



SEASONAL FOOD

AVAILABILITY

Barotse Floodplain System

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Introduction

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) is being implemented in ten communities in the Barotse floodplain in Zambia's Western Province. The objective of the AAS program is to reduce poverty and improve food security by harnessing the potential, productivity and diversity of aquatic and agricultural systems.¹ Within the Barotse floodplain, the program aims to improve the productivity and diversification of aquatic agricultural management practices in order to make better use of seasonal flooding patterns and natural resources and improve the livelihoods of the poor and vulnerable.²

An understanding of the food and nutrition security situation in the Barotse floodplain is essential to supporting the AAS program objective. Food availability in the Barotse is highly seasonal and is especially limited during the hunger season, which lasts from August or September to January. During this time, as food shortages increase, food and nutrition insecurity become more severe.³ Exploring the links between biodiversity and diet diversity within the floodplain allows the identification of entry points for sustainable and diverse diet options. Participatory action research (PAR) was therefore conducted between 2014 and 2015 in the ten AAS communities to identify the available food items within the communities and observe patterns in temporal changes of food availability. This narrative provides an explanation of how that research has been conceptualized/envisaged in the form of one all-inclusive seasonal food availability calendar of the AAS Barotse floodplain communities, and discusses trends in food availability across the communities.

Methodology

PAR was conducted in the ten AAS communities to create seasonal calendars that captured the temporal changes in food availability. Focus groups were formed in each community to complete the seasonal calendars. The selection of community members was undertaken by AAS community facilitators who identified individuals with an interest in participating in a nutrition-focused program. Separate women and men focus group discussions were held in each community to promote participation of all community members and to identify differences in perceptions of food availability between women and men. Each group was composed of 10-15 individuals. The participants were asked to list all the food items available for consumption in the community and to specify the months that each food item is available. Participants also specified the levels of availability each month. Degrees of availability included: not available, low availability, medium availability and high availability.

In total, eight seasonal calendars were developed in AAS communities. Seasonal calendars were developed in Lealui, Mapungu and Nalitoya from July to August 2014. Due to the proximity and the same food availability of the three AAS communities in Senanga, community members from Nalitoya, Nembwele and Sifuna jointly participated in the creation of the seasonal calendar in Nalitoya. Seasonal calendars were developed in Kabula and Kapanda in November 2014, in Situlu in December 2014, in Nanikelako in April 2015 and in Mwandu in May 2015.

The food items listed in each seasonal calendar were organized into three primary food categories based on nutrition materials used by the Ministry of Agriculture and Livestock: energy (*ze fa maata*), protective (*silelezo*) and body-building (*ze yaha mubili*). Protective was divided into the sub-categories of vitamin A-rich foods (*lico ze nani vitamin A*), dark leafy greens (*miloho ye butala*) and other vegetables and fruits (*miloho ni litolwana zemu*). Body-building was divided into the sub-categories

¹ CGIAR Research Program on Aquatic Agricultural Systems, 2014

² Longley & Thilsted, 2012

³ Baidu-Forson, Phiri, Ngu'ni, Mulele, Simainga, Situmo, Ndiyoi, Wahl, Gambone, Mulanda, & Syatwinda, 2014

of animal-source food (*lico ze fumaniwa kwa lifolofolo*) and legumes, beans, seeds and nuts (*manawa, ndongo*).

Following the completion of the community seasonal calendars, one comprehensive, all-inclusive calendar was created to illustrate the availability of food within the Barotse floodplain. First, all the food items mentioned across the ten communities were organized in one excel worksheet based on the categories described above. Under each food item, the availability of that food was inserted for each community across the months of January to December. Figure 1 displays the first step in creating the all-inclusive calendar for maize.

