Working Paper on Social-Ecological Resilience Series
No. 2012-018

Consumption Smoothing and the Role of Wild Food Items in Rural Zambia

By

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Vulnerability and Resilience of Social-Ecological Systems

RIHN Research Project E-04

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Abstract

The objective of this study is to investigate how farmers smooth their consumption against fluctuating agricultural income, focusing on the composition of consumption and the role of wild food items. We use household survey data collected over a 2-year period from November 2007 to October 2009 in rural Zambia, in which extremely heavy rainfall in December 2007 caused a significant negative shock in agricultural production, the most important income source of the farmers in the study site. We find that farmers smoothed their consumption levels of staple foods, but did not smooth those of animal and fish products, processed non-staple food, and non-food items. It means that farmers used the latter as buffers against fluctuating income. Cash purchases of staple foods, and the receipt of staple foods as gift and food aid played a critical role in smoothing consumption levels of staple foods. Wild food items collected from the bush were also important in consumption smoothing complementary to purchased, gifted, aided staple foods.

Key words: Consumption Smoothing, Agricultural Production Shock, Wild Food Items, Food Aid, Zambia

要約

この研究の目的は、農業収入の変動に対して農民がどのように消費を平準化しているかという点について、消費の内訳や野生食物の役割に焦点をあてて解明することにある。本稿では、2007 年 11 月から 2009 年 10 月の 2 年間にわたりザンビアの農村で集めた家計調査データを利用する。調査期間中の 2007 年 12 月に非常な豪雨が発生し、調査地の農家にとってもっとも重要な収入源である農業の生産が顕著に減少した。分析の結果、農家は主食の消費水準を平準化していたが、動物・魚介類、主食以外の加工食品、非食料の消費は平準化していなかった。このことは、農民は後者を収入変動の際のバッファとして使っていることを意味する。現金による主食食料の購入、贈与や援助による主食食料の受け取りも主食消費の平準化に不可欠の役割を果たしていた。野外で採取した野生食物は、購入食料、贈与食料、援助食料などと補完的に食料消費の平準化に重要な役割をしていた。

キーワード：消費平準化、農業生産ショック、野生食物、食料援助、ザンビア

1. Introduction

Most rural farmers in developing countries depend on agriculture as their main income source and face a number of income risks due to unstable production. But they have developed a variety of strategies to mitigate these risks, including the diversification of income sources, risk-sharing with friends and relatives, and settlement in perceived safe areas (e.g., Fafchamps, 2003). From the viewpoint of economics, farmers will improve their welfare if they can smooth their consumption levels against the fluctuating income. However, changes in overall consumption and its component parts are themselves important strategies to manage unexpected income fluctuations. Although consumption levels do not appear to be smoothed by such strategies, it is possible for farmers to improve their welfare. Nevertheless, the existing literature provides little empirical evidence regarding the changes that farmers make to their consumption to mitigate income shocks during and after a shock event. One explanation for the lack of evidence is a lack of available data to enable such an empirical study. Particularly, with respect to the use of wild foods after a production shock such as drought and flood, although it has been described a lot by anthropologists, it has seldom been to a subject to empirical economics.

The aim of this study is to provide empirical evidence of the change of consumption composition including wild food items as a farmers' coping strategy against fluctuating income. To do so, we use household panel data collected over 2-year period in a rural area in Southern Province, Zambia. The panel data were constructed based on weekly household interview throughout the survey period from November 2007 to October 2009. One of the important components of the weekly interview is household consumption. Just after the survey started, an extremely heavy rainfall took place in the study site in December 2007 and caused a significant shock in agricultural production, thereby providing us with a rare opportunity to investigate how farmers adjust consumption when they experience income fluctuations.

2. The Data and Methodology

The data used in this study were collected as part of the Resilience Project of the Research Institute of Humanity and Nature. The Project identified three sites for its household survey in Southern Province, Zambia, the most drought-prone zone in the country. The three sites are located along the slope adjoining Lake Kariba within a 15-km radius and are agro-ecologically distinctive (Sakurai, 2008). Site A is located on the lower terrace of the slope on the lakeshore (elevation 500 m above sea level [asl]); Site C is on the upper terrace of the slope on the southern edge of the Zambian plateau (elevation 1050 m asl); and Site B is located on a hillside between the other two (elevation 850 m asl). Based on a village census conducted before the rainy season in 2007, 16 sample households in each site, 48 in total, were selected for household survey randomly from the list stratified by their plot location in their villages (Sakurai 2008). The household survey consisted of three components: (1) weekly interviews of members of the sample households including consumption and expenditure, (2) weekly or monthly anthropometric measurements of the household members, and (3) daily rainfall measurements at the plot level. The interview was conducted every week by an enumerator, using structured questionnaires to obtain information about household agricultural production, income, consumption, and time use (Sakurai 2008). The data collected from November 2007 to October 2009 were utilized for the analyses.

