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### Constraints on the Use of Animal Source Foods for Young Children in Ghana: A Participatory Rapid Appraisal Approach

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## **CONSTRAINTS ON THE USE OF ANIMAL SOURCE FOODS FOR YOUNG CHILDREN IN GHANA: A PARTICIPATORY RAPID APPRAISAL APPROACH**

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Micronutrient deficiencies limit child health and development. Although animal source foods (ASF) provide highly bioavailable micronutrients, Ghanaian preschoolers consume little. Participatory rapid appraisal methods identified constraints to the availability, accessibility, and utilization of ASF. Stakeholders working with or living in six communities in three agro-ecological zones reported constraints including low income, lack of access to technology and markets, inequitable household food allocation, inadequate knowledge, and beliefs. The least expensive ASF was fish, which was easy to preserve and consumed by all communities. Since ASF was primarily purchased, interventions that increase income may be most successful in improving Ghanaian children's diets.

**KEYWORDS** animal source foods, participatory rapid appraisal, diet, children, micronutrients, Ghana

**INTRODUCTION**

In low-income African communities, children's diets are typically comprised of tubers and cereals that are low in micronutrients and high in inhibitory factors that interfere with nutrient absorption. Studies indicate an unmet need among young children for iron, zinc, calcium, riboflavin, and vitamins A and B-12 (Murphy and Allen, 2003; Gibson, 1994; Neumann et al., 1996). Deficiencies of these micronutrients contribute to

poor child health, growth deficits, and impaired cognitive performance and neuromuscular development (Tomkins, 2000; Grantham-McGregor and Ani, 2001). All of these micronutrients are abundant and highly bioavailable in animal source foods (ASF); however, children's diets in poor communities usually contain little or no ASF (Ferguson et al., 1993; Gibson, 1994).

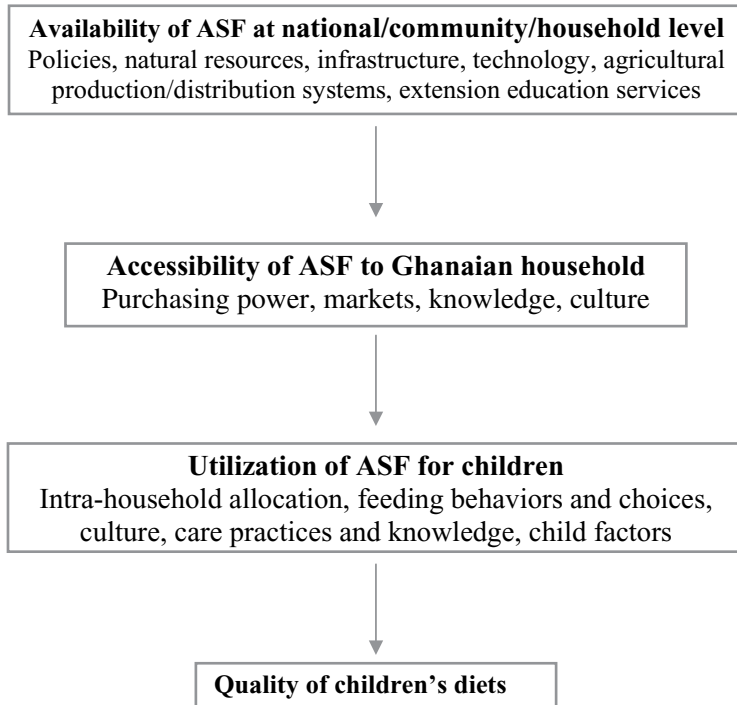
Ghanaian children are no different in their suboptimal dietary intakes and poor micronutrient status (Kwaku et al., 1998; Lartey et al., 2000; Lutter and Rivera, 2003). According to the 2003 Demographic and Health Survey, more than one-quarter (28%) of nonbreastfed 24- to 35-month-old toddlers did not consume any ASF (GSS, 2004). Anthropometric and biochemical outcomes are consistent with these dietary results; almost one-third (29%) of Ghanaian children under 5 years were stunted and over one-half (54%) had moderate-to-severe iron deficiency anemia.

To develop relevant and context-specific interventions to improve the quality of Ghanaian children's diets, there is the need to identify factors that constrain the use of ASF in vulnerable households. Participatory Rapid Appraisal (PRA) is a commonly utilized research approach that emphasizes local knowledge and allows the involvement of community members in problem appraisal, analysis, and intervention planning (Theis and Grady, 1991; World Bank, 1996). Some of the techniques that constitute PRA include community mapping, focus group discussion, and key informant interviews. These activities are designed to facilitate information sharing, analysis, and to determine needed actions among stakeholders (FAO, 1993). Using this methodology, the primary objective of this study was to develop with stakeholders a problem model of the constraints on the inclusion of ASF in the diet of young Ghanaian children. Once defined, stakeholders identified and prioritized plausible interventions to overcome the specified constraints.

## METHODS

### Problem Model

An *a priori* problem model (Figure 1) for understanding the constraints on the use of ASF in children's diets was developed to guide the data collection. The framework was based on core components of food security (FAO, 1996). Three broad questions were asked:



**Figure 1.** The *a priori* conceptual framework shows the proposed determinants of the quality of Ghanaian children's diets. The framework was used as a guide for data collection on the availability, accessibility, and utilization of animal source foods (ASF) for young children.

Is ASF available at the national, local, and household levels? (Availability)  
 Can households obtain available ASF for household consumption?  
 (Accessibility)  
 Are the obtained ASF used in children's diets? (Utilization).

