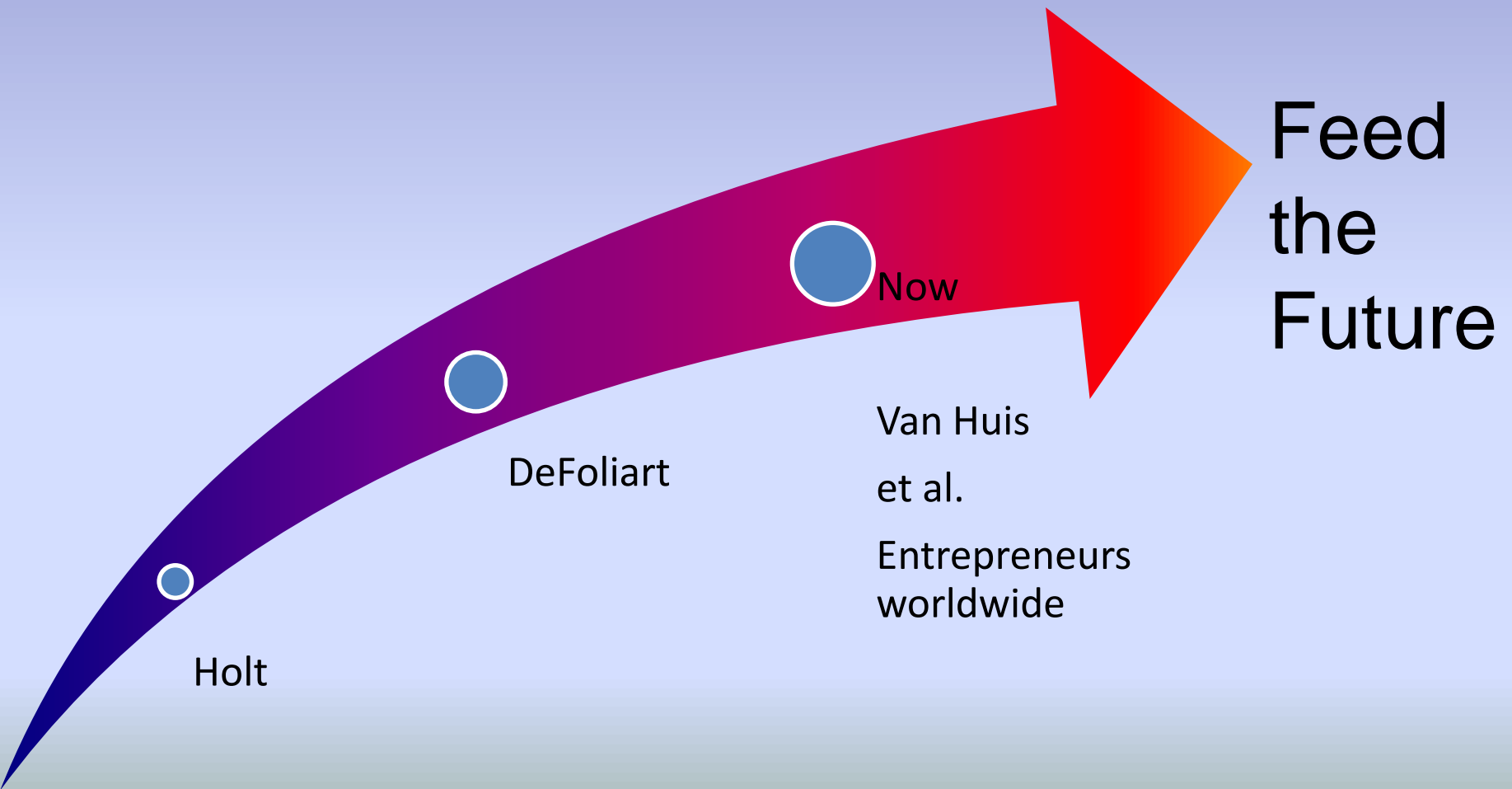
# The Ute People and Westerners



# The Ute People And Westerners



# Entomophagy Trajectory: Onward and Upward





# ***Montana State University- Bozeman***

## ***PSPP 465R Health, Poverty, Agriculture: Concepts and Action Research***

***BIOL 106CS***

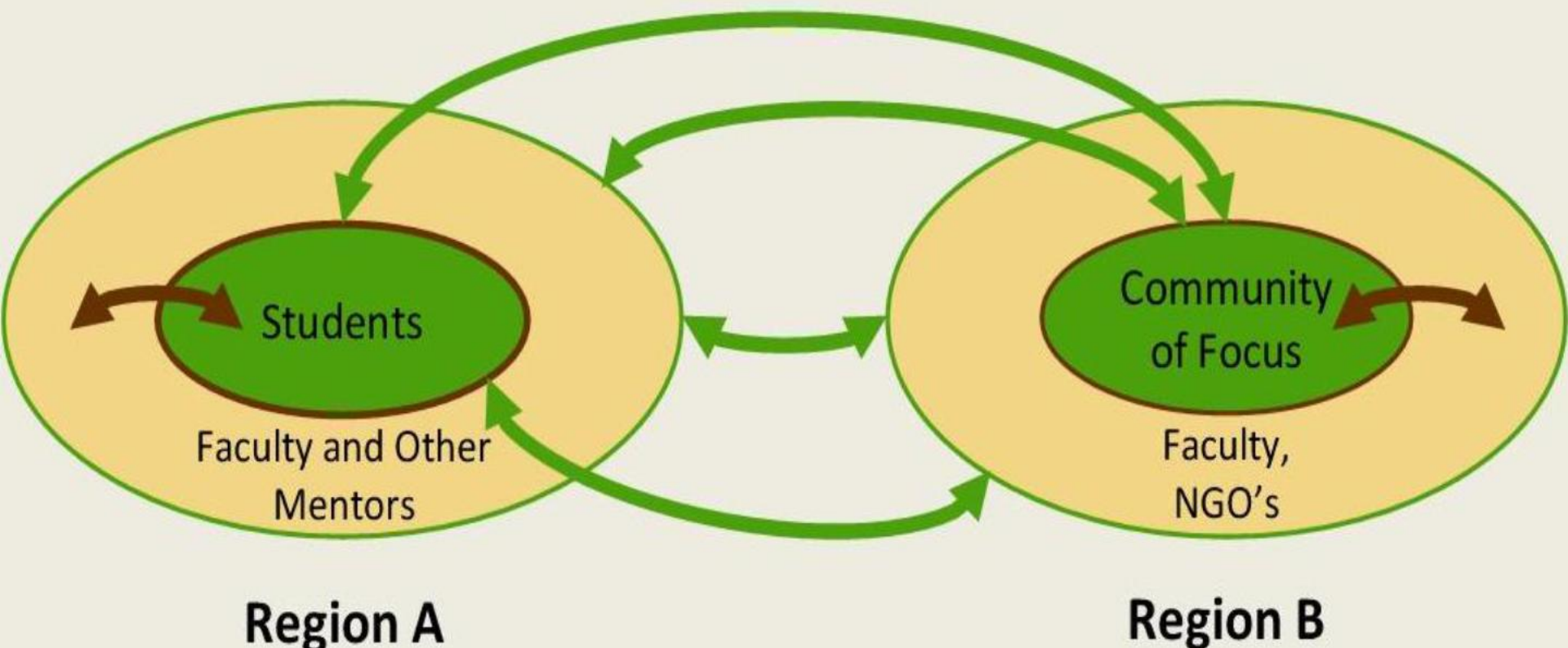
***Issues of Insects and Human Societies***



# Communities of Learning

## The Transformed Classroom

### In the in Expansive Collaboration Module





2009/05/20 12:08



Montana Fish, Wildlife, and Parks; Penny Landon, District Administrator, Carbon Conservation District (Carbon County, Montana) hosts 150 local students May 2009 for a day of earth-friendly fun.



Eager hands politely wait their turn to spear a waxmoth larvae and navigate the sauces (Below and left).



Students learn and practice the safe, easy steps in preparation, serving, and eating this appetizer. Students practice the fine motor skill of spearing a boiled larva and earn a tasty reward!