Figure 1. AAS seasonal food availability calendar: Step 1

English/Lozi		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rain/Pula					Ends						Starts		
Food/Lico	AAS community												
Maize/Mbonyi	Kabula												
	Kapanda												
	Mapungu												
	Mwandi												
	Lealui												
	Nanikelako												
	Situlu												
	Nalitoya, Nembwele & Sifuna												

Not available	Low availability	Medium availability	High availability
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In some cases, the availability of a food item was fairly similar across communities or was only mentioned in one or two communities. In other cases, the availability of a food item varied significantly across the communities. In order to depict the availability of a food item across all communities in one calendar, despite differences observed, the next step involved giving number values to each level of availability and then taking the average value of availability for each month. “Not available,” displayed in white in the calendar, was given the value of 0; “low availability,” displayed in light green, was given the value of 1; “medium availability,” displayed in green, was given the value of 2; and “high availability,” displayed in dark green, was given the value of 3. Figure 2 illustrates how numerical values were given and how the average numerical value for availability was calculated per month across the communities. The average values were rounded up to determine the level of availability of the food item each month (for example, 2.5 was rounded up to 3, or to “high availability”).

Figure 2. AAS seasonal food availability calendar: Step 2

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
English/Lozi													
Rain/Pula					Ends						Starts		
Food/Lico	AAS community												
Maize/Mbonyi	Kabula	2	3	3	3	3	2	1	0	0	0	0	0
	Kapanda	2	1	1	2	2	3	3	0	0	0	0	2
	Mapungu	2	2	3	1	1	1	1	1	1	1	1	1
	Mwandi	1	2	2	2	1	0	0	0	0	0	2	3
	Lealui	3	3	3	2	1	1	1	1	1	1	1	3
	Nanikelako	2	2	3	2	1	0	0	0	0	0	1	3
	Situlu	1	3	3	3	2	2	2	1	1	1	1	1
	Nalitoya, Nembwele & Sifuna	2	2	2	2	1	1	1	1	0	0	0	2
	AVERAGE	1.875	2.25	2.5	2.125	1.5	1.25	1.125	0.5	0.375	0.375	0.75	1.875

Next, the availability of each food item per community was removed and only the average availability across the ten communities remained. This left a more condensed illustration of the availability of each food item, as seen in Figure 3.

Figure 3. AAS seasonal food availability calendar: Step 3

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lozi	English												
Pula	Rain				Ends						Starts		
Lico	Food												
Mbonyi	Maize												

All 127 food items were then organized based on the food group and sub-food group previously mentioned. Within each group or sub-group, the food items were ordered depending on the frequency with which they were mentioned across the ten communities. For example, those that were mentioned by all communities were listed first within the appropriate food group and those mentioned by only one or two communities were listed last. This last step resulted in the final seasonal food availability calendar for the AAS hub, which can be found in Annex 1.

Discussion

The availability of certain food items across the ten communities varied greatly in terms of time periods and degree of availability; in other cases, food availability trends were generally similar across the communities. The following discussion highlights patterns in availability among the primary food items.

Energy

Maize, rice and cassava, three main staple crops, were discussed in all communities during focus group discussions. However, the availability of these crops varied among the communities in terms of time periods and intensity. For example, maize is available year-long only in Mapungu, Lealui and Situlu. The remaining communities mentioned a lack of availability around September and October, with Mwandi and Nanikelako experiencing the longest period without maize (5 months). Although patterns

of rice availability are generally the same across all communities, Mwandu and Lealui experience longer periods of availability. Cassava shows varying levels of availability across the communities. Kabula, Kapanda, Mwandu, Nalitoya, Nembwele and Sifuna have higher levels of cassava availability throughout the year compared to Mapungu and Lealui, where the crop is also available all year-long, but with lower levels of availability. Nanikelako and Situlu are the only communities to experience long periods of time (9 months) without cassava.

Other grains discussed in the communities included pearl millet, sorghum, finger millet and wheat. Pearl millet and sorghum were not mentioned by community members in Nanikelako or in Situlu. Pearl millet is generally available between March and June, with Kabula, Mwandu, Nalitoya, Nembwele and Sifuna experiencing longer periods of availability than Kapanda and Mapungu. Finger millet was only mentioned in the Senanga communities and wheat only in Lealui.