A wide variety of factors might influence the availability of ASF, including the natural ecology, national policies on the agricultural sector and trade, policies and funding for agriculture extension, and land ownership. Accessibility is related to the affordability of ASF relative to the household economic situation, as well as other societal factors (e.g., religious dietary norms, infrastructure for processing, storing, and selling ASF)

that may influence a family's ability to consume the product. Utilization of ASF is defined by the interaction of factors that influence ASF allocation among household members. These include cultural norms, childcare and feeding behaviors, as well as knowledge about children's dietary needs. This simplified problem model demonstrates the importance of considering different layers of influence beyond the caregivers' daily decisions about child feeding. However, it cannot reflect completely the complexity of determinants. For example, national policies on agricultural production may directly influence the existence of ASF in a region (availability), but policies may also indirectly influence utilization within the home. National initiatives to encourage school attendance of girls may influence female empowerment, intrahousehold food distribution decisions, and, ultimately, use of ASF for children.

### Study Sites

Ghana, a West African country of 18.8 million people (GSS, 2004), has three major agro-ecological zones (Coastal Savannah in the south, Forest Transitional in the middle belt, and Interior Savannah Grassland in the north) that vary in production and, therefore, availability of ASF. Fishing is typical of the coastal areas of the Coastal Savannah zone, whereas hunting of wild game (*bush meat*) and livestock-rearing are common sources of ASF in the Forest Transitional and Interior Savannah Grassland zones, respectively. A multi-stage study site selection approach was applied involving the selection of one administrative region from each agro-ecological zone. Then, in each selected region, one rural and one semi-rural (closer proximity to main town) community were selected. Regions were selected based on the existence of research or outreach collaborations; communities within each region were selected using the following criteria:

1. availability or use of ASF typical to the agro-ecological zone,
2. presence of community- or household-level livestock/animal-rearing activities,
3. logistical accessibility to the community.

Program directors and regional staff of the Ghana Ministry of Food and Agriculture assisted in selecting the six study sites. A community census was completed to identify households with children 2–5 years of age.

## Study Participants

Project stakeholders included a) all of the local agricultural extension agents (AEAs) from the Ministry of Food and Agriculture and community nutrition and health workers (CNHWs) from the Ghana Health Services who worked in the districts of the selected communities; b) community key informants; and c) caregivers of young children, along with the project research scientists with expertise in agricultural, biological, and social sciences. Stakeholders from each of these categories were involved in the data collection process as well as the analysis and synthesis of results presented in this article.

Two AEA in each agro-ecological zone facilitated community entry and identified about six male and female residents in each community who served as key informants. In each site, the key informants sketched a community map showing the spatial distribution of households with children 2- to 5-years old. The mapping process involved drawing of important landmarks (e.g., main streets, bodies of water, churches, shrines, markets) on a large sheet of paper and then household units were added and numbered. The key informants were then divided into three groups and each group independently assigned each household a wealth rank (poor, average, rich) based on the group's own criteria. The wealth-ranking criteria used by each group was recorded and collated (Table 1). Key informants' perception of wealth was similar among the six study communities. Households that were considered of high wealth included those families who owned high value property (e.g., house, motorized vehicle), lived in a well-built house, were able to care for their family (i.e., provide adequate food and education for the children), and were able to provide loans to others in the community. Households of medium wealth were perceived as those with the ability to provide enough food for the family, had members who usually had a steady job, but had limited financial resources as compared to the high wealth rank (e.g., owned a bicycle instead of a car). Finally, the low wealth category was assigned to households that cultivated a small piece of land or had members who worked as landless laborers for others, had insufficient money for food, medical bills, and school fees, and were described as living "from hand to mouth." Households for which there was agreement among at least two of the three key informant groups were assigned that wealth ranking and included in the sampling frame. A random selection of 6–16 households (depending on size of the wealth rank) was made for the focus groups within each wealth rank in each of the study communities.

**Table 1.** *A priori* criteria used by key informants to assign wealth ranking to households with 2- to 5-year-old children by ecological zone and rural/semi-rural setting

Wealth Rank	Interior Savannah Grasslands		Forest Transitional		Coastal Savannah	
	Rural	Peri-Urban	Rural	Peri-Urban	Rural	Peri-Urban
<b>High</b>	<ul style="list-style-type: none"> <li>• Children in secondary school</li> <li>• Has cement block house</li> <li>• Has property (lorry/motorbike, TV, gun, livestock)</li> <li>• Can lend to others</li> <li>• Wears expensive clothing</li> </ul>	<ul style="list-style-type: none"> <li>• Children attend good schools</li> <li>• Has house of cement blocks with aluminium roofing</li> <li>• Owns large numbers of livestock (cattle, sheep, goats, car/motorbike)</li> </ul>	<ul style="list-style-type: none"> <li>• Takes good care of his/her children</li> <li>• Has property (cars, stores, corn mill, buildings)</li> <li>• Able to lend money to others</li> </ul>	<ul style="list-style-type: none"> <li>• Able to send children to school</li> <li>• Has own house</li> <li>• Has money to feed family</li> <li>• Has a good harvest from farming</li> </ul>	<ul style="list-style-type: none"> <li>• Able to look after family/child in good school</li> <li>• Has a profession/regular income /has a store</li> <li>• Has own fishing net / able to buy a lot of fish at seashore for sale</li> </ul>	<ul style="list-style-type: none"> <li>• Has money/can give out loans</li> <li>• Cocoa farmer</li> <li>• Has car/livestock</li> <li>• Has regular income from job</li> </ul>
<b>Medium</b>	<ul style="list-style-type: none"> <li>• Children attend school</li> <li>• Provides enough food to feed family</li> <li>• May own a bicycle, some livestock</li> <li>• House roofed with iron sheets</li> </ul>	<ul style="list-style-type: none"> <li>• Able to send children to school</li> <li>• Able to provide enough food</li> <li>• Has reasonable number of livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Able to provide for children</li> <li>• Not too rich; reasonable income</li> <li>• Has good housing</li> </ul>	<ul style="list-style-type: none"> <li>• Dresses well</li> <li>• Works hard</li> </ul>	<ul style="list-style-type: none"> <li>• Has little money/takes loans to support his fishing activity</li> <li>• has own fishing net/ does not work as a laborer</li> </ul>	<ul style="list-style-type: none"> <li>• Has some money</li> <li>• Has a profession or is an artisan</li> <li>• Receives remittance from family abroad</li> <li>• Has built a house</li> <li>• Has a shop/farm from which family is fed</li> </ul>

