



Cricket Farming to Prevent Kwashiorkor in Sanambele, Mali (West Africa)

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Introduction:

AGSC 465 students used a holistic approach to research alternative protein sources to not only alleviate kwashiorkor rates, but to ensure its sustainability and the future of the Sanambele village. A traditional snack of Sanambelean and most Malian village children is wild-caught, roasted grasshoppers. However, in 2009 Sanambelean mothers began discouraging grasshopper snacks because of pesticides used in cotton fields where children hunted for hoppers. Without this source of complete protein Sanambelean children may be unable to meet the 10 essential amino acids necessary for complete metabolic function, allowing normal growth and development. Therefore through the use of Sanambele localism we proposed the idea of alternative insect farming more particularly the *Acheta domesticus* (house cricket) for consumption and as a combatant to the Kwashiorkor rates. We proposed cricket farming for these reasons: 1). Compared with conventional livestock they produce far more protein per kilogram of phytomass consumed; 2). They reproduce rapidly (100 eggs in their life span and 5 to 10/day); 3). Protein and fat levels in the insect species is generally higher than those of traditional protein sources, vertebrate meat, dairy, and some seeds. Twenty thousand subsistence farmers in Thailand are farming the same species. The use concrete barrel-like structures to provide the housing (Yhoung-agree 2012).

Table 1. Comparison of total protein, lysine, tryptophan, in Sanambelean children's foods compared to crickets, *A. domesticus*.

Food Source	Total Protein g/100g	Lysine g/100g	Tryptophan g/100g	Source of information
Maize (cc)	9.5	.254	.067	http://www.fao.org/infood/n/FOODSUpdatedGFU-list.xls
Millet (cc)	9.7	.332	.189	http://www.fao.org/infood/n/FOODSUpdatedGFU-list.xls
Sorghum(cc)	10.1	.204	.123	http://www.fao.org/infood/n/FOODSUpdatedGFU-list.xls
Cowpeas	23.4	1.599	.254	http://www.fao.org/infood/n/FOODSUpdatedGFU-list.xls
Bambara Ground Nuts(cc)	17.7	1.141	.192	http://www.fao.org/infood/n/FOODSUpdatedGFU-list.xls
Cricket(<i>Acheta domesticus</i>)	7.6	.461	2.44	Yhoung-agree, Jintana. "Yhoung-agree, Edible Insects in Thailand: Nutritional Value Adn Health Concerns." Forest Insects as Food; Humans Bite Back (2010): 201-16

Hypotheses Tested:

General Hypothesis: Appropriate structures can be built by Sanambeleans using only materials available in the village to enable them to farm crickets, *Acheta domesticus*, thereby significantly decreasing percentage of children with or at risk for Kwashiorkor in the village.

Subhypothesis A: Access to food, water, oviposition sand, and opposite gender deters crickets from escaping through cotton cloth, netting (similar to bed nets in Mali), or thatched roofing.

Subhypothesis B: Thatched roofing on cricket farm enclosures will prevent escape of crickets.

Subhypothesis C: Crochet materials (made by Sanambele Woman's Handicraft cooperative) prevents cricket escape in insect farming structures.

Methods/Materials:

- Photoperiod: 14:12::Light:Dark, natural light.
- Ambient Temperature: 21°C
- Adult house crickets, *Acheta domesticus* (from Rainbow Mealworms, Compton California)

Experiment #1:



4 glass aquaria (1 for stock culture, 3 for testing)
Test materials: netting stich (similar to

Cotton cheese cloth
Banana Sheath Leaves Matting Control (egg cartons) 2.5 cm diameter holes, both male and female crickets
4 males and 5 females/aquaria
Divided males and females
Only females provided Fluker's cricket quencher and high calcium diet

Experiment # 2:



2.5cm deep in bottom of mason jars/ all put in 1 aquaria
Added wooded materials for climbing

Metal lid secured cloth tops and thatch made of grasses
5 male crickets/ jar and 20 female in aquaria outside jars
Second aquarium has 1 quart jar with 3 males/ 3 females + Fluker's cricket quencher and high calcium diet

Experiment # 3:



2.5cm deep in bottom of 3 mason jars
Added wooded materials for climbing

Thatch made of wheat/ weeds/and grass all placed on mason jars secured with stone 3 males/ jar and 16 females/ +Fluker's cricket quencher and high calcium diet

Experiment # 4:



2 (928 ml) glass mason jars filled with 2.5cm of sand
Added wood materials for climbing

Top of jars covered with crocheted material made by woman's handicraft of Sanambele)
3 males/jar and 17 females/ aquaria + Fluker's cricket quencher and high diet

Results/ Discussion:

The traditional weave of the Sanambele woman used for their crochet material provided the only material to endure escape methods of house crickets, *Acheta domesticus*. **Sanambele women's crocheted material contained crickets for over 24+ hours in comparison to all the other materials tested from which *A. domesticus* managed to escape.**

Conclusion:

All materials suggested are currently available in Sanambele.

•To assimilate an ideal cricket ecosystem, we propose Sanambeleans use the same building materials (clay brick) they use to build their own housing to house crickets. Clay brick, like concrete, can insulate providing relief from Malian heat (40 degrees C). Clay will provide elevation opportunities, preventing contamination of the colony with frass. Crickets should be provided unlimited amounts of natural forage, and a dampened cloth for obtaining water. A small gourd with a handle filled with at least 2.5 cm of wet sand will allow for oviposition and egg incubation. Since there is no electricity in Sanambele, crickets will have natural light and dark periods, 12:12 photoperiod. The structure should then be enclosed by a doubled over crochet-weave and tied with string made from Sanambele-produced cotton around the barrel, to prevent escape and predation.

Recommendations for the Sanambeleans:

- Enclose any/ and ALL tiny spaces in which would allow the crickets to escape.
- Tightly secure top of structure with cotton string.
- Carefully maintain an adequate supply of food, water, and the opposite gender they do not have as strong of a will to escape.

Literature Cited:

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Yhoung-agree, Jintana. 2010. Yhoung-agree, Edible Insects in Thailand; Nutritional Value And Health Concerns. Forest Insects as Food; Humans Bite Back. 201-216.

Photo credits:

Dunkel, Florence and Megan Sullivan. 2010. Sanambele Mali, March 2010. Virtual Center for Rural Poverty, Traditional Ecological Wealth, Teaching and Learning. Montana State University, web accessed: 22 Apr. 2012. <<http://www.montana.edu/mali/npphotogallery.html>>.

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