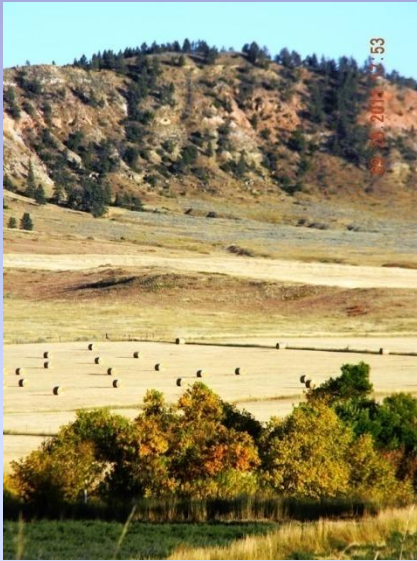


University students also learn preparation and serving skills. Everyone learns why





# Community Garden on Apsaalooke Reservation, Crow Agency





# *Melanoplus differentialis* attack on Apsaalooke Community Garden



# What's Next?

- Bait crops on perimeter of garden
- Parsley intercropping in garden
- Fresh and/or frozen hoppers for profit





# Sanambele Village Crops Supplying Tryptophan and/or Lysine, the essential amino acids missing in grain-based diet



But, what is  
their  
seasonal  
availability  
?





# Nutritional Facts

- Kwashiorkor (diet deficient in complete protein ← meat, eggs and dairy), can cause permanent damage
- Malian Diet consists of:  
millet, sorghum, rice, corn, tomatoes, carrots, peanuts and cowpeas  
→ incomplete protein by itself



# The New Paradigm

## Technological Knowledge

First Peoples'  
Scientists,  
Professors,  
Students



Government,  
Non-Government  
Organizations

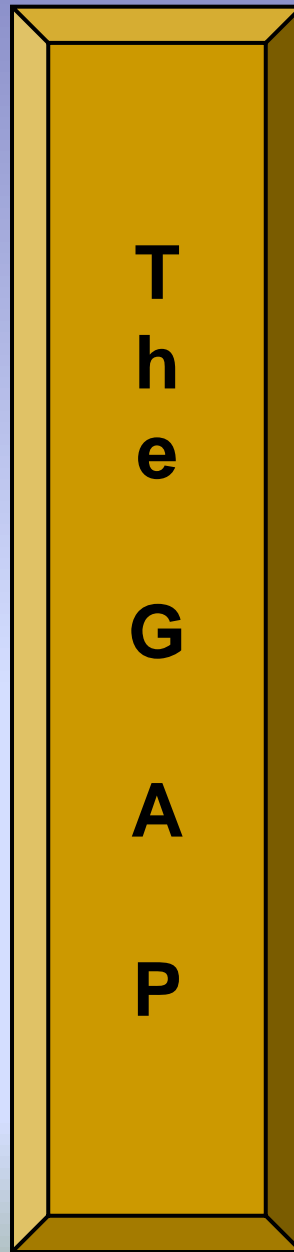


US  
Scientists,  
Professors,  
Students



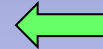
## Needs

- Appreciation for First Peoples' Knowledge, Wisdom, Traditional Ecological Knowledge
- Culture of Sharing, Respect for Elders, Conflict Resolution



## Wealth of Traditional Ecological Knowledge

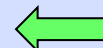
Montana  
Family Farmers



Malian  
Subsistence  
Farmers



Native  
Americans



## Needs

- Literacy
- Food Security
- Health Food Choices
- Potable Water
- Entrepreneurial Opportunities

## **Ways to Bridge The G A P**

**Stop, LISTEN to Subsistence Farmers, Other First Peoples  
Family Farmers**

**Use Participatory, Holistic Processes**

**Appreciate Cultural Values**

**Engage in First-People-Driven, Family Farmer Collaborative Research**





Savory and Butterfield 1999

**Plate 4.** *We now take the perspective of the whole (gray), first of all by defining the limit of a “manageable” whole, then determining what that whole must become based on the needs of the people within it and the environment that must sustain their endeavors (the holistic goal). Now the people making decisions within the whole can look outwardly at all available knowledge to determine which best serves their needs and takes them toward the holistic goal.*

# **Recommendations**

- 1. Encourage seriousness in media**
- 2. Respectful understanding; intercultural competency**
- 3. Content-rich textbooks**
- 4. Intertwine funding requests with conserving energy, environmental sustainability, health, budget**
- 5. Let your voice be heard in our governments, schools, professional organizations**
- 6. Organize to continue this trans-disciplinary forum begun by FAO.**