Continued



Table 1. Continued

Wealth Rank	Interior Savannah Grasslands			Forest Transitional			Coastal Savannah		
	Rural	Peri-Urban	Rural	Peri-Urban	Rural	Peri-Urban	Rural	Peri-Urban	
Low	<ul style="list-style-type: none"> <li>• No other income apart from compound farming</li> <li>• Not able to pay for medical bills/school fees</li> <li>• Not able to provide adequately for children (school, clothing, food)</li> <li>• Poor housing</li> <li>• Has no livestock</li> <li>• No relatives/family to help out</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequate food/money</li> <li>• Can't send children to school</li> <li>• Household unkempt/inadequate clothing</li> <li>• Poor condition of Housing</li> <li>• No relatives to help out</li> </ul>	<ul style="list-style-type: none"> <li>• Can't afford to take sick child to hospital</li> <li>• Does not take good care of his/her children</li> <li>• Doesn't have suitable housing</li> <li>• Has no trade and no farm</li> </ul>	<ul style="list-style-type: none"> <li>• Has to beg for money/food</li> <li>• Has lots of children and cannot take care of them</li> <li>• Has no land to farm</li> </ul>	<ul style="list-style-type: none"> <li>• Doesn't have money, property</li> <li>• Unable to send children to school</li> <li>• Works as laborer</li> <li>• Lives from hand to mouth</li> <li>• If can't find work for a day, can't feed family that day</li> <li>• Borrows from others</li> </ul>	<ul style="list-style-type: none"> <li>• Has no money/borrows money/food from others</li> <li>• Has no family help</li> <li>• Doesn't work</li> <li>• Does menial jobs</li> <li>• Depends mainly on farming for money</li> </ul>			

The human subjects review committees at Iowa State University and University of Ghana (Noguchi Memorial Institute for Medical Research) approved this project.

### Data Collection

*Focus Group Discussions with AEA and CNHW.* Focus groups were held separately with the AEA and CNHW; one district did not hold a CNHW focus group because of logistic problems. Agricultural extension agents and CNHWs discussed their perceptions about the constraints to ASF use in the communities in which they worked and institutional challenges that affected their capacity to address perceived constraints.

*Focus Group Discussions with Caregivers.* The key informants invited caregivers of 2- to 5-year old children of the randomly selected households to participate in a focus group specific for their wealth rank; the wealth ranking information was not reported to caregivers. A total of 16 focus groups with 172 caregivers were completed. One focus group discussion with at least six caregivers was completed for each of the three wealth ranks in the two Forest Transitional communities and in the rural community in the Interior Savannah zone. In the Interior Savannah semi-rural community, participants from the medium and high wealth rankings were combined because there were fewer than six caregivers from the high wealth group who were able to attend. In the semi-rural Coastal Savannah community, only two caregivers from the high wealth group attended. Only two caregiver focus groups (medium and low wealth rank) were completed for the Coastal Savannah rural community as none of the caregiver households were classified as high wealth rank. Descriptive data were collected at the beginning from each caregiver on her educational level, marital status, relationship to index child, and occupation. Then, the discussions focused on household animal ownership and rearing activities, reasons for animal rearing, ease of obtaining ASF for home use, affordability of ASF, perceived constraints on use of ASF, household food distribution practices, and child-feeding practices related to ASF.

*ASF Tracking.* To assess accessibility and marketing challenges of ASF, typical ASF products were tracked from the home to the source (the original vendor or producer, when possible). Two care-giver participants who were available to travel to the point of purchase or production of the

ASF were selected from each community. Interviews and direct observation were used to determine difficulties in obtaining ASF by both the caregiver and vendor/producer.

### **Data Analyses and Consensus Building**

Qualitative data from the focus group discussions, interviews, and observations were summarized using content analysis (Patton, 2001). Common themes among the different data sources were abstracted and compared. Quantitative data were analyzed with Pearson chi-square to test group differences (rural vs. semi-rural, agro-ecological zones, wealth rankings). SAS software, version 9.0 (SAS Institute Inc., Cary, NC), was used; statistical significance was set at  $p < 0.05$ .

*Consensus Building.* During a 2-day workshop, 40 of the stakeholders from all three agro-ecological zones (AEA, CHNW, and community key informants), as well as national and regional directors of governmental and nongovernmental organizations, and project researchers examined the qualitative and quantitative data, reached a consensus on the primary constraints to ASF in children's diets, and developed the problem model. The integrated problem model represented constraints that had at least one of the following characteristics:

1. direct effect
2. robust association
3. relevant to all three agro-ecological zones
4. multiple routes of impact
5. affected at least two constraint levels (availability, accessibility, utilization).

Interventions that addressed these constraints were identified and prioritized.

