International Livestock Research Institute

Workshop and mission report

Food safety in Western Province, Zambia: Field visits and scoping mission

February 2015

CGIAR

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Citation

ILRI (International Livestock Research Institute). 2015. *Food safety in Western Province, Zambia: Field visits and scoping mission.* Report of a workshop and field trip held at Mongu, Zambia, 2–6 February 2015. Nairobi, Kenya: ILRI.

Contents

Summary

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) food safety activity provincial government stakeholder meeting was held at Mongu, Zambia on 4 February 2015. The key findings were:

- Safety and improved preservation in the milk and fish value chains should be prioritized
- Consumption of dead or moribund animals is an issue
- Safety of fruit and vegetables, and mangoes in particular, is an issue
- General hygiene and sanitation is low

Community visits

Lealui: 3 February 2015 – on flood plain

Main issues: milk and fish preservation and safety; sanitation during the flood season

Nembwele, Sifuna and Nalitoya: 5 February 2015 – not on flood plain

Main issues: mango and milk safety/preservation; lack of protein in diet; productivity (milk, calves and chickens); Newcastle disease; consumption of dead animals

Liangati health centre (small rural health clinic): 5 February 2015

Main issues: Follow up on foodborne and diarrhoeal disease burden data

Senanga dairy co-operative: 5 February 2015

Main issues: How safe is fresh and sour milk? Options for preservation including pasteurisation; shelf-life

Nasla halal beef company abattoir, Senanga: 5 February 2015

Main issues: What level of contamination exists? Can fly control be improved? Improving quality of cattle supplied; liver rejection rates and wastage

Next steps

- Investigate the safety of sour and raw milk. Risk profile against time during storage and along value chain from point of production.
- Assess safety of fish (microbial contamination along the market chain, starting with markets and after sale). Enquire about the safety of pyrethroids in catching and fly and mosquito nets.
- Investigate the safety and preservation options for village mangoes (next mango season).
- Consider the safety of consuming dead or moribund animals; would guidelines be useful given that it will happen regardless?
- Fly control studies – start with fish (consider meat in the future?)

Other

- Animal health – Liver fluke and Newcastle disease
- Persist with burden of disease data from Ministry of Health

Immediate to do

- Design fish fly study, fish market sampling strategy and fresh to sour milk safety study
- Obtain sampling equipment and sample storage and transport equipment (small freezer?)

Background

In 2015-16, food safety activities will be conducted within AAS. These will include a prioritization exercise and evaluation of simple food hygiene interventions. To obtain understanding, ideas and feedback on initial plans, field visits to Mongu were conducted from 2 to 6 February 2015.

This included visits to two AAS communities: Lealui, located on the flood plain (3 February), and Nembwele, Sifuna and Nalitoya, a cluster of three villages away from the flood plain (5 February). These communities were fairly different in topography and lifestyle. Also visited were a rural health clinic in Liangati (5 February), a dairy co-operative in Senanga (5 February), an abattoir (Nasla in Senanga on 5 February) and a local government stakeholder workshop in Mongu (4 February). Travel from and to Lusaka was done on the 2 and 6 February, respectively.

Provincial government stakeholder meeting

Nalumba 2 Lodge, Mongu, 4 February 2015

Key findings

- Safety and improved preservation in the milk and fish value chains should be prioritized
- Consumption of dead and moribund animals is an issue
- Safety of fruit and vegetables and mangoes in particular is an issue
- General hygiene and sanitation is low

Agenda

14:00 Introductions
14:15 Overview of AAS Zambia
14:35 AAS food safety Zambia: Initial plan and motivation
Feedback and stakeholder views on food safety
15:00 Identifying food safety priorities
Open discussion

Participants

A range of government representatives with a role in food safety and foodborne disease control were invited. Unfortunately, the representative from the Ministry of Health was unable to attend. Only one provincial level officer attended.

As the AAS food safety work is at an early stage, guidance was required from experts and stakeholders with local knowledge of food safety. The number of participants was limited because the meeting was exploratory and aimed at promoting open discussion.

