

Animal Husbandry in the Village of Sanambele: A Possible Solution to Protein Deficiency.

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Introduction

Kwashiorkor remains a problem in the developing world particularly in areas that experience drought, famine, and social upheaval. Much is still in the process of being learned about Kwashiorkor but most scientists agree that it is a severe form of protein malnutrition and therefore is a macronutrient deficiency (Trowell et al. 1955). Lack of protein can cause growth failure, loss of muscle mass, decreased immunity, weakening of the heart and respiratory system, and death (Harvard School of Public Health). Children are most at risk to Kwashiorkor due to the demands of nutrition in growing bodies. This is not aided by the lack of maternal understanding in nutrient requirements for their young (Trowell et al. 1955).

In the village of Sanambele, Mali Kwashiorkor is a suspected problem. Villagers have complained about symptoms that occur with Kwashiorkor and visitors like Dr. Florence Dunkel have observed evidence in the people that suggest that the disease exist in Sanambele. Observation by Dr. Florence Dunkel reported children with white reddish hair, swollen bellies, and village growth charts for children that mimic child growth where the disease is prevalent. Sanambele is geographically located in an area that receives periods of intense rain and periods of intense drought therefore increasing its likelihood of problems with Kwashiorkor (Trowell et al. 1955).

One way to fight a lack of protein in the diet is to create a sustainable food source that is high in proteins. One way to achieve a constant source of available protein is to raise animals for meat and dairy products. Studies have shown that animal proteins more so than vegetables

produce more complete proteins in that all twenty two amino acids are prevalent. Proteins are organic compounds made up of amino acids that help the body do the important job of repairing and creating cells (Wikipedia.com). Meat, milk, and eggs are an easy way to gain all the essential amino acids required for proper protein requirements. Animal-source foods are an excellent source of high quality and readily digested protein and are rich in energy (Neumann et al. 1999). Animal-source foods are a calorically compact and an efficient source of micronutrients. The main micronutrients offered in abundant and bio-available form by animal products are calcium and B12 from milk, and iron, zinc, and vitamin A from meat and offal (Neumann et al. 1999). Animal products are the almost exclusive sources of dietary vitamin B12, and a good source of preformed vitamin A, particularly in milk (Neumann et al. 1999).

Many studies have focused on animal production for means of income to reduce food impoverished villages similar to Snambele. Most of these studies focus on poultry as a mean of income rather than simply as a food source to be utilized by the villagers. However when studies focus on better understanding of animal husbandry success in animal food production increases dramatically. A study done in Kenya dealt with increased village consumption of chicken by encouraging women to care for chickens more thoroughly by housing them in areas of greater food availability (Njue et al. 2002). Similarly, success was seen in small ruminant production in Nigeria with knowledge in delayed age at first parturition and extended parturition intervals in semi arid environments with seasonal and often unreliable feed sources (Rege, 1994). These studies provide ample evidence that gaining knowledge about animal husbandry can increase local food sources for villagers.

Upon introduction to the Sanambele village (January 2009) by Florence Dunkel, professor of Health, Agriculture, and Poverty at Montana State University, the issue of Kwashiorkor was introduced and discussed. Many discussions occurred with Dr. Dunkel on daily village life and eating habits of the Sanambele people. Video footage was shown in class where I was introduced to the body conditions of the livestock raised in Sanambele. After thinking about the connection between Kwashiorkor and livestock health I was able to conjure up a hypothesis.

In Sanambele Mali a variety of animals already exist that with better knowledge of animal husbandry can be more readily utilized for sources of protein. By readily making protein available through better knowledge of animal needs the likelihood of kwashiorkor could greatly be reduced.

Hypothesis:

By increasing knowledge about animal needs and basic requirements, meat, egg, and dairy production can be increased and a steady source of protein can be provided to the Sanambele village thus reducing the likelihood of possible kwashiorkor protein deficiency.

Materials and Methods

There was a wide variety of ways information was gathered for this project. Lots of information was gathered by first hand knowledge of persons who have visited the Sanambele village, those include Dr. Florence Dunkel, Keriba Coulibaly, and Wendy Nickisch. Keriba Coulibaly is a Malian agriculturalist that answered questions pertaining to farming practices in Sanambele through multiple e-mails I sent him. Wendy Nickisch is a student at Montana State University that traveled to Sanambele in March 2009 with Florence Dunkel and answered