## **RESULTS**

### **Study Community Characteristics**

Study sites varied in size from 29 to 246 households with children 2–5 years of age (Table 2). With the exception of the rural Forest Transitional

Table 2. Characteristics of study community and participating caregivers by ecological zone and rural–semi-rural status

	Interior Savannah Grasslands		Forest Transitional		Coastal Savannah	
	Rural	Semi-Rural	Rural	Semi-Rural	Rural	Semi-Rural
Community, total # of households <sup>1</sup>	247	202	550	396	122	194
Households with 2–5 year old children, # (%)	69 (27.9)	68 (33.7)	246 (44.7)	237 (59.8)	37 (30.3)	51 (26.3)
Wealth ranking, n (%)						
Low	47 (68.1)	50 (73.5)	99 (40.2)	122 (51.5) <sup>3</sup>	28 (75.7)	25 (49.0) <sup>4</sup>
Medium	12 (17.4)	13 (19.1)	139 (56.5)	100 (42.2)	7 (18.9)	20 (39.2)
High	10 (14.5)	5 (7.4)	8 (3.3)	8 (3.3)	0	6 (11.8)
Not ranked <sup>2</sup>				7 (3.0)	2 (5.4)	
Caregiver focus group participants, n	36	26	33	34	19	24
Any formal education, n%	6 (16.6)	5 (19.2)	10 (30.3)	26 (76.5) <sup>4</sup>	6 (31.6)	15 (62.5) <sup>4</sup>
Married, n%	32 (88.8)	26 (100.0)	29 (87.9)	31 (91.2)	14 (73.7)	20 (83.3)
Main occupation, n% <sup>2</sup>						
Crop farming	11 (30.6)	6 (23.1)	24 (72.7)	26 (76.5)	0 (0)	12 (50.0)
Fish processing/selling	13 (36.1)	2 (7.7)	0 (0)	0 (0)	13 (68.4)	2 (8.3)
Petty trade	10 (27.8)	17 (65.4)	6 (18.2)	4 (11.8)	2 (10.5)	7 (29.2)
Other	2 (5.5)	1 (3.8)	3 (9.1)	4 (11.8)	4 (21.1)	3 (12.5)

<sup>1</sup>Information on the community was obtained from the census.

<sup>2</sup>Lack of agreement between key informants on the wealth rank of the household.

<sup>3</sup>Rural vs. semi-rural differences were significant ( $p < 0.05$ ), using chi-square goodness-of-fit.

<sup>4</sup>Rural vs. semi-rural differences were significant ( $p < 0.05$ ), using Fisher's Exact test; low vs. medium and high rank for Wealth ranking analysis.

community, more of these households were categorized as low wealth (40–71%) than medium or high wealth rank. Overall, few households were ranked as high wealth; the highest percentage was 15% for the rural Interior Savannah Grassland community.

### **Characteristics of Caregiver Participants**

Focus group discussants included 172 caregivers who were randomly selected by wealth ranking and included mothers (90%), grandmothers (5%), and other adult female household members (5%). Most caregivers (>70%) were married (Table 2). Less than 20% of the Interior Savannah caregivers had any formal education. With the exception of the Interior Savannah communities, rural caregivers were significantly less likely to have any formal education than their semi-rural contemporaries ( $p < 0.0001$ ). Educational attainment did not differ between wealth categories.

Crop farming was the main occupation of caregivers living in the Forest Transitional zone. Over 33% of the caregivers in the rural Interior Savannah community processed and sold fish. The women obtained fish from community fishermen at the nearby dam. Processing and selling of fish was also the main occupation for almost 66% of the caregivers from the rural community in the Coastal Savannah zone. In contrast, crop farming was more common among caregivers living in the more inland, semi-rural Coastal Savannah community. Petty trading was common solely among the semi-rural caregivers in the Interior Savannah zone.

### **Household Animal-Rearing Practices**

Across the three agro-ecological zones, home-rearing of hens, goats, and sheep was common among both the rural and semi-rural caregivers of all wealth ranks. Hens were most common with at least 40% of caregivers from each focus group indicating that their households raised hens. In the Interior Savannah, pig-rearing was common among rural households with 100%, 58%, and 36% of caregivers engaged in the activity in the high, medium, and low wealth focus groups, respectively. In contrast, only 1–2 caregivers from each focus group in the Forest Transitional communities and 2 caregivers in the Coastal Savannah zone raised pigs. In both the rural and semi-rural communities in the Interior Savannah, at least 50% of the caregivers from the medium and high wealth focus

groups indicated that their households owned cattle and guinea fowl; among the low wealth households, at least 33% had cattle and 20% had guinea fowl. None of the Coastal Savannah nor Forest Transitional households reared cattle and only one caregiver household (semi-rural, high wealth group) was involved in guinea fowl-rearing in the Forest Transitional zone. Other animal-rearing activities included ducks (Coastal Savannah), snails (Forest Transitional), and dogs and cats (Interior Savannah).

Data from the caregiver focus groups showed marked similarities in the reasons for animal-rearing across all agro-ecological zones, rural and semi-rural communities, and wealth ranks. Home-reared animals were rarely used for everyday household food consumption. Animals were slaughtered for home consumption for celebrations such as weddings, child-naming ceremonies, religious celebrations, and funerals, during periods of food scarcity, or when an animal was sick. Household animal-rearing, particularly of livestock, supplemented income from crop farming and other household income-generation activities. Animal sales provided money for paying school fees, medical bills, funerals, as well as basic needs during a crisis.

When there is a poor harvest, we sell some animals to get money to buy foodstuffs.

Caregiver, medium wealth rank, rural,  
Forest Transitional zone

Live animals were used for the payment of dowry and cultural and religious rites. For example, some participants believed that having animals in the home diverted curses intended for humans. In the Interior Savannah where cattle-rearing was common, dung was used as manure to fertilize land for crop farming as well as being mixed with mud for housing construction. The AEA focus groups in all three zones confirmed that home-reared animals were not for usual household consumption nor income.

Animals, particularly large animals like sheep, goats, sheep, and cattle are not viewed as a regular income source for the households that have them; they serve more as a bank or savings account to be used in times of hardship or for emergencies. They are sold for money to take care of specific problems or needs.