The weekly interview recorded the amount and the estimated value of all the food items consumed by the sample households and the expenditures for all the non-food goods and services purchased by the sample households during the week precedent to the interview. Note that the food items include not only those purchased but also those self-produced, gifted and collected from the bush, while the non-food items are only purchased. The values of self-produced or collected food items are estimated by us based on the estimation done by the respondents and the local market prices collected by the survey. For this study, all the items were categorized into five categories: namely staple foods, vegetables and fruit (including those collected from the bush), animal and fish products (including those caught in the bush and water), processed food excluding staple food, and

non-food goods and services. Then, the values of all the items were aggregated for each category at the household level for each week, and divided by adult equivalent size of household (the weight for children at and under the age of 12 is one third of adult). The value of household consumption of five categories of items per week per adult equivalent were then averaged for each month, and deflated by a site-specific monthly price index created based on observed prices at the local market and consumption baskets at the study sites. Thus, we obtained series of real value of weekly consumption of five categories of items covering each month of the 2-year period for each household.

3. Results and Discussion

3.1. Overall seasonal consumption change

Table 1 shows the average consumption level per week per adult equivalent for the five consumption categories and total consumption over the 2-year period for each site. Real consumption per adult equivalent was highest at site B and lowest at site A. Average food consumption ranged from 82.5% to 89.0% of total consumption at the three sites, with the remainder going to the non-food categories, i.e. household goods and services. Although site C did not have the highest total consumption, its consumption share for non-food items was the highest of the three sites.

According to the census of the three sites done as a preparation for the survey, all the households in the study site depended on agriculture as their main income source and less than 5 percent of adult people were engaged in non-agricultural job as a secondary income source in the agricultural year of 2006/07, one year before the survey started (Sakurai, 2008). We could confirm that the main income source of the sample households was also agriculture and hence most of the household income was obtained at the time of harvest, which is in March and April (authors' calculation, unpublished data). Of course, the harvest is only in-kind income, and cash income of sample households depends on when they sell the harvest as well as how they make necessary cash

through employment, asset (mainly livestock) sales, receiving gifts and aids, and so on. In addition, an extreme heavy rainfall took place in the study site in December 2007 (Kanno et al., 2011) and caused a significant reduction of crop production at the harvest time of 2007/08 crop year (Sakurai et al., 2011). In spite of such factors causing fluctuation of monthly income, weekly consumption level of each month appears to be smoothed except for the post-harvest period of 2008/09 crop year at site C (Figure 1). However, the weekly consumption for some of the subcategories seemed to fluctuate, as is discussed in the remainder of this section.

Table 1 Average value of consumption per week per adult equivalent [1]

	Staple Food	Vegetables and Fruit	Animal Products	Processed Non-Staple Food	Non-food goods and services	Total
Site A	11788	5054	2334	1750	2574	23499
	50.2%	21.5%	9.9%	7.4%	11.0%	100.0%
Site B	15206	4833	3446	2289	3142	28915
	52.6%	16.7%	11.9%	7.9%	10.9%	100.0%
Site C	11508	4775	2836	2002	4492	25613
	44.9%	18.6%	11.1%	7.8%	17.5%	100.0%

[1] Real values in Zambian Kwacha (ZMK) deflated by site-specific price index (=1 at site A in November 2007) and percentage of the value of each category in the total value of consumption. The data period is from November 2007 to October 2009.