Name of participant	Organization	Position
Mate Chuma	WorldFish/AAS	Nutrition Officer
Stephen Kunda	Mongu Municipal Council	Senior Health Inspector
Gary M. Syatwinda	Ministry of Agriculture and Livestock	Senior Livestock Production Officer
Golden Ngandu	Ministry of Agriculture and Livestock	District Livestock Officer, Mongu
Brian Kayula	Mongu Municipal Council	Health Inspector
Mubiana Muyangwa	Village Water Zambia	
Mulele Sibeso	Ministry of Agriculture and Livestock	Senior Nutrition Officer
Gethings Chisule	Ministry of Agriculture and Livestock	Principal Fisheries Officer
Ngula Mubonda	WorldFish/AAS	Hub Research Manager
Theo Knight-Jones	ILRI/WorldFish	Food Safety Epidemiology Expert
Maybin Mwangala	WorldFish/AAS	Nutrition Officer
Conrad Muyaule	WorldFish/AAS	Value Chain Coordinator
Mwansa Songe	ILRI/WorldFish	Food Safety Expert; Nutrition and Food Safety Coordinator

Identifying foodborne disease priorities

Participants were asked to make lists to help identify food safety priorities in Western Province. These are tabulated below.

Which five foods are eaten in the greatest quantities?

Participant	1	2	3	4	5
Brian Kayula	Fish	Meat	Maize	Rice	Cassava meal
Mulele Sibeso	Maize	Fish	Beef	Vegetables	Mangoes
Maybin Mwangala	Maize	Cassava	Fish	Sour milk	Wild vegetables
Stephen Kunda	Fish	Cassava	*Simdambi* (vegetables)	Eggs	Nshima
Mate Chuma	Fish	Sour milk	Maize	Cassava	Vegetables (pumpkin leaves, rape, hibiscus)
Gethings Chisale	Sour milk	Fish (*kapenta*)	Beef	Chicken (broiler)	Maize
Conrad Muyaule	Maize	Rice	Cassava	Cassava leaves	Fish
Mubiana Muyangwa	Maize	Local vegetables	Cooking oil	Sugar	Rice
Gary Syatwinda	Fish (dried and fresh)	Beef	Milk (raw)	Mangoes	Chicken (village and hybrid)
Golden Ngandu	Maize	Fish	Milk	Cassava	Rice
Ngula Mubonda	Nsima Maize	Nsima Cassava	Fish (fresh and dry)	Sour milk	Fruits (mango and wild fruit)

Which three foods are responsible for most foodborne disease in Barotse?

Participant	1	2	3
Brian Kayula	Fish	Meat	Rice
Mulele Sibeso	Milk	Fish	Cassava
Maybin Mwangala	Fish	Sour milk	Fresh milk
Stephen Kunda	Cassava	Fresh fish	Beef
Mate Chuma	Fish	Milk	Meat (beef)
Gethings Chisale	Fresh fish	Beef	Green vegetables
Conrad Muyaulle	Milk (fresh and sour)	Pork	Beef
Mubiana Muyangwa	Mangoes/fruits	Vegetables	Salt
Gary Syatwinda	Beef	Milk (raw)	Mangoes/maize
Golden Ngandu	Milk	Fish	Vegetables
Ngula Mubonda	Sour milk	Mango and wild fruits	Pork

Which three high-risk foods have the greatest potential for improved hygiene (at production, storage, processing, preparation and cooking stages)?

Participant	1	2	3
Brian Kayula	Water	Fruits – Mango	Vegetables
Mulele Sibeso	Milk	Cassava, particularly when soaked in dirty water	Fish
Maybin Mwangala	Maize	Milk	Fish
Stephen Kunda	Fresh fish	Beef	Leftover food
Mate Chuma	Fish	Milk	Meat (beef, pork)
Gethings Chisale	Dried fish	Vegetables	Sour milk
Conrad Muyaulle	Milk	Mangoes	Pork
Mubiana Muyangwa	Water	Fruits	Mango
Gary Syatwinda	Fish	Beef	Mangoes
Golden Ngandu	Milk	Fish	Cassava
Ngula Mubonda	Sour milk	Fruits	Pork

Which three foods are responsible for most foodborne disease in children under five years of age?

Participant	1	2	3
Brian Kayula	Fish	Milk	Meat
Mulele Sibeso	Fish	Milk	Beef
Maybin Mwangala	Cassava	Fresh milk	Beef
Stephen Kunda	Porridge	Left-over food	Mangoes
Mate Chuma	Milk	Mango	Maize porridge
Gethings Chisale	Fresh milk	Porridge	Fish
Conrad Muyaulle	Milk	Cassava leaves	Eggs
Mubiana Muyangwa	Mangoes	Boiled maize	Left-over food
Gary Syatwinda	Mangoes	Boiled maize	Raw milk
Golden Ngandu	Milk	Fish	Cassava
Ngula Mubonda	Fruits (unwashed)	Milk	Cold food

Discussion

People in the communities largely eat what they grow although certain foods with commercial value are not eaten. For example, cattle are only eaten in the villages when they die or are unwell. Cattle are, however, sold to commercial abattoirs. Chickens are sold at markets but not eaten at home unless they die and cannot be sold; eggs similarly are not eaten as they could one day become a chicken. Foods thought to be high-risk and in need of attention are milk (raw and soured), fish (fresh and dried) and fruit and vegetables (mangoes in particular). Risks and consumption rates will vary with season. Reheated, undercooked and contaminated porridge fed to children was also a concern. There was also concern over beef fed to children as it was typically dropped on the floor and consumed regardless of hygiene; diarrhoea in children was thought to be a problem. Concerns were also raised about the consumption of dead animals.