AEA, Interior Savannah zone

## ASF Consumed in the Study Communities

Caregivers reported consuming ASF in their diet although home-reared animals were rarely used for household consumption. There was no consistent pattern in ASF consumption observed in the responses given by the different wealth groups. In all localities and across all wealth ranks, caregivers reported that they were responsible for providing the soup ingredients that included the ASF for family meals while the men provided the starchy staples. This was confirmed by the AEA and CHNW focus group participants as well as direct observation through ASF tracking.

Consumption of fish was universal (Figure 2) and was ranked as the most frequently consumed ASF by the caregivers, irrespective of agro-ecological zone, locality, or wealth rank. The common use of fish was also evident from the food tracking results where 83% of the ASF tracked across the three zones was either fresh or smoked fish; the remaining 17% of ASF in the tracking study was home-produced eggs. Caregivers of all wealth ranks indicated that fish was most frequently included in family meals because it was relatively inexpensive compared to other ASF. In interior and coastal communities, both freshwater and marine fish were readily available in the fresh, smoked, dried, or fermented form. Caregivers obtained fish from vendors selling next to the ocean, river, or dam, cold stores, and community and township markets (Figure 3).

Other commonly consumed ASF were hens (Interior and Coastal Savannah) and guinea fowl (Interior Savannah). Although none of the households from the focus groups in the Forest Transitional zone were involved in cattle production, beef consumption appeared to be more common than in the Interior Savannah zone where cattle were raised. Consumption of guinea fowl, pig, dog, and cat was more widespread in the Interior Savannah zone compared to the other agro-ecological zones; however, these ASF were not mentioned by focus groups in other zones as usual foods in the caregivers' homes.

Animal source food products used in food preparation were obtained in the fresh, dried, smoked, or fermented (particularly fish) form with little or no further processing; secondary processing of animal foods to make sausage, yogurt, or cheese was rare. The one exception was *wagasi*, a local cheese product made from cow's milk that is common among some ethnic groups in the Interior Savannah zone but not a typical part of children's diets.

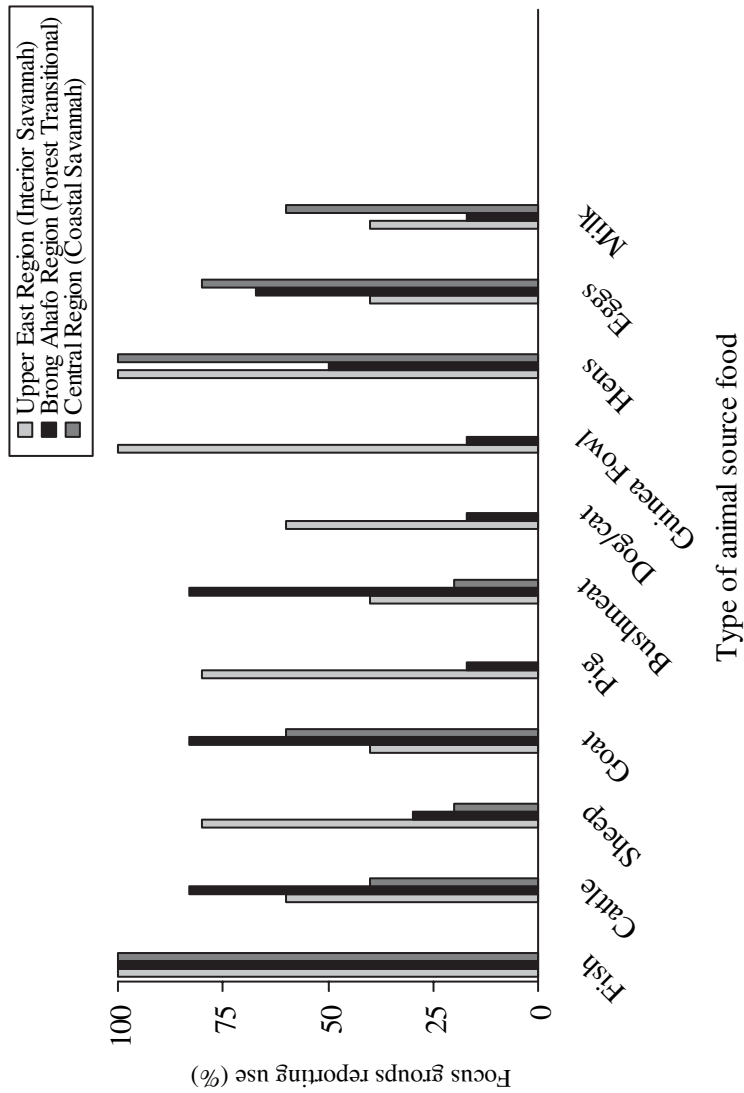
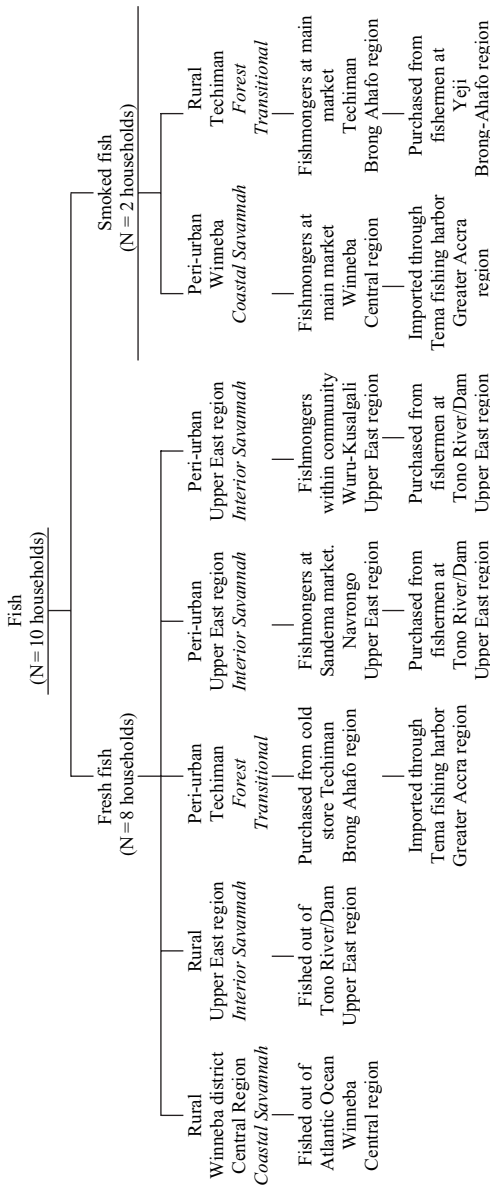