questions and showed video footage of life in the village. Florence Dunkel has a long history of knowledge and experience with the villagers of Sanambele and was an integral part to my understanding of this village. Other interviews were used to obtain knowledge of animal husbandry practices. Those include Melvin Brown of Amalthia Dairy in Bozeman, Chase Hubbard of Warren Wilson College Farm, and Jenny Sabo of the Sabo ranch in Harrison Montana. Other methods of acquiring the information used for this paper were the Montana State University library, which has significant stocks of books pertaining to animal husbandry and nutrition. The Bozeman Public Library was a resource for organic agricultural practices in particular. Besides books many peer-reviewed journals were obtained through Internet article databases, those include the Web of Science, Agricola, Bioline, Google scholar, and the Health and Wellness Center. Those databases were searched using key words like animal husbandry, poverty alleviation, Mali, poultry, ruminants, nutrition, and feed. Animal husbandry received limited amounts of hits and was basically never the focus point of any articles pertaining to African poverty. Poultry received the most hits of 8000 in dealing with poverty issues worldwide. Those articles like mentioned before were mostly using poultry as a source of income to alleviate poverty. Cattle production in Africa was the least studied and emphasis was placed solely on Tsetse fly regions. The key word animal husbandry had 2700 hits mostly pertaining to the economics of husbandry which had little help to my topic of research. Other Internet recourses were used including Wikipedia, ATTRA a sustainable agriculture web site, fao.org, Harvard School of Public Health, and Acres USA. All of these recourses were pulled together along with personal knowledge to create a simple guide to basic husbandry practices and nutritional benefits from harvesting animals.

Originally the point of this paper was to incorporate knowledge of animal husbandry to better the production of crops via soil nutrient cycling. This would be done by grazing management and increased manure production. However I came to realize that the capability of the Sanambele people far surpassed my expertise as they know their land and crops much better than I do. I figured that they would benefit much better through recourses I could acquire but they could not about the science of animal management that has been studied tremendously in the western world.

Results:

As already stated this paper's purpose is to give resources about basic animal husbandry practices that are studied significantly in the Western world. This results section is an analysis of extensive literature in this field. In this section each animal relative to the sanambele village will be outlined.

Goats:

The goat is a browser which means it would rather harvest food up than down. This is the opposite of a grazer. Leaves, branches, and the bark of young trees are a natural part of a goat's diet in the wild (Belenger, pg 3, 2001). Goats thrive in indoor housing that allows 10 square feet of space per goat plus as much outside range as possible (Belenger pg 3, 2001). Goats show increase production of milk and weight gain when housed in dry areas with plenty of ventilation (Belenger pg 51, 2001). The goat has a ruminant digestive system meaning it has four compartments adapted to function in digestion. Vast number of protozoan's and bacteria live within the rumens digestive tract which allows microbes to break down not only starches, fats,

and proteins, but cellulose as well (Kellems and Church pg 19, 2002). Goat's rumen capacity ranges from 4-5 gallons (Belenger pg 75, 2001). Studies have showed increase production of milk and health in goats when roughage was feed to goat kids at an early age, 2 weeks or older (Belenger pg 75, 2001). This practice is to develop the microbial functions of the ruminant. Roughage should always be feed first so upon introduction to high concentrated feed grains the ruminant is better prepared for digestion (Kellems and Church pg 12, 2002).

Breeding goat's is important for milk production and also for elevated surplus animal use. Goats cycle in the fall and winter when daylight shortens but in temperate regions goats can cycle year round. Goats begin estrus as early as 3-4 months of age. Goats should not be breed this early and years of experience by Australian research has proved goats should be breed by weight not by age (Belenger pg 150, 2001). Eighty pounds and above is best (Belenger pg 158, 2001). Pregnant goats should be dried off from milking 2 months before expected kidding. Energy is depleted very heavily when an animal is producing milk. Drying does off improve the health and eases the demands of both the doe and her kids (Belenger pg 158, 2001). The easiest way to dry off a doe is to just stop milking her.

Bucks can breed at less than a year old but should be limited to ten to twelve does his first year. Extensive research in the cattle industry shows the importance of breeding similar weights of animals so as not to crush the doe and also to improve genetic makeup in the progeny (Sanagaré et al. 2000). Bucks range in the 50 percentile of all kids and should be castrated if planned to be eaten to avoid 'buck odor' in the meat (Belenger pg 108, 2001).

Nutrition of feed is the key to goat reproduction and milk and meat production. Goats need water, carbohydrates, fats, proteins, and minerals as basic daily nutrient requirements.

Studies have shown that little is known on the exact requirements of goat mineral needs but after reviewing literature it is my recommendation that calcium, phosphorus and copper are the essential minerals to goat health (Haenlein, 1980).

Goats appear to have superior adaptation to the arid tropics because of their ability to conserve water, travel well, graze selectively, and take a wide variety of vegetation for consumption (Shelton, 1978). Animal protein can be produced more effectively as milk than as meat so milk is the emphasis I am recommending for meeting needs from animal protein for the Sanambele villagers (Shelton, 1978). A major advantage to the goat is its small size relative to the cow which makes their requirements for milk and meat production less and thus curtails to the small agriculturalist. Labor requirements for milk are 2 to 4 times less for goats than that of cows (Shelton, 1978).