Milk

Milk is consumed raw and soured. Raw milk is sometimes boiled. Sour milk is preserved and kept for several weeks. Milk is consumed at home, sold directly to local individuals by the farmer or sold at co-operatives or to traders.

There were uncertainties over effectiveness of souring in controlling microbes. It would be interesting to profile the physical, sanitary and microbial risk profile of milk from production to souring. Sour milk is widely consumed in Africa and elsewhere. Flies, hygiene (holding containers washed in contaminated water, for example) and storage were also thought to be issues.

Fish

Fish is eaten in large quantities and is sometimes deliberately allowed to rot as part of the preparation process (bubble fish). Like milk, the time between harvest and sale and consumption can be very long (10 to 15 hours between harvest and landing is not unusual). Chemicals used to catch and preserve fish are also a concern. Oil repeatedly applied to fish in markets to improve its appearance was also a concern. People typically pay more for dried fish although it is considered a poor man's food. Fishers and traders prefer to sell fish as soon as possible; sometimes they may be unaware of or unable to access markets with better prices. Prospects for fish farming were briefly discussed but were inconclusive.

Animal-derived food operators

Dairy co-operatives in Tukongoti, Mongu and Senanga (visit to Senanga on 5 February 2015)
Abattoirs: Dagon Springs, Zambeef, Star beef and Nasla (visited on 5 February 2015)

Future plans

It was suggested that future stakeholder meetings include representatives from the private sector, including abattoirs, market traders, as well as representatives of the Department of Health and communities (who were invited but unable to attend). A large meeting with many stakeholders was not seen as an effective way of discussing food safety. Individual bilateral workshops could be an effective way of promoting dialogue between stakeholders with difficult relationships.

Legislation of food safety and hygiene left aspects open to interpretation. As a result, there are regular disputes about which department is responsible for certain tasks, for example, over meat inspection, although this is less of an issue in Western Province where veterinarians are present in abattoirs for inspection for contagious bovine pleuropneumonia. In addition, certain tasks are ignored by all parties and slip through the gaps, particularly in rural areas. Environmental Health Technologists under local councils often have a reactive approach rather than preventative.

Community visits

The purpose of the community visits was to convey information about the proposed AAS food safety work and obtain feedback and guidance on activities.

Lealui

Main issues

- Milk and fish preservation and safety
- Sanitation during the flood season

Mwansa Songe and Theo Knight-Jones visited this community with Minke Stadler from Wageningen University who had worked closely with the community, a translator and a community extension officer from the Ministry of livestock (Adrian Mususuka).

The proposed food safety work was introduced as outlined in the activity plan, that is,

- Prioritisation based on (1) food sampling and microbiological testing, (2) stakeholder, expert and community discourse and guidance and (3) value chain risk mapping
- Evaluation of simple interventions to improve food safety for prioritized foods and settings

Discussion

The sanitation of toilets was a concern particularly at flood time (December to June) when people would excrete and draw water from the same flood waters, and latrines would also flood. Most villages had cattle and sold milk daily to the co-operative in Mongu, a two-hour bicycle ride away. Some would milk as many as 100 cattle. Time from milking to refrigeration at the dairy co-operative is a concern, as is general milking hygiene. Fish was also mentioned as an important high-risk food. The importance of proper cooking, cross-contamination, clean water and hand washing were discussed.

Nembwele, Sifuna and Nalitoya (not on flood plain)

Main issues

- Mango and milk safety/preservation
- Lack of protein in diet
- Productivity (milk, calves and chickens)
- Newcastle disease
- Consumption of dead animals


People associated blindness with regular consumption of fish. Apparently, there are many blind people in some parts. It was not known if river blindness is a problem in the area, although this is transmitted by simulean flies living near fast flowing water, not from consumption of fish.

