

*Exploring Alternative Foods for World Hunger: The Potential of Edible Insects
International Conference
SIFAT, April 23-24, 2010*

How do Entomologists Contribute to World Hunger? Florence V. Dunkel

I would like to begin with a word of thanks to Kathy Bryson for the inspiration and dedicated logistical talents to organize this symposium that has gathered this amazing group of participants from Africa, Asia, Europe, Latin America and North America.

It pleases me to share with you that I have been an entomologist for 43 years. I have served on many national Entomology Society committees, chaired the Editorial Board of the American Entomologist, served as Department Head in Entomology, received regional teaching awards in Entomology and national awards for my research in food security.

Nevertheless, one thing embarrasses me a lot.

Are we US Entomologists contributing to World Hunger?

How many departments of entomology in the USA have subspecialties in food insect and nutrition? How many entomology departments are linked with health and human nutrition departments? Is this an unlikely combination? Why?

What is the Western Attitude toward using food insects as a “land shrimp,” as an hors d’oeuvres, as a salad or pizza topping, as a quesadilla ingredient, as an alternative to red meat, as a fortifying flour to add to desserts to our sweets-craving kids and adults?

How do US Entomologists contribute to the “Western Attitude” about food insects? How do they contribute by the choices they make on grant panels, foundation boards, as professors designing topics to teach the new generation of world leaders, or as senior research scientists deciding on the direction for their research?

What is the Western Attitude? Who are the “Westerners”? Westerners are a small group humans, probably 0.5 billion Europeans living in Europe and people of European descent, mainly living in the US and Canada. Westerners opinions and

food production have had a strong influence on practices such as food preferences and food availability among most of the “non-Western” cultures. In many of those non-Western cultures, storytelling is an important way to convey information especially in rural settings or when conversing with people of cultures rich in storytelling roots.

Over the years I have worked with very passionate undergrad students. Each year 40 of them engage with me in action research with communities in Mali and on a Native American Reservation in Montana. Another 35 to 40 students prepare and participate in a campus-wide food insect luncheon followed by a debate later in the semester on a food insect issue. Students human nutrition and their professor, a registered dietician, join with us in these endeavors as well. All of these courses are University core courses. I will be mentioning these students as I cite examples of research they are pursuing.

Here are some stories.

Here is a Montana, story.

Language, many ceremonies, as well as traditional foods were taken from the Northern Cheyenne people in Montana in a forced assimilation. Diabetes, obesity, and alcoholism arrived. This story doesn't specifically involve food insects to our knowledge, but I am using it to set the stage for a series of stories that do involve food insects and a similar lack of acceptance of indigenous cultural wisdom.

From my student Amber Ferda: In the early 1800s, the Cheyenne were supplying the French and other tribes with horses, dried meat, prairie turnip flour, buffalo robes, dressed skins, shirts and leggings made of deer skin and traded all of these for corn, beans, melons, tobacco, pumpkins, guns, powder, axes, knives, beads and mirrors (Weist, 1977). Trading with other tribes, especially the Arikaras and Mandans, they no longer had to rely on growing their own food to survive.

Then the situation started to change. In the late 1850s and early 1860s, wild game was quickly disappearing from the Plains. This in turn, started to make the Cheyenne more dependent on the white man for food and supplies (Weist, 1977). Due to shortages, the Cheyenne decided to split into four smaller groups. Two groups settled at Fort Keogh, Nebraska. They hunted and raised gardens. This made quite an impression on the officers, because of the Cheyenne people's extensive knowledge of plant applications and gardening (Weist, 1977).

In spring 1880, the officer in charge of Fort Keogh, Miles, gave permission to certain Cheyenne to search for hunting grounds up along the Tongue River in Montana. After extensive searching, they decided on Lame Deer and Muddy Creek, where they settled in permanent lodges, hunted and also planted gardens (Weist, 1977). But life did not get easier. During spring 1882, cattle were being herded out of Miles City and up the Tongue River, where there was

plenty of water and good grazing land. Some urged the Cheyenne to homestead their land, since they were non-treaty Indians and so were eligible to homestead (Weist, 1977). Then in 1884, President Chester A. Arthur signed an Executive Order creating the Tongue River Reservation, 371,200 acres. But the east boundary was never established, and this soon created conflict with white ranchers who tried to force the Cheyenne onto the reservation, so the white folk could have the land for themselves to raise cattle (Weist, 1977). During this time in the late 1880s, the last buffalo were killed and gardening and farming were virtually non-existent due to the Cheyenne being forced to live on the reservation.