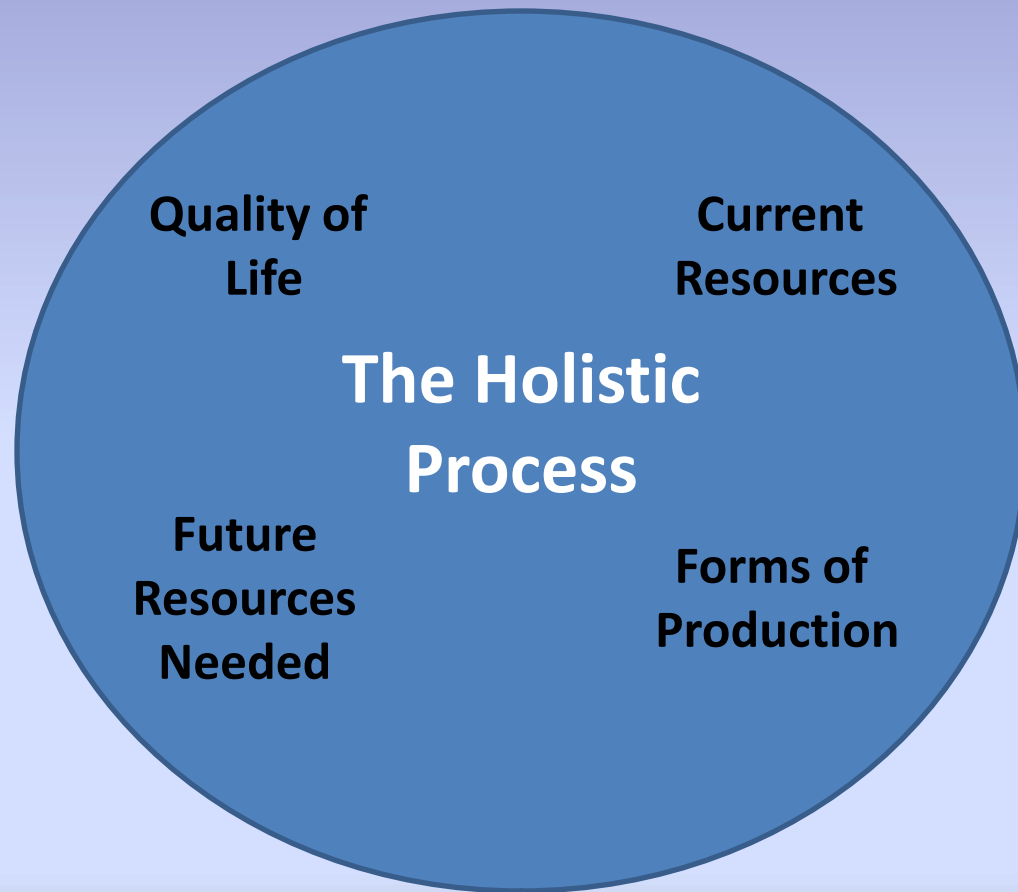
# THANK YOU!

***Communication,  
Western Attitude,  
Intercultural Competency  
(What is important to communicate  
in Western Cultures?)***

***Florence V. Dunkel***

***Department of Plant Science and Plant Pathology  
Montana State University-Bozeman***

# Holistic Circle of Life Processes



Savory and Butterfield 1999.  
*Holistic Thought and Management*

# International Locust Patrols

- USAID
- PRIFAS
- GTZ
- British Locust Control





# Nutritional Facts

**Complete  
proteins**



# Example of complete protein:

- *Oedaleus senegalensis*
- *Kraussaria angulifera*



Grasshopper are supplemental snacks for young children

# Nutritional aspect

- Young children (5-10 years old) need ~1g protein/kg bodyweight/day → 19-34 grams protein

	Average Weight of insect	Protein content per 100 grams of weight	Protein content per insect (average)	Number of grasshoppers to be consumed to make up 10% of diet	
				5 year old	10 year old
male	0.313 grams	~20.6grams	0.1376g	27 OR	48 OR
female	0.688 grams	~20.6 grams	0.07g	13	24

Compared to ~29 grams per 100 grams of lean beef

Isn't the Western Attitude changing?