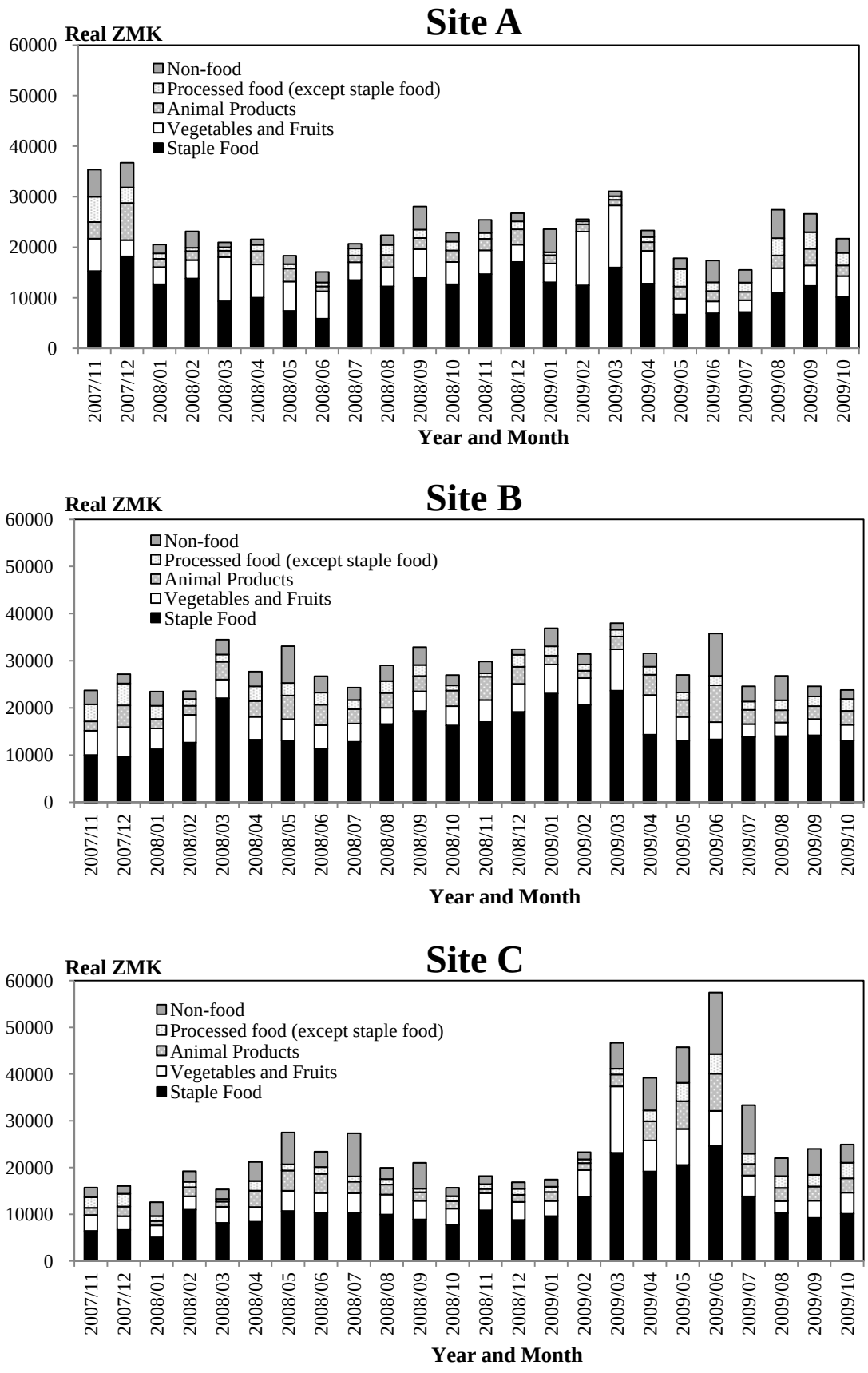

Figure 1. Average consumption per week per adult equivalent for five consumption categories from November 2007 to October 2009

3.2. Food and non-food consumption

Table 2 shows the coefficient of variation of total consumption and its five components per week per adult equivalent for the 2-year study period (November 2007 to October 2009) for each site. As observed in Figure 1, both total consumption and non-food consumption fluctuated over the 2-year period, the coefficient of variation of non-food consumption is much larger than that of total consumption. It means that non-food items were serving as a buffer for food consumption against agricultural income fluctuation. Based on the coefficient of variation reported in Table 2, not only the consumption of non-food items, but also those of processed, non-staple food and animal and fish products had big coefficients of variation particularly at sites A and C. That is, processed, non-staple food and animal and fish products were also serving as a buffer for food consumption against agricultural income fluctuation.