Figure 2. Percentage of focus groups in which participants reported use of different animal source foods (ASF) in their households, by ecological zone.





**Figure 3.** Tracking of ASF from household to source from where it originated, example of fresh and smoked fish.

We don't know the value of wagasi for children so we don't usually give it to children. We adults buy it to eat as a snack.

Caregiver, high wealth, rural,  
Interior Savanna zone

### **Perceived Constraints to Incorporating ASF in Children's Diets**

Caregivers from the different wealth ranks within and across agro-ecological zones had similar views on challenges to including ASF in their children's diets. Thus, the sections below represent the pooled views across the wealth ranks and agro-ecological zones. Where available, the results were corroborated with information from the AEA and CNHW focus group as well as direct observation.

*Availability.* Perceptions on the constraints to ASF availability in the communities studied pertained to issues relating to household level production and local supply of ASF. There was no large scale intensive animal production in the communities studied. The primary household animal production method was "free-range," where the animals remained unprotected and unconfined during the day and foraged for food on their own. This practice was considered inefficient by the AEA and program managers, because the high energy cost of forging limited proliferation of livestock and hence the supply of ASF. Other production-related constraints were the rearing of low-yield animal breeds, poor animal housing, and irregular availability of animal feed and water. The presence of one rather than two rainy seasons contributed to the harsher conditions found in the Interior Savannah Grassland zone than in the other agro-ecological zones.

The supply of livestock (including small ruminants) and poultry was decreased also by high mortality related to animal diseases and pests; this was, in part, due to inadequate extension services. The AEA in all three zones reported that there were institutional challenges that hampered the availability and quality of the extension services they provided. Some of these institutional challenges were: insufficient veterinary services coverage, inadequate supply of medications for animal disease prevention and treatment, inadequate means of transport for outreach activities, and limited opportunities for updating AEA knowledge and skills. The consequences of these institutional constraints at the community and household levels were articulated in the caregiver focus groups, where caregivers lamented on the difficulties in accessing veterinary services for their sick animals.

We had some cattle that got sick last year and we brought it to the attention of the vet at Ministry of Food and Agriculture (MOFA) but the vet didn't come to the community to see the animals so all the cattle died.

Caregiver, low wealth rank, rural,  
Interior Savannah zone

Even when services existed, some caregivers reported that they could not access them because of the related costs.

The local vets come around to give the animals injections but we have to pay for their transportation and services but we don't always have the money.

Caregiver, low wealth rank,  
Forest Transitional zone

The AEA acknowledged that poverty limited the ability of many households to access veterinary services. However, they also believed that cultural values and beliefs reinforced the reluctance of farmers to seek veterinary services for disease prevention and control.

The farmers view owning animals as a prestigious thing; the more you have, the more prestige, so they are unwilling to sell one or two in order to get money to vaccinate the rest of the herd against disease. They are looking at the number [of the animals] they have in the short term.

AEA, Coastal Savannah zone

Some people also believe that a sick animal has in actuality taken on some curse or evil intended for a human being in the household; therefore if the animal is treated the disease will be diverted to the person for whom it was initially intended so they may be reluctant to seek treatment for the sick animal.

AEA, Interior Savannah Grassland zone

*Accessibility.* Inadequate household purchasing power was the most frequently mentioned constraint to ASF accessibility across all the data sources. This was because the majority of ASF obtained for household consumption was purchased.

We don't normally eat what we raise in the home because they serve as security for us. If we want to eat goat or sheep in the home then we'll buy the meat from the market and that takes money.

Caregiver, high wealth rank, Interior Savannah

Caregivers attributed low purchasing power to lack of employment opportunities, reliance on unpredictable rain-fed crop farming, inadequate market linkages for selling farm produce, and lack of capital for entrepreneurial development.

There were two additional constraints associated with the accessibility of ASF from the local markets. First, since animals were rarely slaughtered in the home, there was a perception that the meat sold in the local community markets was unsafe.

We don't usually slaughter big animals, like sheep and goat to eat in the home. We get more money from selling these. If one considers how much money you can get from selling such animals it doesn't encourage you to kill the animal for home use...if you kill the animal and decide to sell part of the meat in the village no one will buy it because people will think the animal was diseased and that was why it was slaughtered.

Caregiver, medium wealth, Coastal Savannah

Given this concern, there was a preference for purchase of meat from the main city or township markets. However, households faced a second constraint—transportation costs—that could make accessing the more distant markets prohibitive. One-way transportation costs to the most proximate township markets ranged from 5,000 cedis (approximately US \$0.56) for the rural Coastal Savannah community to 6,000 cedis (approximately US \$0.67) for the rural Forest Transitional community.

*Utilization.* Children's consumption of ASF was limited by the small amount used in the household meal and the infrequency of meals that contained ASF. Households typically added ASF to the evening meal, thus decreasing the number of opportunities during the day that children had to receive ASF. In addition, some households practiced traditional food allocation that favored older age groups.