The availability of “malaka,” a white or yellow squash, was discussed in all the communities, showing various degrees of availability across the communities. “Malaka” is generally available during the same time period in Kabula, Kapanda, Mapungu, Mwandu and Situlu, starting at the end of the year and lasting into the beginning of the year. However, it is available all year round in Lealui and in the Senanga communities. In Nanikelako, it is available only mid-year, which is different from all other communities. Sweet potato was mentioned in all communities, except Kabula. The availability of sweet potato also differed across communities, where it generally lasts for the same amount of time in Kapanda, Mwandu, Nanikelako, Nalitoya, Nembwele and Sifuna (5-6 months) but is available for longer periods in Situlu (8 months) and Mwandu and Lealui (12 months). The level of availability is also higher in Lealui than in Mapungu.

Other energy-dense foods discussed included Livingstone yam, “mampana” (potato-like food found in water), and Irish potato. These items, which were not discussed in all communities, have varying levels of availability among the communities. The two types of sugarcane mentioned, “nswe” and “mushati,” both have similar patterns of availability across the communities.

Protective

Vitamin A-rich food

Pumpkin and mango were discussed in all communities. While the availability of pumpkin lasts for similar periods of time across the communities, it varies in terms of degrees of availability. For example, Kabula, Mwandu, Lealui and Situlu were the only communities to mention that pumpkin is highly available during certain months. “Mupusi”, an orange squash, and paw paw were mentioned by most communities and show similar patterns of availability across communities. However, “mupusi” is available for a longer period of time in Kabula, Mwandu and Situlu. Additionally, only in Mapungu is paw paw available all year (but at a low level). Carrot was only mentioned in Lealui and Nanikelako.

Dark leafy greens

Pumpkin leaves, amaranth, hibiscus, cat’s whiskers, and rape were discussed in all communities while cassava leaves and sweet potato leaves were discussed in most. Bean leaves were mentioned in only Mwandu and Nanikelako. Pumpkin leaves, sweet potato leaves, cassava leaves, bean leaves, amaranth, hibiscus and cat’s whiskers all exhibit very similar patterns across the communities in which they were discussed, with high levels of availability lasting from November/December to January/February. Pumpkin leaves, sweet potato leaves and cassava leaves are generally available for longer periods of time throughout the year; in some communities, sweet potato leaves and cassava leaves are available all year long.

Rape is the only dark leafy green that has availability that greatly varies across the communities. It is available all year in Kalabo, Lealui, Situlu, Nalitoya, Nembwele and Sifuna, but at different degrees of availability. The availability of rape in Kabula and Kapanda is the opposite of that in Nanikelako, which is the only community in Mongu district that does not have year-long availability of rape.

Other vegetables

The availability of many other vegetables varies across the communities. Cabbage, which was discussed in all the communities, is available all year in Mwandu (in small quantities), for longer periods of time in Mapungu (9 months) and Nanikelako (8 months), and then for short periods that differ among the remaining communities. Chinese cabbage also experiences highly differing periods and degrees of availability among the five communities in which it was discussed, as does tomato, which was discussed in all communities. African eggplant shows similar patterns of availability in Mwandu, Lealui and Nanikelako. However, it is available for the opposite period of time in Kapanda than in Mwandu, Lealui and Nanikelako, and available all year round in the Senanga communities. Only communities in the Kalabo and Mongu districts mentioned eggplant, however the period of time in which eggplant is available in the Kalabo communities is the opposite of that in which it is available in the Mongu communities.

Overall, the availability of onion, okra and mushroom types is similar across the communities. Onion is available all year in almost all communities, except Kapanda. Green pepper was only discussed in Lealui and Nanikelako, and green beans only in Lealui.

A variety of wild vegetables is also available throughout the communities, but generally for short periods of time. Mapungu was the only community in which focus groups did not mention wild vegetables.