Table 2 Coefficient of variation total consumption and the consumption of its components per week per adult equivalent[1]

	Total Consumption	Staple Food	Vegetables and Fruit	Animal and Fish	Processed Non-Staple Food	Non-Food
Site A	0.23	0.28	0.48	0.53	0.65	0.58
Site B	0.15	0.26	0.31	0.39	0.38	0.55
Site C	0.44	0.44	0.52	0.59	0.55	0.70

[1] Real values in Zambian Kwacha (ZMK) deflated by site-specific price index (=1 at site A in November 2007). The data period is from November 2007 to October 2009.

3.3. Food consumption and food sources

3.3.1 Staple foods

Figure 2 illustrates real values for staple food consumption and the source of the items. Note that maize is the staple food in the study sites constituting more than two-thirds of staple food consumption in the study site, but the figure includes other cereals, grains, beans, and potatoes as staple foods. With a few exceptions, total consumption of staple foods appeared to be smoother throughout the survey period than consumption of self-produced staple foods, and it is confirmed

by the comparison of coefficients of variation between the value of total staple food consumption and that of self-produced staple food consumption for all the sites as shown in Table 3, indicating that cash purchases played an important role in smoothing consumption in the study site.

Among them farmers at site A relied more heavily on purchased food particularly in 2008 due to the heavy rainfall shock in agricultural production, suggesting that cash-earning activities, such as non-agricultural businesses/employment, livestock sales, and cotton production, played a more critical role in obtaining staple food items for these households. In fact, temporary non-agricultural employment in fishery or mining sectors and livestock sales were recorded to be their coping strategies after the production shock. Food obtained from "other" sources includes private gifts and public food aids. It is recorded that wheat was distributed as food aid from November 2007 to April 2008 at site A, which constituted a significant share of staple food consumption as shown in Figure 2. On the other hand, households at sites B and C primarily consumed self-produced staple foods, but still relied on purchased staple food to some extent in agricultural year 2007/08 after the heavy rainfall shock.

Table 3 Coefficient of variation of total staple food and self-produce staple consumption per week per adult equivalent[1]

	Total Staple Food Consumption		Self-Produced Staple Food Consumption	
	Mean (standard deviation)	Coefficient of Variation	Mean (standard deviation)	Coefficient of Variation
Site A	11901 (3298)	0.28	3340 (2896)	0.87
Site B	15327 (3954)	0.26	10049 (3655)	0.36
Site C	11563 (5070)	0.44	9190 (5451)	0.59

[1] Real values in Zambian Kwacha (ZMK) deflated by site-specific price index (=1 at site A in November 2007). The data period is from November 2007 to October 2009.