As long as the animal product is available in the family pot, the child will get some of it. The problem is the animal food is not always

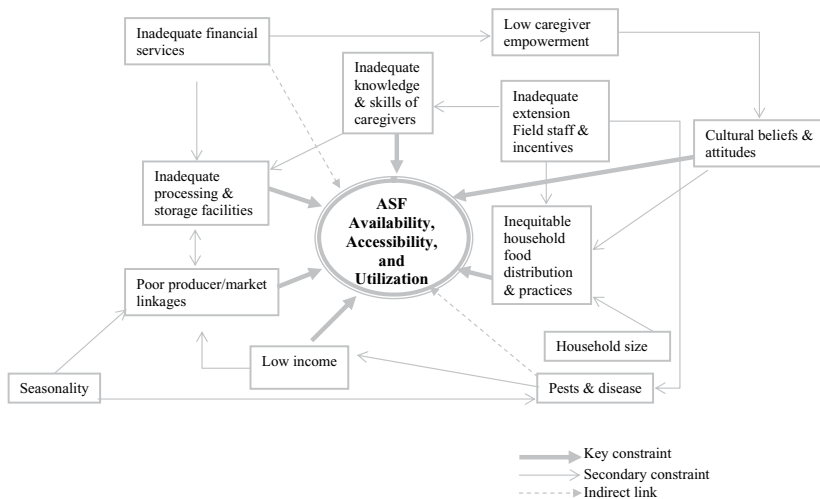
present in the family pot and when it's available then it's usually in one meal, the evening meal and the quantity is often quite small.

CHNW, Forest transitional zone

The utilization of ASF was also affected by the more common use of meat rather than milk or eggs that can be easily consumed by young children. Caregivers perceived that some meat was too tough for children to chew and meat fat was associated with fever. In addition, they were unwilling to offer ASF because it would encourage unrealistic taste preferences and expectations that would not always be possible to meet. Underlying these perceptions were other factors that constrained ASF utilization, including lack of time to provide adequate childcare (including feeding), ignorance about the benefits of ASF for children, and perceived food preferences of the child.

### Problem Model for Constraints On the Use of ASF in Children's Diets

Seven key constraints were included in the integrated model that was developed by project stakeholders (Figure 4): low household income and purchasing power, poor producer-consumer market linkages, inadequate ASF



**Figure 4.** Integrated problem model developed through the Participatory Rapid Appraisal approach that specifies the key constraints on the use of ASF in Ghanaian children's diets.

processing and storage facilities, inadequate knowledge and skills of caregivers and field staff working with caregivers, low empowerment of women, inequitable household food allocation practices, and cultural beliefs and attitudes. The constraints in the problem model were not ordered hierarchically; however, poverty or low income was the most consistently mentioned obstacle to the incorporation of sufficient quantities of ASF in the household diet across all the data sources. Poverty was a key issue because most of the ASF in household diets across the three agro-ecological zones was purchased, regardless of household animal-rearing activities or wealth strata.

Underlying secondary constraints included in the model were inadequate financial services, seasonality, animal diseases/pests, household size, inadequate resources for extension field staff, and limited opportunity for continuing education and effective outreach activities.

*Potential Interventions to Address Constraints.* Stakeholders prioritized interventions that would enhance households' purchasing power through income generation activities (Table 3). Improved caregiver incomes may also improve caregiver empowerment and control of the quality of their children's diets. However, the benefit of income generation activities is limited by households' ability to enter existing markets or develop new markets for the products from their Income Generation Activities (IGA). Poor market linkages can be a key barrier; mechanisms to increase caregivers' abilities to source market information and to increase marketability of their goods/services are important.

Other priority interventions included provision of adequate ASF processing technologies to enhance year-round availability of ASF in the home and behavior change education to overcome cultural barriers and poor attitudes relative to ASF. Finally, field staff, such as agricultural extension agents who work with caregivers households, require training in ASF-related issues in order to impart meaningful information to caregivers on a consistent basis.

## DISCUSSION

The present study was a research process to specify constraints to ASF in Ghanaian children's diets and to identify promising interventions to overcome those constraints. We endeavored to collect data that would capture agro-ecological and community (rural vs. semi-rural) differences

**Table 3.** Key constraints and associated suggested interventions defined by stakeholders to increase the use of ASF in young Ghanaian children's diets

Key Constraint	Suggested Activities and Interventions
1. Low income	<ul style="list-style-type: none"> <li>• Support the promotion of income generation activities for caregiver households</li> <li>• Establishment of financial service facilities for loans for entrepreneurial development</li> </ul>
2. Poor producer/consumer linkages	<ul style="list-style-type: none"> <li>• Training of communities/households on how to source market information</li> <li>• Training on community mobilization of funds</li> <li>• Promotion of co-operatives/and other group economic ventures</li> </ul>
3. Lack of processing and storage technology and facilities	<ul style="list-style-type: none"> <li>• Provision of ASF processing and storage technologies</li> <li>• Training on ASF preservation applications</li> </ul>
4. Inadequate knowledge and skills of caregivers	<ul style="list-style-type: none"> <li>• Training for field staff working with caregivers at household level</li> <li>• Social marketing education on importance of ASF in children using various media (radio, posters)</li> </ul>
5. Low caregiver empowerment and inequitable household food distribution	<ul style="list-style-type: none"> <li>• Support the promotion of income generating activities for caregivers to ensure adequate household supply of food (ASF)</li> </ul>
6. Cultural beliefs and attitudes	<ul style="list-style-type: none"> <li>• Education for behavior and attitude change</li> <li>• Promotion of positive cultural values</li> <li>• Involvement of community opinion leaders in changing "harmful" beliefs and taboos</li> </ul>

in ASF availability, accessibility, and utilization as well as household level differences based on wealth categorizations. The expected differences in ASF availability across the three different agro-ecological zones were observed in the household animal-rearing results where we found cattle-rearing to be common in the Interior Savannah Grassland but not in the other two zones; and in the results for commonly consumed ASF, where consumption of bush meat was relatively common in the Forest

Transitional zone compared to the other zones. Guinea fowl is a typical poultry found in the Interior Savannah Grassland and the ASF consumption results reflects levels of consumption of guinea fowl in this zone. Interestingly, fish was the most frequently consumed ASF irrespective of agro-ecological zone, locality, and wealth rank. Low, medium, and high wealth caregiver households alike used fish more than any other ASF in their home meals because it was the cheapest form of ASF available. Household wealth rank therefore appeared not to have a bearing on ASF consumption for the populations in our study.