US government agents were assigned to the reservation to introduce farming and a wage economy that would allow Cheyenne to be self-sufficient (Weist, 1977). Results were not good. In the first annual report in 1886 it was noted:

“The rain, what little came, was not received at the right season. Many seeds did not germinate and the crops that did survive were nearly killed by the driest season known in ten years. The potato bug came and wiped out that crop...the onion, melon and pumpkin yielded the best, but we expect very little value for them. The reservation has been devastated in all directions by prairie and timber fires and the atmosphere in return is laden with smoke. These Indians, having no poultry, hogs, sheep or cattle are left entirely dependent on the charity of the government for every particle of food that they consume” (Weist, 1977).

Published Cheyenne history then concludes (minus the parenthetical comment) that drought, hailstorms, **insect infestations (probably grasshoppers, one of the world’s most common food insects)**, lack of irrigation due to droughts and the short growing seasons made the reservation unsuitable for small-scale farming as a means of providing food. Therefore, the Cheyenne had to rely on the ration system that consisted of beans, coffee, sugar, flour and beef (Weist, 1977). After this time, gardening virtually became non-existent, and the ways of the past were no more.

Thus, we can see the profound effect the “Western Attitude” can have and has had with peoples that may be depending on traditional foods, nutritionally and culturally.

Here is a Utah story. About the same point in our history that we were taking traditions of wild harvested foods and vegetable gardens away from the Northern Cheyenne, the Ute Nation of Native Americans were occupying what is now known as Utah. The Ute shared their knowledge of traditional foods and saved the lives of the Euro-Americans who came to live in the area of the Great Salt Lake.

From my student Luke Bergeson:.. These are important stories that were passed down to the generation of my student, stories of overcoming hunger with traditional knowledge, knowledge of food insects held by the Ute people..

When I asked my student to interview his grandmother about those years the Ute saved the settlers with their traditional knowledge, his grandmother talked of how plentiful the crickets were, saying “the crickets came in swarms destroying crops and devouring everything in site, they left nothing behind.”

Mormon settlers realized they were not the first to occupy this area. Native Americans had been in this area for years, so the Mormons tried to learn from the Ute how to live off of the land and to survive in the desert conditions. One account from William Brewer, a professor of agriculture spoke of the Ute people. He found them collecting crickets and other insects in bushes by the shore of the Great Salt Lake in 1863 (Food Insects Newsletter pg. 1)

“The Indians come far and near to gather them, the worms (insects) are dried in the sun, the shell rubbed off, when a yellowish kernel remains, like a small yellow grain of rice. This is oily, very nutritious, and not unpleasant to the taste, and under the name of koo-chah-bee forms a very important article of food. The Indians gave me some; it does not taste bad, and **if one were ignorant of its origin**, it would make fine soup. Gulls, ducks, snipe, frogs, and Indians fatten on it.”

Some insects mentioned were *Anabrus simplex* (Orthoptera: Tettigoniidae) which Mormons called crickets, but weren't really crickets. but wingless katydids. Adults are large, almost 2 inches long and they travel in large dense bands. Sometimes travelling in bands of 20 to 30 per square yard these insects have been damaging to crops for a long time. Their nutritional value is clear and it is not surprising Native Americans used them for food on a regular basis. In some cases they went to extreme measures to obtain them. The Ute shared techniques for obtaining and eating these crickets with early white settlers. One such instance went as follows:

John Bidwell, a pioneer in Humboldt Sink area in 1841, looked at the “manna” with a more discerning eye: “...The Indians gathered the honey and pressed it into balls about the size of one's fist, having the appearance of wet bran. At first we greatly relished this Indian food, **but when we saw what it was made of –that the insects pressed into the mass were main ingredient—we lost our appetites and bought no more of it.**”

The “Western attitude” toward food insect was an aversion even 170 years ago. That insect was a katydid, now known as the Mormon cricket. Have the descendents of these Euro-American peoples saved from starvation by the Ute and their food insects now incorporated food insects into their diet? No. Stories of the Ute people and their katydid pemmican remain, but not the practice of eating insects. Mormons do not celebrate Thanksgiving with an insect feast! (photos of Great Salt Lake and Mormon cricket)

Here is a story from Rwanda. (Add photos of kids and the night in Kigali on slides in Food Insect series.)