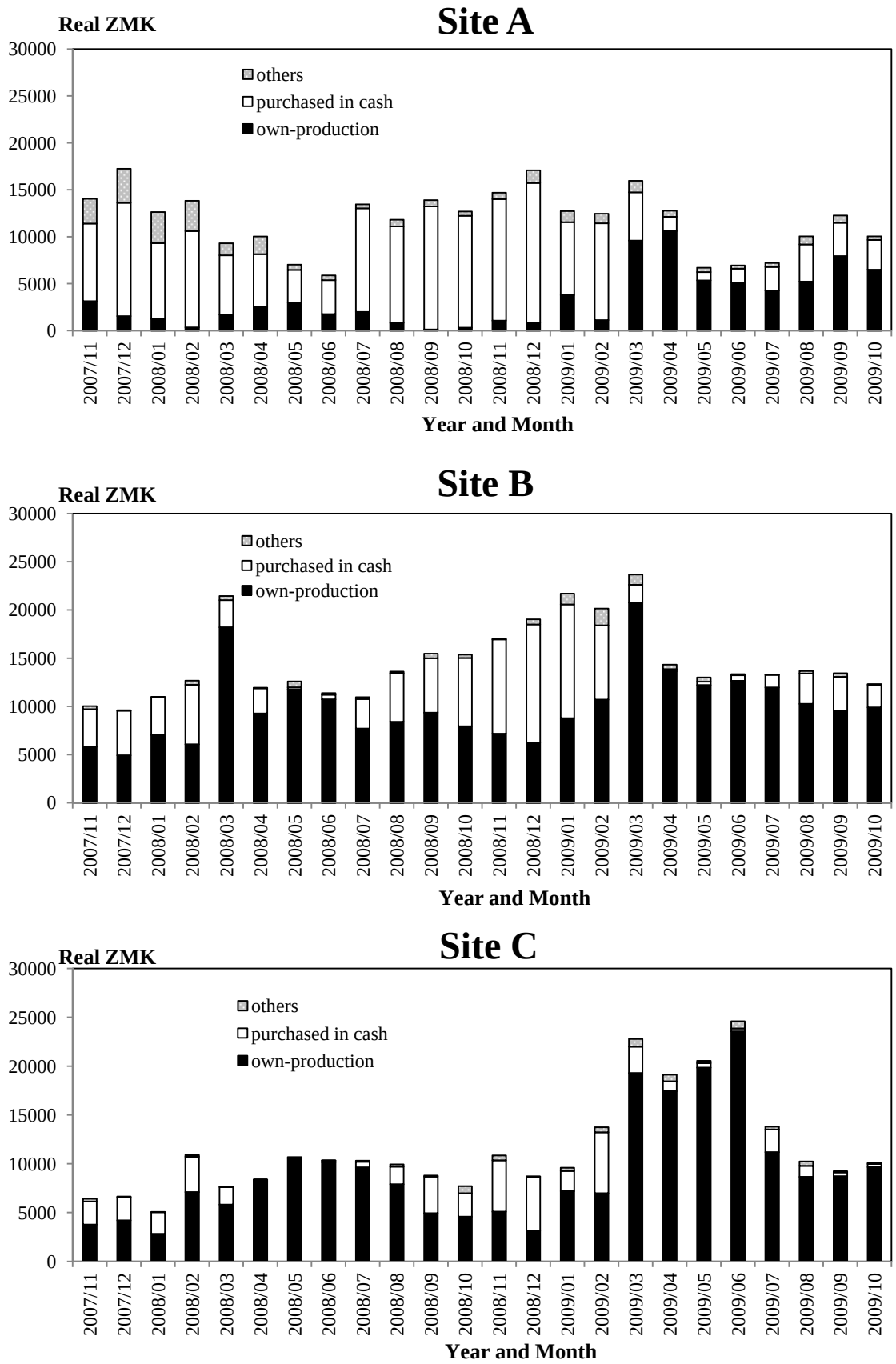

Figure 2. Average consumption of staple food per week per adult equivalent by source from November 2007 to October 2009

3.3.2 Wild food items collected from the bush

Farmers at the study sites relies on wild food items collected from the bush (see Figure 3 for plants, Figure 4 for animal and fish, and Appendix for the names of those wild food items).

Most natural plants, including mushrooms, were classified as vegetables and fruit in this study, but a small number were considered to be staple food items (e.g., wild tubers). From February to April each year (during the harvest period), farmers at all sites consumed large quantities of self-produced products (Figure 4), and all of them should be vegetables since no fruit plantation were reported in the study sites. With the exception of this period, consumption levels of vegetables and fruit were generally smoothed year-round, with self-produced vegetables usually representing a significant share of consumption. However, the collection of wild food items was also important. For example, from December to February (during the rainy season), the collection of wild vegetables and fruit comprised the majority of consumed items at sites A and B. During the rainy season food stock from the previous harvest should have been run out for some households, as a consequence wild food items particularly some kind of wild fruits became to be an important source of calorie intake until the next harvest.

As shown in Table 4, the consumed value of wild vegetables and fruit was significantly and positively correlated with that of purchased staple food at all the three sites, implying that wild food item and purchased staple food were complementary. It is clearer at sites A and B, where the consumed value of wild vegetables and fruits was significantly and negatively correlated with that of self-produced staple food. That is, farmers at site A and B purchased staple food and collected wild food to cope with the shortage of self-produced staple food. At site C, such relationship was not so strong probably because staple food production was nearly sufficient at site C (Figure 2). In addition, at site A where a significant amount of food aid and gift were distributed (Figure 2), the consumed value of wild vegetables and fruit was significantly, positively correlated with that of staple food given as gift or aid, indicating that food gift and aid were also complementary to wild food items collected in the bush. On the other hand, wild food items are not clear substitute for

self-produced vegetables in all the sites as implied by the non-significant correlation between them (Table 4). As mentioned above, wild food items include fruits, which are not self-produced and the objective of wild food item collection may not be to get vegetables in the bush but to obtain any substitution for self-produced staple food during the period when self-produced staple food stock is exhausted. In sum, collected wild food items played an important role to supply additional food in case of self-production shortfall (i.e. 2007/08 agricultural year) and in sites of shortage of self-produced staple food (i.e. sites A and B) and its role is complement to the purchase of staple food and receipt of staple food aid or gift.