Does it matter that many Westerners  
in influential positions are  
ethnocentric and create hunger and  
malnutrition throughout the world?



# Western Attitude

**REJECTED**

- Risk of pesticides should be assessed
- Risk of losing cultural richness
- Reassess holistic goals to identify current issues

# Recommendations



- Teach wherever you are
- Respect and recognize value in traditional wisdom
- Know principles of ethno-centrism and ethno-relativism.

# Food Concepts: Which is Yuk?

## Silk Worms vs. Chicken Nuggets

**“He was a bold man that first eat an oyster” ----- Jonathan Swift 1738**

**“Eat fish, live longer. Eat oysters, love longer”--- Marketing for Cialis of the Sea**



Glued and Chewed: McDonald's Nuggets are 44% chicken, the rest is corn, salt, and preservatives; glued with modified corn starch



# Cows Vs. Caterpillars

- World Championship of  
Global Human and  
Environmental Health



# Compare



Vs.



## EDIBLE FOOD PRODUCT VALUE

<b>Edible product (% live weight)</b>	<b>44</b>	<b>95</b>
<b>Protein quality</b>	<b>Complete</b>	<b>Complete</b>
<b>Fatty acid composition (%)</b>		
<b>Saturated</b>	<b>45</b>	<b>36</b>
<b>Monounsaturated</b>	<b>47</b>	<b>14</b>
<b>Polyunsaturated</b>	<b>4</b>	<b>50</b>
<b>Iron (mg %)</b>	<b>2-4</b>	<b>10.6</b>

# WINNER

# X

# Compare



Vs.



## REPRODUCTION: POPULATION EXPANSION

Reproduction age (months)	24	2
Fecundity (# progeny)	1	600
Pregnancy length (days)	285	3
Reproductive cycles (#/2 yr)	1	12
WINNER		X



# Compare



Vs.



## FEEDS, NEEDS AND GROWTH

Body heat maintenance	Warm	Cold
Feed sources	Grass, grains	Leaves
Drinking water (L/Kg live animal/d)	0.1	None leaves
Weight gain (%/day)	0.3	7.3
Food conversion (feed [g]/weight gain [g])	8	2
Energy input/protein output	54	4
WINNER		X

# Compare



Vs.



## ECOLOGICAL IMPACT

<b>Excreta</b>	<b>Urine, manure</b>	<b>Frass - water conserved</b>
<b>Housing</b>	<b>Horizontal</b>	<b>Horizontal vertical</b>
<b>Greenhouse gas emissions (CO2 equivalents [g] / body weight [Kg] / day</b>	<b>6.5</b>	<b>0.45</b>
<b>Greenhouse gas emissions (CO2 equivalents [g] / weight gain [Kg] / day</b>	<b>2850</b>	<b>7.6</b>
<b>WINNER</b>		<b>X</b>

# Compare



Vs.



## WHY FIGHT ROUNDS WON

EDIBLE FOOD PRODUCT VALUE		X
REPRODUCTION, POPULATION EXPANSION		X
FEED AND GROWTH		X
ECOLOGICAL IMPACT		X
OVERALL WINNER		X