Chickens:

When chickens are raised to their full potential they can be a great asset for egg production, high quality meat, and very nutrient dense manure. Current chicken production in Sanambele is a low input low output system that requires chickens to forage free ranging to get most of their nutrients they don't receive from household waste. While this system works egg production is minimal and weight gain is slow.

It is important to understand energy spent foraging is energy that could be put towards egg and meat production. Studies in Zimbabwe show great result in chicken manure turned to compost which promotes food sources like worms, insects, larvae, vermin, and other beneficial organisms for chickens to feed on. Making compost piles is a steady feed source for the foraging

chicken (Ekue et al.) Anywhere grass and legumes can grow chickens capable of foraging could benefit greatly from harvesting grasses and studies have shown 30 percent of caloric needs can be met on grasses alone (Robinson). Building chicken coops is another easy method that greatly increases chicken production. Coops not only provide shelter from predators but they also make egg gathering and production easier while providing a steady area to bring feed to the chickens. The idea of portable chicken coops has become widely used in the United States and is showing great results as it is designed to move chickens to where the feed is. It is important to realize that chickens need calories year round especially with stress placed on them from egg production. Cereal grains if at all possible should be planted specifically for chicken feed. Healthy layers eat about 4 pounds of feed for every dozen eggs they lay (). It is important to note that in hot climates hens eat less and thus a more concentrated feed should be given which is why grains and grasses should be grown specifically for chicken production in the hot climate of Sanambele (). Chickens given grain timed when temperatures are cooler could boost intake of feed by the chicken. Anytime the chicken is able to self harvest feed the less stress it puts on the farmer. Chickens should have access to farm fields and gardens where they can harvest not only the stubble of crops but also the insects in the soil and the grasses that sprout after harvest. This is where the moveable coop becomes an asset. Moving the coop to farm fields also provides great nutrient cycling through the manure dropped by the chicken as it forages.

Calcium is the most important mineral to the chicken for laying and bone development (). Limestone is an easy way to get calcium into feed. Heat is the main cause of chicken malnutrition and even though they might not be eating they must have a source of calcium. Access to water and shade should reduce the heat stress on chickens.

The most striking problem in relation to village poultry production is the high mortality: Mortality rates may be as high as 80-90% within the first year after hatching (Wilson et al., 1987) Newcastle disease is believed to be the most devastating disease in free-range systems and the main cause of the high mortality (Riise et al.). Vaccines exist for New Castle disease and money made in the village should be considered for buying the vaccine. When applying the vaccine at least 80 % of the chicken population should be vaccinated (Riise et al.). If at all possible chickens should be separated by age for fewer disease transmissions especially the adults and chicks (Mapiye and Sibanda,)

As women are the primary care takers in poultry production it is very important that they organize themselves to think of possible ways to increase village chicken health. One solution that would greatly help in overall health and production is to start records of deaths, diseases, clutch numbers, and other aspects that can monitor total production from the village (Wilson et al., 1987).

Cattle:

After reviewing the literature I believe cattle production is not ideal to the climate and forage base in Sanambele. The small ruminant which requires less input should be the focus of meat production (Shelton, 1978). However, cattle play an important role in social aspects of the village and should not be left out. Milk production from the cow is the easiest way to gain protein from this animal.

The importance of genetics in cattle breeds is of the utmost importance. Cattle breeds should be selected for high drought tolerance, milk and meat production, and heat tolerance for the Sanambele region.

Conclusion:

After reading the literature and viewing the studies great increases in village livestock production occurs with very simple modifications of husbandry. An important aspect of presenting this change is to model introduction of this information after the Farmer First model written by Chambers and Thrupp. By incorporating the Farmer First model changes are more easily made by learning from the farmer and empowering the farmer through their local knowledge. Another model to greatly influence animal productivity is described by Alan Savory's vision of holistic management. By seeing the animal as part of a whole system that is part of the village function the more important knowledge about proper management becomes and thus creates a cycle which improves animal health.

In conclusion I see great opportunity to increase meat and milk production in the small ruminant animals by delayed age at breeding, improved rumination development, and improved housing. Small ruminants, especially the goat show great adaption to the climate of Sanambele and should be utilized as much as possible. Intake is the most important aspect of production for any animal and anything that hinders consumption greatly reduced animal output. In the hot climate of Sanambele chicken production can increase dramatically if emphasis is put on strategies for keeping chickens cool. As is the case with all animals if the village can put income towards vaccines and adequate feed i.e. minerals that aren't offered in feed rations, overall health will rise and meat, milk, and eggs will be boosted. After reading the literature on cattle production it is concluded that Sanambele does not have a proper recourse base for keeping such a large animal healthy and producing. Cattle are important for social animal to the village. Milk is the easiest way to get protein from this animal.

In conclusion this research makes me believe that a more steady flow of protein could be introduced to the village of Sanambele with adoption and further information of animal husbandry practices. As the farmers in Sanambele are already very knowledgeable and capable this task should not be very hard for them to try.

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