One night in 1985, I had just returned to Kigali from the field with my graduate student. It was dark, about 7:30 in the evening. I had worked there since 1983 and was used to being in Kigali at this time of night. At this time in the past, Kigali was a quiet capital city. This night was very different. There were many, many children out on the streets, ages about 9 to 12. They were darting out in front of traffic under the streetlights. Each one had a small bag in their hand. We stopped the car

to find out what was going on in this usually quiet capital city. The children were so happy, excited, even jubilant. “The locusts have come!” they screamed in Kinyarwanda. They were selling their bags of hoppers for the equivalent of \$1 US. This was big money, about as much as their dads could earn for one day’s labor in the city. No wonder they were happy!

Yes, I bought a bag, took the hoppers back to the hotel, asked the chef to prepare them. I’ve been eating fresh-cooked insects ever since.

When I worked in and led a large US AID project there, 95% of the population were subsistence farmers. Dry edible beans was their main source of protein and calories. Certainly this is better than millet, sorghum, and corn being the main source of protein. Locusts and grasshoppers are nonetheless a more efficient source of protein so it makes sense to catch and eat and to sell if folks in the city will buy them. I hope there weren’t other Euro-Americans and Europeans visiting Rwanda that month and expressed exclamations of disgust to these enthusiastic, young children.

These were what entomologists and the general public call locusts. They really look and taste just like grasshoppers. What is the difference?

Locusts that swarm and migrate are very similar in looks to grasshoppers. The main difference is that locusts have more than one generation per year and they are gregarious or tend to swarm. As immatures they run through the countryside in bands. As adults they catch the prevailing winds and move as a cloud from country to country without a visa. Some grasshoppers, like the Senegalese grasshopper, *Oedaleus senegalensis*, can switch between being a locust-type grasshopper and a plain ordinary grasshopper. Either way they are delicious.

Here is a story from North and West Africa. Did you know that entomologists in the USA, France, England, Germany actually compete for developing a control plan that can kill the greatest number of locusts and grasshoppers in North and West Africa? Why is it better to eat grasshoppers and locusts than millet, wheat, barley, sorghum, and maize? When traditional peoples, the subsistence farmers in West and North Africa, still the majority of the population in these areas, don’t have locusts and grasshoppers to eat (or termites or certain lepidopteran larvae), what are they eating? Are they eating complete proteins?

What do we mean by a complete protein? And, why is this important? (use the brick wall idea.)

From my student Heather Taylor: Proteins are a class of nutrients required by all living things and play a pivotal role in many life processes. Not only are they a major structural component of all cells of the human body, they also function as enzymes and hormones and are responsible for transporting many chemical compounds throughout the body. Proteins are made up of amino acids, which themselves are essential for the synthesis of body proteins as well as other chemical compounds such as nucleic acids, hormones, and coenzymes. When a protein is consumed, the enzyme pepsin in the stomach breaks the protein into smaller peptide chains, which are further broken into individual amino acids in the small intestine. These amino acids are then absorbed and can be rearranged by the body into the proteins it requires (Otten, et al., 2006).

There are two classifications of amino acids: essential (or indispensable) and nonessential (or dispensable). Nonessential amino acids are those which the body can synthesize in adequate quantities on its own. Essential amino acids must be consumed in the diet to be available for protein manufacturing. There are ten amino acids considered essential in children's diets. These are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, valine, and arginine. **The presence of each of these amino acids in sufficient quantities, that is in the correct ratios, in the diet is critical to the health of any child** (Otten, et. al., 2006).(use slide of the 10 essential amino acids)

Have entomologists, the governments of USA, England, France, and Germany systematically destroyed a preferred, efficient food source, a source of complete proteins for these millions of peoples? Why were millions of dollars invested in pesticides and bio-control agents to destroy a crop of complete proteins? Why weren't these dollars spent instead on helping the villagers and nomadic herders of Africa harvest this excellent protein source?