# The final score: impact factors

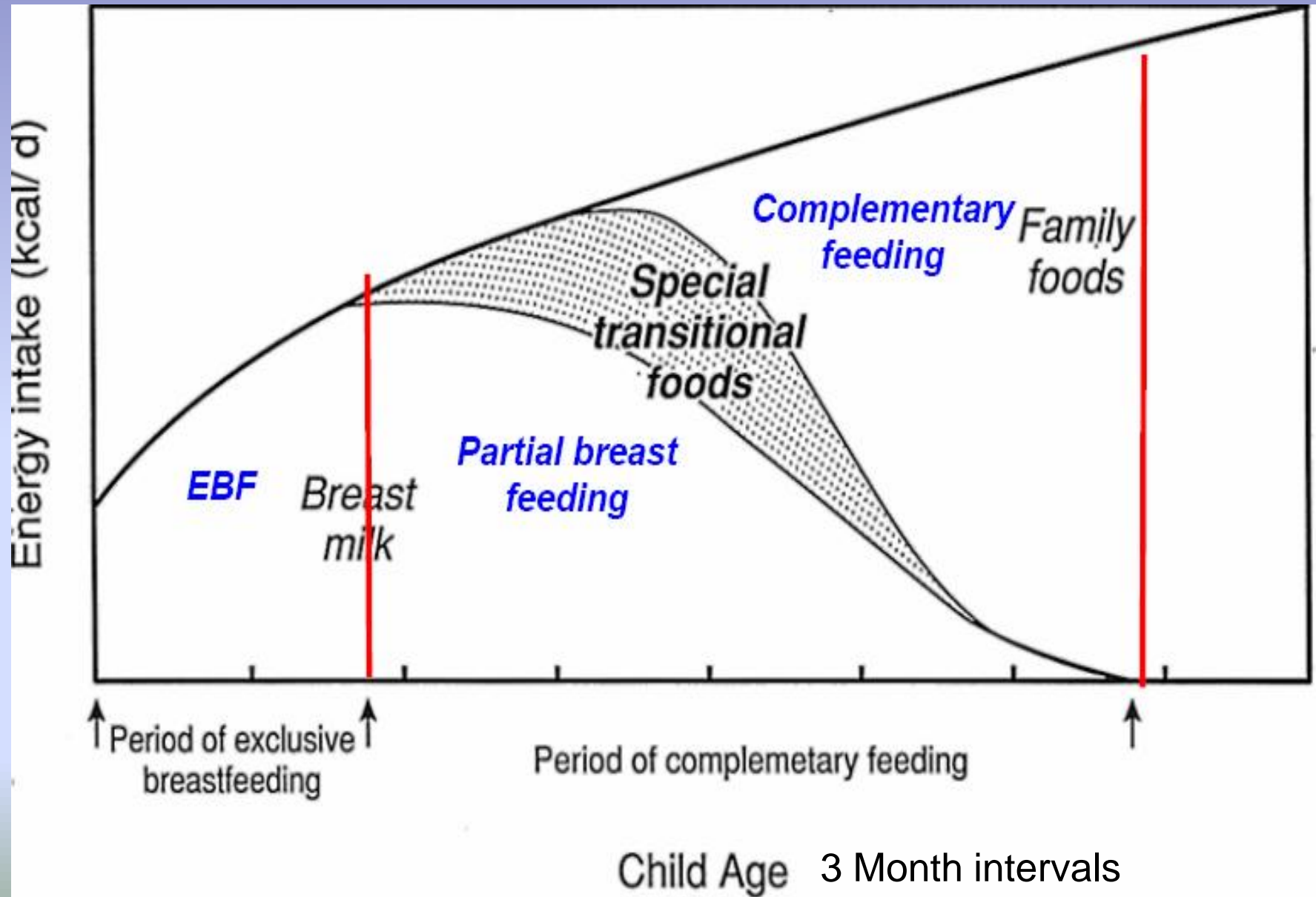
- Aggregate Impact (caterpillar/cattle) = Product of 10 rounds

1. [Food conversion]
  2. [Edible tissue from live weight]
  3. [Tissue protein from edible tissue]
  4. [PDCAAS]\*
  5. [Birth to collection]
  6. [Live born]
  7. [Cycles per year]
  8. [ % daily weight gain]
  9. [GHG reduction/body weight]
  10. [Land and water requirements]
- Product of 10 rounds

4
2.2
1.5
1
24
600
12
24.3
14
??
775M

\*Protein Digestibility Corrected Amino Acid Score = 1 = after digestion of protein, 1 unit of protein provides 100% of essential amino acid required by a 2 – 5 years old child.

# Feeding Transitions with Age





# A Story from Rwanda





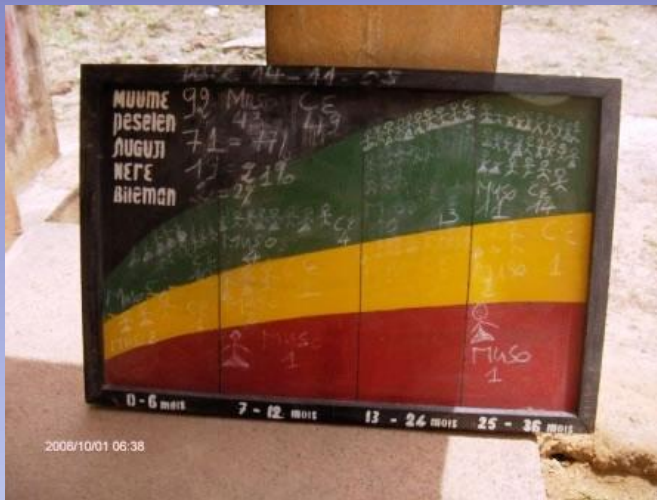
# Results of Holistic Process

- Focus groups (gender separated; gender combined)
- 11 villages including Sanambele