Table 4 Correlation of wild vegetables and fruit consumption with other consumption[1]

	Site A	Site B	Site C
Self-Produced Staple Food	-0.49*	-0.47*	-0.17
Purchased Staple Food	0.52**	0.53**	0.55**
Gifted/Aided Staple Food	0.77**	0.09	0.07
Self-Produced Vegetables and Fruit	-0.31	-0.15	0.16
Self-Produced Animal and Fish	0.37	0.45*	-0.24

[1] The numbers are Pearson's correlation coefficients. ** and * indicate significance level of 1% and 5% respectively.

Table 5 Correlation of wild animal and fish consumption with other consumption[1]

	Site A	Site B	Site C
Self-Produced Staple Food	0.34	0.00	-0.23
Purchased Staple Food	0.27	0.02	0.14
Gifted/Aided Staple Food	0.14	-0.02	0.27
Self-Produced Vegetables and Fruit	0.02	-0.04	-0.23
Self-Produced Animal and Fish	0.23	0.18	-0.18

[1] The numbers are Pearson's correlation coefficients. ** and * indicate significance level of 1% and 5% respectively.

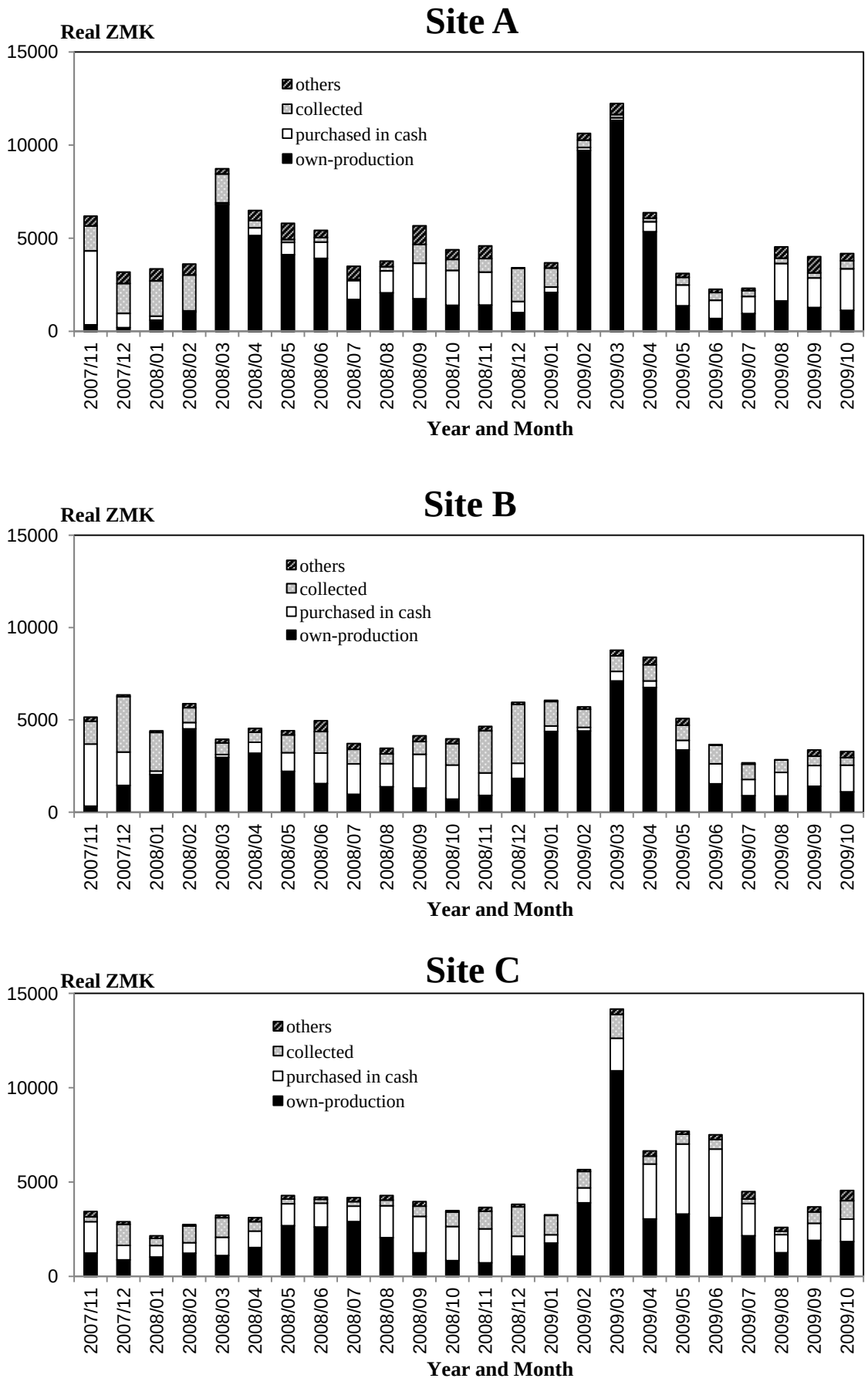

Figure 3. Average consumption of vegetables and fruit per week per adult equivalent by source from November 2007 to October 2009