Mangoes were reported as causing disease; malaria (maybe due to greater exposure when picking mangoes, time of year or just confusion) was mentioned by communities as was diarrhoea. Villagers eat large amounts of mangoes during the mango season and would like a way of preserving them (potted fruit or dried are options). Issues include general sanitation, cross contamination of raw mangoes, cleanliness of mangoes when picked and harvest hygiene. A similar concern was raised for vegetables including relish (anything eaten with *nshima*, including meat).

Villages have fresh milk when cattle leave the flood plain in February to July. Few own cattle, and those that do sell fresh milk directly to neighbours. Sour milk was preferred over fresh milk because of taste. Some do not like the taste of heated milk. George the community facilitator was the only one out of roughly 15 participants to own cattle (50 heads) and would sell five litres of milk a day; some customers would then re-sell the milk as sour milk. George also produced about 5–10 calves a year.

Someone questioned the safety of smoking of fish.

Most own chickens (40 per household) although recent mass mortality from Newcastle disease (called *Kakuto*) killed 95% (starting September–October 2014 and ongoing). Villages knew little about chicken health/medicine, despite its importance as a source of income (15 to 40 Zambian kwacha [ZMW] per bird at market, sold in Senanga). More was known about cattle health (fluke treatment given every six months). Eggs were seldom eaten (possibly when someone was sick) as an egg could hatch into a more valuable chicken.

The six foods mostly consumed (in terms of quantity and frequency) were *nshima*, rice, sweet potatoes, cassava, *malaka* (squash/pumpkin) and wild fruits. Chickens and cattle were only eaten

when they died of disease (even cattle that died of anthrax). Animals were sold for slaughter to generate income.

Community members reported that the consumption of dead animals was not nice or safe but was worth it. People did become sick and one person died in recent times from this practice. Animals that died of anthrax are boiled for a long time and not roasted. Extended cooking was known to be sensible to improve food safety.

The villages had a good water supply although some reports of dirty water were raised about Sifuna village. Toilet collapse was another problem.

Liangati Health Centre

This is a small rural health clinic run by a nurse (Simutonga Mulala) and community helpers.

Main issue: Follow up on foodborne and diarrhoeal disease burden data

Diarrhoea was a common problem, particularly in children and especially in the rainy season due to inadequate toilet facilities and poor water sanitation and food hygiene (contaminated milk and fish were mentioned as important causes). The United Kingdom charity Village Water was working in this area to set up boreholes. The chlorination of water was being promoted.

All cases were classified and reported to the district. Data were then aggregated and reported upstream. Diarrhoea was included as a disease category which may signify foodborne disease burden (contact John Mutukwa for more details of Senanga district disease data).

Senanga Dairy Co-operative

Livestock officers Mulako Munalula and Crispin Mweemba were present.

Main issues

- How safe is fresh and sour milk?
- Options for preservation, including pasteurization
- Shelf-life

The co-operative has 72 members (only 30 supply milk). Members get a better milk price. Most travel up to 10 km (one hour by bicycle) to deliver milk in 20-litre plastic bottles (metal containers reported

as used in Lealui). Bottles were cleaned by the co-operative on delivery of milk. Farmers have 3–40 head of cattle (average 20). The vice-secretary Imata Namunda has 19 head of cattle and takes 30–60 minutes for milking; the average milk yield is 1.5 litres per cow. On Sundays, no deliveries are made and milk is consumed at home. Fresh milk for home consumption is first boiled as refrigeration is not available.

The co-operative buys fresh milk at ZMW 3.15 and sells at ZMW 5 per litre. When the milk arrives at the co-operative, a trained operative uses a lactometer to test it for water content and alcohol to test for sourness (going off); milk that fails the latter test is sold as sour milk. Farmers should not bring sour milk. Sour milk is more popular. Fresh milk can be kept refrigerated for up to eight days. Sour milk is kept refrigerated for up to one week. Whey is not drained; consumers prefer whey (*toya*) to be drained. Milk is passed through a filter. Milk is sold to individuals for own consumption rather than resale.

In the rainy season, supply of milk outstrips demand (more grass results in greater production, although some people move cattle to grazing points that are too distant—20 km away—to deliver milk to the co-operative). Price may be changed accordingly. Because the co-operative no longer does door-to-door sales, consumers prefer to buy milk locally as they have the right sort of sour milk which is cheaper and more convenient. The co-operative does not pasteurize milk (to our surprise, the local District Livestock Officer reported there was no bovine tuberculosis or brucellosis but that specific surveillance was not performed).

Prices of milk were ZMW 5 per litre at the co-operative, ZMW 14 per litre at the supermarket (pasteurised milk) and ZMW 14 per litre when bought directly from local producers.