In the 1970s and 1980s the USA was shipping thousands of gallons of malathion and other neurotoxins to West and North Africa to attack the locusts. Malathion is a synthetic organophosphate, a nerve toxin. Insects have the same neurotransmitters as humans. Yes, the dose makes the poison. Then, when one of the malathion spray planes crashed in Senegal, dousing the land that produced this complete protein, and all the incomplete proteins, the millet, sorghum, and corn, AND the people, the US Environmental Protection Agency decreed in the same year, NO MORE SPRAYING with anything except a bio-control agent. Now, the people and the soil will be safe and one could possibly still consume the grasshoppers and locusts who died from B.t. (a biocontrol bacterium, *Bacillus thurengiensis*) or *Beauveria bassiana* or another entomopathogenic fungus, but the golden source of efficient, low cost complete proteins for African farming and ranching families is still the target of destruction by these "Western" governments.

Why? Because those in charge expected, assumed the clouds of locusts were not a jackpot, a bonus from the earth of complete protein. How did this happen? I would

bet a large sum that those in charge of GTZ, PRIFAS, USAID Locust Control, and the English locust management teams never thought to learn to know the cultures of these places, not the culture of the African governments, but the cultures of the African people themselves, the subsistence farming and ranching families. This became a clear case of lack of intercultural competence.

What does it mean to be interculturally competent? From observations by a cross-cultural communicator and sociologist, Milton Bennett, in the 1980s, 1990s, and early 2000s, emerged a model of 6 distinct stages of world views spread across a continuum from ethnocentrism to ethnorelativism (Bennett 2004). How would this look with respect to food insects?

Denial. is the strongest form of ethnocentrism. Euro-Americans in this stage would conclude “Eating insects is outrageous and noone anywhere in their right mind does that.”

Defense is a little softer ethnocentrism. Folks in this stage would say “Well, I understand there are people somewhere in the world that eat insects, but this is a ridiculous practice. It is much better to not include those in your diet.”

Minimization is softer yet ethnocentrism. These Euro-American folks would say, “I know some people in the world eat food insects, but that is no different than our eating oysters, guts and all.”

Reversal is an special type of ethnocentrism in which one denigrates one’s own cultural identity. These folks would say “I can’t understand why everyone doesn’t eat insects. Cultures using insects are far superior to our own.”

Acceptance is the beginning of ethnorelativism. Euro-Americans in this phase would say “I understand that some cultures use insects as food and that is just fine, whether a culture uses insects as food or not, each culture is valuable, and equally worthy.”

Adaptation is an even stronger phase in ethnorelativism. A Euro-American in this phase would say, “I want to learn about your food insect preparation methods. This is very interesting.”

Integration. This is the final stage of intercultural competence. In this stage a Euro-American would say “Oh, we’ve have sautéed grasshoppers this evening. Wonderful. The last time I had these, they used a special marinade called ...Have you found a place to obtain silk moth pupae. They are so good, I’ve found with chutney and cream cheese.”

So what?? Does it matter that many Westerners in influential positions are ethnocentric and have created hunger and malnutrition throughout the world? What are the consequences? One of the quickest results is a rise in

protein deficiency, deficiency of diets which provide the right ratio of amino acids for our human bodies to build the proteins that we need for physical and mental development.

This kind of protein deficiency has a fancy name called Kwashiorkor. What happens when a community is faced with not enough complete protein for their children? Slow growth and development, both physically and mentally is the result. What happens when these kwashiorkor at-risk children are faced with malaria, diarrhea, other infectious diseases?

Kwashiorkor is a form of protein-energy malnutrition which is endemic in many African nations, including Mali. Kwashiorkor is most commonly seen in children two to three years of age, which is about the time of weaning. Kwashiorkor appears as a result of a diet which provides sufficient or excess calories but is deficient in complete proteins. This is in contrast to marasmus, a form of malnutrition related to severe calorie deprivation (Hendricks and Duggan, 2006). Often, kwashiorkor sets in when a child is weaned off mother's milk and transitioned to a diet lacking in the high-quality protein previously ingested in the form of breast milk. Massive distension of the abdomen is the cardinal clinical sign of Kwashiorkor. Other common symptoms include edema in the hands, feet, and face, delayed mental and physical development, and reddening of the hair. Children with the disease are commonly irritable, listless, and suffer from decreased appetite. Unless a sufficient quality protein source is found and introduced gradually into the child's diet, Kwashiorkor can be fatal (Dettwyler, 1993). In general, victims of kwashiorkor are at greater risk from mortality than those with marasmus (Hendricks and Duggan, 2006). Traditional dietary preferences and societal traditions often influence the development of Kwashiorkor.