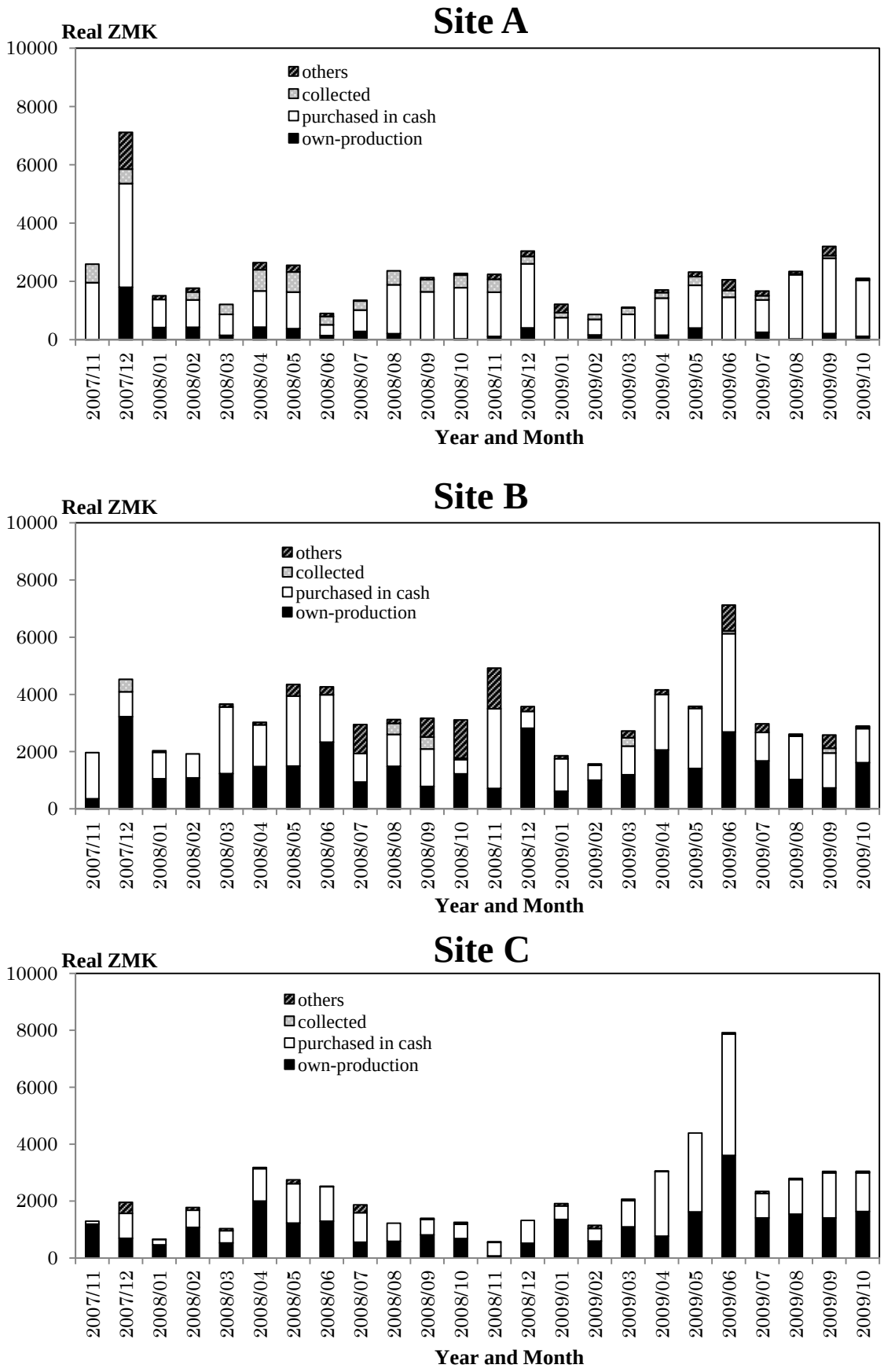

Figure 4. Average consumption of animal and fish per week per adult equivalent by source from November 2007 to October 2009

Animal and fish products included meat, milk, eggs, and fish. In contrast to staple food and vegetables and ftuits, the total value of consumption does not appear to be smoothed (Table 2 and Figure 4). The December 2007 peak for site A represented a high level of meat consumption during the Christmas season. Consumption declined in December 2008, possibly as a result of economic hardship after a poor agricultural harvest in 2007/08. Similar consumption patterns were observed at site B to a lesser extent, but the pattern was not observed at site C, even though the surveyed households also celebrate Christmas. There were also peaks in June 2009 for sites B and C, but such peaks were not observed in June 2008. We have no explanation for these high levels of meat consumption levels because the survey respondents stated that the consumption was “usual” for that time period. At site A, wild animal and fish took a sizable share in total animal and fish consumption. Most of them are fish caught in the river and Kariba lake since site A is located near river and the lake. As shown in Table 5, unlike to case of wild vegetable and fruit, the consumed value of wild animal and fish did not have any correlation with that of other food items. Therefore, wild animal and fish are considered to have little role in coping with the shock in agricultural production.

4. Conclusion

Farmers in rural Zambia were shown to adjust the level and composition of consumption, to mitigate the impact of agricultural income fluctuations. In the 2-year study period, farmers smoothed their consumption of staple foods, and used animal and fish products, processed non-staple food, and non-food items as buffers. Cash purchases played a critical role in smoothing