Other fruits

Guava, which was discussed in all communities, has similar availability across the communities. Watermelon, in contrast, varies in availability. It is available for the longest periods of time in Mapungu and Mwandu (8-10 months). The periods of watermelon availability are fairly similar in the communities in Mongu and Senanga; however, this period of availability is the opposite of watermelon availability in the Lukulu communities. Banana was only discussed in Mapungu, Lealui, Situlu, Nalitoya, Nembwele and Sifuna. It is available all year in Mapungu, Nalitoya, Nembwele and Sifuna, but with lower availability than in Lealui and Situlu. Orange, which was only discussed in Kapanda, Mapungu, Lealui, Nalitoya, Nembwele and Sifuna, is available for a longer period and with higher availability in the Senanga communities. Likewise, "nati," a variety of orange, was only discussed in the Senanga communities. Lemon and pineapple were mentioned in few communities, including those in Senanga. It therefore appears from the research that more varieties of fruit are available in the communities in Senanga (Nalitoya, Nembwele and Sifuna). Forty different types of wild fruits were mentioned throughout the communities, but more so in Mapungu, Mwandu and Kabula, and especially in Kapanda.

Body-building

Animal-source food

Fish was discussed in all communities. In Kabula, Mapungu, Mwandu and Nanikelako, community members mentioned that fish was available all year, despite the fishing ban that lasts from December to March. This is likely due to the practice of illegal fishing. The levels of fish availability vary across the communities, with particularly low availability in Mapungu. Chicken, duck, cow, pig, goat and eggs are available all year across the communities, but generally with "low" availability. Besides Situlu and

Nanikelako, all other communities defined the availability of chicken and duck as “low.” Similarly, Situlu was the only community to define the availability of cow and pig as “high.” Community members in Nanikelako were also the only ones to define the availability of eggs as “medium” and not “low.” Assuming no errors were made in data collection and the research methodology remained the same across the communities, this information indicates that community members in Nanikelako and Situlu have higher levels of animal-source protein available to them.

The availability of sour and fresh milk was similar across the communities, with higher levels of availability from September/October to January/February. Caterpillars as a source of food were only mentioned in the communities in Kalabo and Senanga while termites and wild rats were only discussed in the Kalabo communities. Community members in Mwandu were the only ones to discuss the availability of bird, impala, hare, African bush squirrel and mole as food items.

Legumes, beans, seeds & nuts

The availability of groundnut varies among the communities. It is available all year in Lealui, during the same time period in the communities in Lukulu and Senanga (March to July) and during a similar time period in Mwandu and Nanikelako (November to March). The period of groundnut availability in Mwandu and Nanikelako is opposite to that of the communities in Lukulu and Senanga. The availability of Bambara groundnut does not greatly vary across communities. Cowpea is available all year only in Lealui. It is available for similar time periods in communities in Lukulu and Senanga, and similar periods in Mwandu and Nanikelako. Cashew nut was only discussed in the communities in Kalabo. “Muzauli” (edible red seed from African rosewood), “mungongo” and “ndungunyu” (seeds used to make cooking oil) were mentioned during focus group discussions in few communities.

Conclusion

The research and focus group discussions on seasonal food availability have provided a greater understanding of the type of food items available in the AAS communities and how food availability changes throughout the year. Community members’ identification of the period of time in which hunger and food and nutrition security are particularly intense also illustrates when communities need particular attention in terms of interventions and programs. Furthermore, the discussions allowed for open participation among community members, fostering communication about ways to improve nutrition when food becomes less available.

The household diet within the Barotse floodplain is similar to the Zambian diet, which consists of a large quantity of energy-dense foods mostly in the form of nshima, a stiff porridge from varying grains and tubers, and has little variety in terms of nutrient-rich foods. It therefore lacks the essential nutrients needed to sustain good health and that are especially important for women during pregnancy and lactation, and children for growth and development. The developed seasonal food availability calendars help to identify opportunities to increase the accessibility and consumption of micronutrient-rich foods, particularly of fish, green leafy vegetables and fruits, to improve food and nutrition security in the Barotse floodplain.