Discrepancy between community-assigned wealth rank and indicators of socio-economic status has been reported for Sudan. Young (1990) found that at an individual level, poor nutritional status of children did not correspond to household wealth designations by community key informants, with richer and poorer families both having malnourished children. In our study, the lack of congruence between household wealth rank and household ASF consumption may be attributable to the comparable socio-cultural elements observed across all the study communities. For example, across all wealth ranks in all the communities, home-reared animals were generally not available for use as food in the home and therefore whatever ASF was included in family meals had to be purchased. This is compounded by the cultural practice of women being responsible for the ASF included in household meals. Any association between ASF consumption and wealth rank may have been reduced because the wealth ranking was based primarily on household level indicators such as ownership of live-stock and property, neither of which was controlled by the women. While the validity of socio-economic stratification by household ranking has been demonstrated (Adams et al., 1997), the wealth rank of a household may not be a valid indicator of the socio-economic status of individual caregivers within a household. In our study, although the caregivers were perceived to belong to households of different wealth, the caregivers themselves may have been at similar socio-economic levels with respect to purchasing power for obtaining ASF for their households.

The considerable overlap in constraints identified across the different strata (agro-ecological zone, rural/semi-rural locality, household wealth rank) and sources (caregivers, AEA, CNHW, institutional program managers) of data resulted in a single integrated problem model of constraints. The model provides a framework for understanding key issues that need to be addressed in efforts to improve the ASF quality of children's diets in Ghana. The model also has potential application in



other African countries as some of the cultural constraint issues identified have been reported elsewhere. For example, in the Gurusum district of Ethiopia, of the 67 households that slaughtered home-reared goats over a 3-year study period, 37% of them slaughtered the goats for consumption during holidays and festivals and the remaining 63% of the households slaughtered the animals to mark important family events like funerals and the birth of a child. The amount of home-produced meat averaged only about 3.5 kg/household/year (Ayele and Peacock, 2003). In Bondo, Kenya, Relma (2003) reported that 83% of households sold livestock to meet incidental bills related to school fees and medical bills.

Inadequate knowledge and skills of caregivers relative to the benefits and use of ASF for children was also a major constraint that is likely to be applicable beyond the borders of Ghana. There is a demonstrated link between caregiver education and child nutrition status (Handa, 1999; Wachs et al., 2005). Although there is an incomplete understanding of the mechanism by which formal education of caregivers improves their children's well-being, interventions that have improved maternal knowledge have been associated with improved dietary quality and intake by their children (Guldan et al., 2000).

Although the objective of the study was to identify constraints associated with ASF in children's foods, the constraints specified in the problem model apply primarily to household and/or community level factors rather than child factors *per se*. This was because 2- to 5-year-old children in the communities studied (regardless of agro-ecological zone or caregiver wealth rank) shared the foods prepared for the whole household. Therefore, the perceived constraints were primarily barriers that caregivers said they encountered in including adequate amounts of ASF in the household pot. This influenced the selection of interventions that stakeholders considered practical. For example, interventions that require caregivers to do "something special" for their children's diet were not suggested, as this was not the norm. The recommended interventions target the primary constraints directly and reflect caregivers' own concerns, thus increasing the likelihood that they would be accepted.

An important intervention priority identified was the need to introduce appropriate technologies for ASF processing and storage. One of the reasons for the widespread use of fish in communities throughout the country was the available processing technologies used to increase the shelf life of fish. This was not applied to other ASF. Fish could be obtained dried (either smoked dry or salted and dried with very little

moisture content), salted, or fermented. The majority of caregiver households did not have access to refrigeration and therefore storage of ASF was an important issue. Introduction of processing technologies to extend the shelflife of other ASF is an important intervention to increase the diversity of ASF available to children. In Malawi, Gibson et al. (2003) concluded that a dietary intervention to enhance the micronutrient density of children's diets failed to improve children's iron status because fish was the major source of ASF consumed. Efforts to enhance children's intakes of different types of ASF are warranted to take advantage of the range of micronutrient densities of different ASF.

This study allowed for an in-depth assessment of the issues of ASF in children's diets and culminated in a problem model and associated interventions that unearthed the multi-faceted nature of the problem and its solutions. This was possible because the study achieved a high level of community and institutional involvement through the use of participatory principles at all stages of the project. This contributed to our ability to look at the issues holistically exploring different perspectives of the issues. Studies, such as this research project, which stimulate high levels of community involvement, create a conducive environment for building trust between researchers and the communities being studied and in so doing enhance both the quantity and quality of data collected (Schultz et al., 1997). Undoubtedly, the high level of community involvement that was achieved in this study created an environment of collective responsibility which is expected to enhance the sustainability of the suggested interventions when they are implemented. From the mix of interventions recommended, it is evident that multiple institutions and interventions are required to successfully address the constraints to ASF in children's diets in Ghana. Fostering collaborations with community and local institutions as well as interdisciplinary partnerships with animal husbandry, agricultural extension, sociology, nutrition and health services, and other relevant fields contribute to the success of community-based dietary interventions (Gibson et al., 2003; Neumann, 2000).

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