consumption levels of staple foods and vegetables and fruit. In addition, the receipt of gift and food aid played an important role in the smoothing of consumption levels of staple food in site A where the reduction of staple food production was very severe. As for wild food items particularly vegetables and fruit, although they are not considered to be part of staple food, they are consumed when self-produced staple food is not available being complementary to purchased and gifted

staple food. That is, natural vegetation surrounding the three study sites has an important function for the villagers who are vulnerable to unstable agricultural production.

This study focused on descriptive analyses of consumption, given that the heavy rainfall in December 2007 had a significantly negative impact on agricultural production at the study site. Further studies are required to examine the relationship between consumption and income. Moreover, it would be useful to investigate income sources to determine which households are better able to smooth consumption and income generation through both agricultural and non-agricultural means.

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Appendix

List of wild food items recorded by the survey (unclassified)

Amaranthus	Mbula
Baboonemonkey	Mubele
Bbondwe	Mundyoli
Bboonko (Bolyo)	Munkoyo
Bolyo (Bboonko)	Munkulwe
Busiika	Musozya
Cartapiler	Mutubwi
Chamudonga	Mwangabbwe
Chigayo Meal	Mwungu
Chisungwa	Namushinde (Namusyinde)
Chititili	Nkomba
Chomelia	Nkula
Cibwantu	Nkwankwa
Delele Nkomba	Nkwekeche
Delenkoma	Nsoboyo
Dove	Ntende
Duiker	Nyama Soya
Hippo	Pease
Iindi	Pocupine
Impwa	Porridge
Inji	Samp
Jakalanda (Zakalanda)	Shoombo
Juniyuni	Shungwa
Kanunka	Siachikuye
Kkopa	Siahipa
Lusala	Soya Chunks
Mabisi	Sungwa
Mafumo (Mafumu)	Tinji
Magwaza	Tusankwa
Masaba (Masabe)	Tutaka
Masuku	Vwili-vwindyo
Mbubu	

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