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Annex 1. AAS SEASONAL CALENDAR

AAS communities of Kabula, Kapanda, Mapungu, Mwandu, Lealui, Nanikelako, Situlu, Nalitoya, Nembwele and Sifuna

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Lozi	English											
		Pula				Ends						Starts		
		Lico	Food											
ZE FA MAATA (ENERGY)		Mbonyi												
		Siloto												
		Mwanja												
		Mauza												
		Mabele												
		Lukesha												
		Buloto												
		Malaka												
		Sikuswani												
		Mampana												
		Nswe												
		Mushwati												
	lico ze nani	Ngulu												
SILELEZO (PROTECTIVE)	vitamin A	Namundalangwe												
	(vitamin A rich food)	Mupusi												
		Mango												
		Simpubila												
	miloho ye butala hahulu	Mangambwa												
		Kalembula												
	(dark leafy greens)	Shombo												
		Matali a manawa												
		Libowa												
Tepe														

		Sindambi/Mundambi	Hibiscus	■	■	■	■	■	■	■	■	■	■	■	■		
		Sihali	Hibiscus	■												■	
		Sishungwa	Cat's whiskers or African cabbage	■	■	■					■	■	■	■	■	■	
	Lepu	Rape	■	■	■	■	■	■	■	■	■	■	■	■	■		
	miloho ni litolwana zemu (other vegetables & fruits)	Kabichi	Cabbage	■													
			Chinese cabbage	■	■												■
		Matamakisi	Tomato	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Nyanyisi	Onion	■					■	■	■	■	■	■	■	■	■
		Delele	Okra	■	■	■											■
		Lunembwe, delele yasintu	Wild okra	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Impwa	African eggplant	■	■	■											■
		Malembeka	Eggplant	■													■
		Mbowa	Mushroom	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Silutoko	Mushroom	■	■	■											■
		Bionde	Underground mushroom		■	■	■	■	■	■	■	■	■	■	■	■	■
			Green pepper	■													■
			Green beans														■
		Molinga	Moringa														■
		Nasilele	Wild vegetable	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Mbububu	Wild vegetable	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Litokola	Wild vegetable	■													■
		Katete Kalunda	Wild vegetable	■													■
		Litindi	Wild vegetable														■
		Mambumbwe	Wild vegetable														■
		Mucelo	Wild vegetable	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Matali a Mulobeni	Wild vegetable	■													■
		Kanyo kamulamu	Wild vegetable	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Samutonga	Wild vegetable														■
		Seto	Wild vegetable	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Ndulweti	Wild vegetable	■													■
Kwaba		Guava	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Mahapu	Watermelon	■													■		
Makonde	Banana	■													■		

Olonji	Orange													
Nati	Small orange variety													
Lemoni	Lemon													
Macamu	Pineapple													
Mahuluhulu	Corky bark monkey orange													
Manganda	Fruit from African palm tree													
Mubuyu	Fruit from Baobab tree													
Mungwinji	Wild fruit similar to coconut													
Mubula	Wild fruit													
Namulomo	Wild fruit													
Mambongo	Wild fruit													
Mahwahwa	Wild fruit													
Mumosomoso	Wild fruit													
Mumawa	Wild fruit													
Mulolo	Wild fruit													
Muhamani	Wild fruit													
Mubilo	Wild fruit													
Mashela	Wild fruit													
Mukasa	Wild fruit													
Muchinga chinga	Wild fruit													
Malaho a mufumali	Wild fruit													
Mutumbulwa	Wild fruit													
Mukekete	Wild fruit													
Linjefu	Wild fruit													
Mutoya	Wild fruit													
Maoma	Wild fruit													
Maoyongo	Wild fruit													
Mbundaina	Wild fruit													
Mucence	Wild fruit													
Mukulikuli	Wild fruit													
Mambole	Wild fruit													
Maliwa	Wild fruit													

(legumes, beans, seeds & nuts)	Manawa	Cowpea													
	Simbangala	Cashew nut													
	Muzauli	Edible red seed from African rosewood													
	Mungongo	Nut used to make cooking oil													
	Ndungunyu	Small nut used to make cooking oil													

SISUPO (LEGEND):	
	Hakuna (not available)
	Ka bunyinyani (low availability)
	Ka buñata nyana (medium availability)
	Ka buñata (high availability)

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