In my other presentation in this symposium I will take you to a small farming village in West Africa, a Bambara village in the country of Mali. We will talk more about kwashiorkor when I discuss our village site analysis in Mali later in this symposium. We will be able to see in detail there what crucial role food insects play in the dynamics of the community. How a traditional food like insects can serve as an essential link between available food and traditional meals and existing nutritional knowledge.

So what?? Why do these small pastoral villages in remote parts of the globe, completely off the grid of electricity and commerce matter? Why should this matter to those of us who live in the US or Europe or an urban area somewhere else in the world? Have you grown up or lived in a subsistence farming village with a strong traditional culture? A village where there is a chief and elder-led form of concensus democracy? Many of these areas had and still have this form of government. What can we "Westerners" learn from these villagers? Here are a few things that I have learned. Knowing one's own culture

and being proud of it is one of the strongest ways to reduce stress, avoid obesity, keep extended family ties strong, and live sustainably on a piece of land for many many generations. (add photos from Sanambele)

Why does this matter that we are systematically destroying the use and the tradition of use of this good protein source in indigenous communities around the world? It matters because these communities hold secrets, they hold secrets of sustainability, of traditional ways, of respect for elders, of the value of the extended family, of traditional medicines and foods, of how to live for millennia on a piece of land successfully, of how to leave a very, very small footprint, of how to enjoy life with low stress. Some villages like the one I will take you to tomorrow are part of a culture that evolved an amazing, hundreds of years old process of peaceful conflict resolution that works! In our courses at Montana State University and at other universities linked in our Virtual Center for Alleviating World Poverty and Valuing Traditional Ecological Wealth Teaching and Learning, we explore these gifts and secrets held by intact cultures around the world. Our most in-depth studies are in 3 communities, Sanambele, Mali, Renchinulmbe, Mongolia and the Northern Cheyenne Reservation in Montana.

Today there are more than 370 million indigenous people in some 70 countries worldwide. Indigenous peoples are the inheritors and practitioners of unique cultures and ways of relating to other people and to the environment. Indigenous peoples have retained social, cultural, economic, and political characteristics that are distinct from those of the dominant societies in which they live. Despite their cultural differences, indigenous peoples around the world share many common problems related to the protection of their rights as distinct peoples, such as the right to have their practices of eating insects not denigrated and ridiculed or their food insect sources destroyed.

How could this disaster have happened? Westerns have destroyed healthy, sustainable lifestyles that favor and support extended family ties and respect for elders. Why don't we hear about this in the Western newspapers?

Isn't this Western Attitude changing? Haven't all the efforts of leaders like Dr. Gene Defoliart, Dr. Julietta Ramos-Elodruy, Dr. Bani, and my husband and me and entrepreneurs like David Gracer and professors like Dr. Tom Turpin at Purdue University and Museum directors like Marjolaine Giroux in Montreal had a permanent effect on this Western Attitude toward food insects? Haven't all the tens of thousands of people to whom we all have been introducing delicious insect dishes now changed the "Western Attitude"? Maybe. When we begin to see

courses offered jointly in Departments of Human Nutrition and Health and Entomology and large funding programs initiated for food insect research and teaching AND when the USAID talks about food aid they really mean it and don't launch programs to kill the food!

To me this is embarrassing. But, out of embarrassing moments can come opportunities to teach and to learn. This is where we are today, this weekend. We are gathered here from all parts of the Earth as those who recognize the central and urgent importance of insects as a source of high quality, nutritious food.

What are positive things that we who are assembled here can do to improve this situation?

- Teach wherever you are in the classroom, the boardroom, a legislative committee, a review panel, with the media, with your family, teach the principles of intercultural development.
- Respect and recognize value in other persons' traditional knowledge.
- Know the principles of ethnocentrism and ethno-relativism
- Be an example of ethno-relativism, Recognize and guard against ethnocentrism.

It is time to speak out and to not be silent.

It is time to know the facts about food insects and share them whenever possible in a culturally sensitive and appropriate manner.

Again, from the inner most reaches of my heart, I want to thank the organizers at SIFAT for bringing us all here to this conference in Alabama sponsored by Auburn University/ United Nations World Food Programme's Universities Fighting World Hunger and Tuskegee University to strengthen our resolve and to encourage all the listeners to take positive action in their own spheres to right this wrong.

Thank you.