The 1500-litre milk cooler was not turned on and was 80%-full of sour milk which must have been there for a very long time. No cold storage appeared to be available.

The co-operative, which was situated on the edge of the town, had an outlet in town. Funding was from the Golden Valley Agricultural Research Trust and the European Union. The co-operative no longer received external funding and appeared to have difficulties.

Nasla halal beef company abattoir, Senanga

Main issues

- What level of contamination exists?
- Can fly control be improved?
- Improving the quality of cattle supplied
- Liver rejection rates and wastage

The abattoir was started in 2009 and is run by lady of Somali origin together with her family. It is competently run. The quality of cattle supplied was an issue; some were emaciated on arrival. Three options for supplied cattle are: (1) bought on dead weight if suitable for immediate slaughter, (2) bought on live weight if finishing required and (3) held at the abattoir until fit for slaughter and a customer is available and paid at that point.

The price is negotiable (unlike Zambeef). Zambeef Senaga recently closed. A veterinary inspector is always present during slaughter. Some meat is sent to Lusaka market for major supermarkets. The premises are inspected by purchasers from Lusaka.

Cows for slaughter are inspected by the local veterinary officer and rejected if sick or pregnant. The upcoming slaughter is then registered with local police and a three-day wait at abattoir follows due to incidence of cattle theft. The animal is then inspected again at the point of slaughter.

Most cattle not branded but recognized on sight. Slaughter takes place approximately twice a week (not on the day of our visit). Meat is kept for 24 hours in cold room; they have their own butcher. There is also an open-air feedlot and hay production; cattle are finished for 90 days outside the rainy season. The abattoir had an independent water supply and power source. Water quality was not investigated.

Ninety percent of livers were condemned. The price of liver was ZMW 22 per kg; at 8 kg per liver, this translates to ZMW 176 per liver. Condemned meat is incinerated.

The range of live weight of cows is 200–500 kg with an average of 350 kg. On average, one cow yields 120 kg dead weight. The abattoir pays ZMW 16 per kg of meat, which translates to ZMW 1900 per cow.

There is no meat grading and the same price per kilogram is charged for all (differential price apparently would cause uproar but might promote better quality). Many farmers keep cattle for numbers rather than to have good quality animals; many farmers have simple lives but would be extremely wealthy in terms of cattle.

Flies were reported to be a problem in the abattoir and the butcher shop. Maggots were reported at other abattoirs.

Agriserve/Musika veterinary supplies outlet is on the same site; they rent the shop from Nasla.

Annex: Additional notes from food safety meeting discussions on 4 February 2015

What are the five mostly eaten foods?

- Cassava: Eaten raw, cooked and made into meal
- Local vegetables, for example, hibiscus (*sindambi*), sweet potato leaves and cassava leaves
- Eggs: Mostly eaten in urban areas; people in rural areas allow the eggs to hatch
- Fish
- Fresh or sour milk

Three foods responsible for most foodborne diseases

- Fresh milk: Contamination is due to handling and sanitation, for example, flies sit on the milk. Bacteria can also be found in sour milk because they have different survival environments. Even sour milk can cause foodborne diseases but fresh milk is has the highest risk. Most people prefer sour milk to fresh milk.
- Fish: Most fishers do not have cold storage facilities from the river to the point of sale. Dry fish is also a risk because sellers sometimes add chemicals such as 'doom' to increase shelf-life which may be harmful upon consumption. They also polish the fish with cooking oil which causes rancidity.
- Beef: In rural areas, only a sick cow is slaughtered and a dead cow will be eaten or the meat sold to local people. People buy this kind of meat because it is cheap. Environmental health technicians, through the council and Ministry of Local Government, can be empowered to assist the veterinarian in sensitizing the local people about the effects of eating such meat. Environmental health technicians and veterinarians should be able to work hand in hand.

Certain foodborne diseases are seasonal, for example, people consume a lot of mangoes during the rainy season and will not usually wash them before consumption. Cooked maize consumed during the same season may cause diarrhoea; traders will cook fresh maize for sale and any unsold maize at the end of the day is boiled again and sold the following day.

High-risk foods with greatest potential for improved hygienic storage, preparation, processing or production

- Milk
- Fish
- Beef

Three foods responsible for most foodborne diseases in children under five years of age

- Porridge: Usually due to poor hygiene, whereby caregivers may not cover the porridge of the child but keep it for the next feed
- Milk
- Mangoes

Beef: Children will usually play with a piece of chicken or beef after a meal and even when it drops on the ground, they will still pick and eat it.