Sanambele's top constraint to achieving their quality of life was children dying from malaria (reported 4.2% village children/yr).

Kante, Dunkel et al. 2009



# Kwashiorkor Eradication Sanambele, Mali

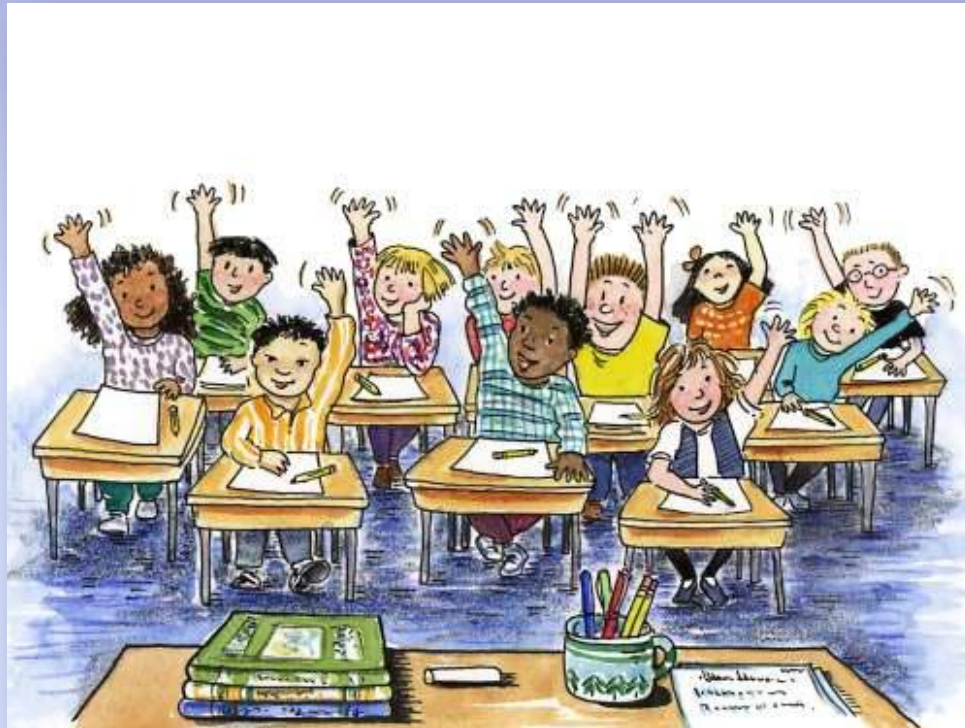


## The statistics

### “Hunger” History

- 2008 23% of young children, 0 to 36 month old with Kwashiorkor or in risk category (mean for Mali is 40%)  
(Source: Sanambele Health Center records)
- 2008 Village women/village midwife develop recovery diet for children at risk
- 2008-2011 Montana State AGSC (was PSPP) 465R students and mentors learn about diet and kwashiorkor and try out models to teach about essential amino acids and crops

# Questions?





Cowpea bruchids,  
*Callosobruchus maculatus*





# What's Next?

- Children's Cow Herd organized by Sanambele Women's Association
- Bambara groundnuts protected with shea butter for longterm storage

# *M. differentialis* lab bioassays with parsley leaf slurry



# *M. differentialis* lab bioassays with simulated garden free choice



# Nutritional Comparison

## Hoppers and Beef

(per 100g serving)

Meat Source	Protein (grams)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)
<i>Usata terpsichore</i> (Lepidoptera)	28.2	35.5	3.67	1.91
Beef (lean ground)	27.4	3.5	0.09	0.23

Source: the Ohio State University2008



# Grasshoppers and Locusts

